AGRICULTURAL INJURIES IN CANADA FOR 1990 – 2000

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Agriculture and Agri-Food Canada

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Foreword and Executive Summary

Agricultural Injuries in Canada for 1990 - 2000 is a comprehensive description of injury occurrence on farms and ranches in Canada over the past decade. For the first time, the Canadian Agricultural Injury Surveillance Program (CAISP) has presented all eleven years' of its agricultural injury surveillance data under a single cover. This report is the most inclusive compendium of a nation's experience with agricultural-related injuries available anywhere.

Many individuals and groups have participated in the identification of injury cases and in the collection and interpretation of data for CAISP. Our collective goal has been to assist those working towards a reduction in the frequency and severity of agricultural injuries by providing comprehensive information on the occurrence of these injuries in Canada.

We have found that agricultural injuries are not random or isolated "accidents". Rather, our report demonstrates that there are many recurrent patterns of agricultural injuries. These patterns generally cross provincial borders and are similar for varied production types.

In presenting agricultural injury data, we have endeavored to do more than simply provide counts on numbers of injuries. The concept of "surveillance" that guides CAISP includes data analysis to identify important patterns of injury occurrence. CAISP then suggests priorities for injury prevention, assists in developing content for injury-prevention programs and helps to implement and evaluate those programs.

This report updates information presented in previous CAISP reports. CAISP's agricultural injury surveillance methods continue to improve as we develop new data-collection methods that allow us to identify and document previously unreported agricultural injury cases. We have therefore amended the presentation of some of our data to more accurately describe patterns of injury occurrence and to more effectively address the needs of data users. As a result of these enhancements, there may be an appearance of inconsistency with numerical results presented in previous reports. These changes in presentation do not affect overall conclusions, but rather permit a more clear and detailed view of the true patterns of occurrence of agricultural injuries in Canada.

The Executive Summary of this report highlights both CAISP's key findings and its recommendations for injury-prevention strategies and priorities. The body of the report includes more detail on the occurrence of agricultural injuries and provides the data to support statements made in the Executive Summary. It also serves as a detailed reference for specific injury patterns.

HIGHLIGHTS AND RECOMMENDATIONS

	HIGHLIGHTS	RECOMMENDATIONS
	Magnitude of the Problem. Agricultural injuries continue to be an important national problem. On average, there are 114 deaths and 1,500 hospitalizations each year in Canada. There was no substantial change in the annual number of agricultural injuries in Canada during the period of study.	*Agricultural injuries should be recognized nationally as an important, preventable cause of death and disability.*
	Agricultural Injury Control Priorities. Obvious national priorities are highlighted below and described in this report. Patterns of agricultural injury can vary from region to region; however, circumstances and immediate causes of injury events are generally similar among regions.	*Recurrent patterns of injury provide one means of establishing national priorities for agricultural injury control.* *The Canadian Agricultural Safety Association (CASA) should make full use of national CAISP data in supporting and planning the development of injury control priorities. Provinces should work together through CASA to establish unified approaches to agricultural injury prevention.* *There is a need for the CAISP network and others to help in prevention efforts by examining regional priorities for agricultural injury prevention. This can be done both by province and by type of production agriculture.*
	High Risk Groups. Groups experiencing the largest numbers of fatal agricultural injuries in Canada are farm or ranch owner-operators, especially elderly males, and children of owner-operators. Visitors to farms and ranches experience a very small number of agricultural fatalities.	*Effective prevention programs must be targeted at the groups at highest risk on farms and ranches.* *CAISP data do not support the commonly-held belief that visitors are often killed on Canadian farms and ranches.*
	Young Children. Toddlers and young children are at very high risk for fatal agricultural injury. Three causes of injury account for about 70% of fatalities in children under age seven: bystander runovers, extra-rider runovers and drownings.	*CASA needs to establish a dialogue with parents and caregivers. The information in this report could help CASA become an effective advocate for parents and their childcare needs.* *Parents and caregivers need to be encouraged to make safe choices when it comes to children's exposure to agricultural workplace hazards.*

	Young Children cont'd.	*Young children should never be permitted to access the farm or ranch work site. Parts of all farms and ranches must be "child-free zones". Fences and barriers are of clear importance in preventing children from accessing work sites.* *The practice of taking children on tractors and other machines as extra-riders must be prohibited. This restriction should be targeted and applied to all families with children, particularly those with young children.* *Innovative solutions to address the need for rural childcare are required.*
	Boys. Males are at higher risk for agricultural injury than females in almost all age groups. This pattern begins when children are toddlers. This is clearly attributable to gender differences in the degree of exposure to the farm or ranch work site. Boys have a higher exposure to the work sites and their associated hazards than girls do.	*Parents and caregivers should be encouraged to limit the exposure of younger children to farm or ranch work sites.*
	Tractor-Related Injuries. These events continue to be a dominant national pattern of injury. Tractor-related injuries are particularly lethal. There has been a minimal decline in the annual number of tractor fatalities over the study period.	*Tractor fatalities should remain a national injury control priority. There is a need to focus research and prevention efforts on leading patterns of tractor fatalities, both by region and by agricultural production characteristics.*
	Tractor Rollovers. There was a modest decline in the number of fatal tractor rollovers over the study period; however, sideways rollovers (e.g., from slopes) and backward rollovers (e.g., from sudden acceleration or from towing stationary loads) remain the leading causes of agricultural fatalities. Rollover injuries occur most frequently in adults of all ages. Sideways rollovers do not generally happen on fields, but rather involve slipping sideways off roads and driveways into ditches.	*There are well-established strategies for the prevention of tractor rollover injuries. Implementation of these strategies in other countries has resulted in near eradication of this leading cause of death. Most important are the use of rollover protection structures (ROPS) and seat belts on all tractors. Additional effective strategies include limiting speed during transport and adopting best practices for hitching and towing.* *CASA and others should advocate for policies that require the retrofitting of ROPS and seat belts on all tractors. Further, there is a need to monitor the percentage of tractors on Canadian farms and ranches that have ROPS and seat belts in place.*

	Runovers. Tractor, vehicle and machinery runovers are a leading cause of fatal injury. They are also important causes of injury associated with hospitalization. The incidence of these events has remained stable over time. Runovers are particularly a problem for children who are either killed as bystanders, or who die after falling off tractors or machinery being operated by others (extra-rider deaths). Unmanned runovers are a leading cause of death among older farmers and ranchers.	*Effective strategies must be developed to keep very young children from entering the work site. Areas where tractors and other machinery are operated must become barriered "child-free zones".* *The practice of taking children as extra-riders on tractors or other machinery must be prohibited. From an engineering perspective, there appears to be no safe method for transporting extra riders on tractors.* *The practice of jumpstarting tractors is inherently dangerous. There is a need to promote best practices for tractor operation and maintenance. See www.caisp.ca for a special report on tractor runover injuries.*
	Machinery Entanglements. The leading cause of non-tractor machinery injuries on Canadian farms and ranches is being caught or entangled in operating machinery. There has been no apparent decline in the occurrence of these types of injuries. Loose clothing often contributes to these events. Other major risk factors in machinery entanglement are the cleaning, repairing or adjusting of machinery while it is in operation and the removal of guards from machinery.	*The use of appropriate machinery guards is essential. Technological advances in the guarding of agricultural machinery are of paramount importance. It is recognized, though, that it may take decades for advances in technology to become the norm in agricultural work places because of the cost of machinery replacement and retrofitting. Strategies that address the type of clothing used during machinery operation may be beneficial. Safety campaigns should raise awareness of the dangers of loose clothing and should promote safer clothing choices. The manufacture and use of innovative, entanglement-free clothing should also be encouraged.* *Engineering and educational solutions are needed to ensure that machinery will be shut down completely before it is cleaned, repaired or adjusted.*
	Animals. Animal-related trauma is an important cause of non-machinery injuries to both males and females. These injuries generally involve bulls, cows and horses. They are more common among older males. Young children are less frequently killed or injured by large farm and ranch animals than older children and adults.	*Prevention efforts aimed at older farm and ranch operators should stress the need for best practices in animal handling at all times. One factor that might contribute to the relatively low rate of animal-related injuries to young children is the use of barriers to separate children from large animals. The use of barriers should be recognized as a successful safety practice on Canadian farms and ranches.*

	Gases in Confined Spaces. Due to the emergence of large-scale livestock operations, animal confinement gases like hydrogen sulfide are becoming an important cause of fatal injury. Young workers appear to be at especially high risk. Among the fatalities caused by hydrogen sulfide poisoning, there have been four instances of multiple deaths. Almost all hydrogen sulfide poisonings were associated with improper ventilation during the routine maintenance of sewers and manure tanks. Of the eighteen victims, eight were killed during rescue attempts. More than half of the hydrogen sulfide-related fatalities occurred on hog farms. Exposure to silo gases is also an important cause of fatalities and lung injuries.	*Best practices must be adhered to in the design of building ventilation systems, the handling and storage of manure, and the maintenance of sewers. Confined space entry procedures should be followed by anyone accessing a sewer, pit or tank where there might be a high concentration of hydrogen sulfide. There is an ongoing need to educate farm and ranch workers about the dangers of animal confinement gases and the use of appropriate safety measures.* *Silo ventilation systems must be properly designed, maintained and operated. Workers should never enter silos or silage bins alone and should wear appropriate respirators when working with fermenting silage.*
	Vehicle Traffic Injuries. These have emerged as an important cause of fatalities. These injury events are expected to occur more frequently as the distances from farms and ranches to markets increase and as agricultural equipment and machines get larger.	*There is a need for dialogue between provincial transportation officials and the agricultural community on appropriate and safe methods for moving agricultural machines on public roadways.* *Agricultural machines must conform to regulations for use on public roadways. CASA and others must continue to promote established regulations for vehicle size, signage, reflectors and lighting.*
	Isolation. Large numbers of people are killed and injured working in isolated locations on Canadian farms and ranches. They frequently die at the scene of the injury event. Of fatal injury events where discovery time was known, 28% of the victims were not found for more than an hour.	*Geographic positioning systems and cellular phones (where service is available) or two-way radios can facilitate rapid response to an emergency at an isolated work site, as long as communication devices are always kept within reach. Civic addressing systems should be improved in rural areas so that emergency personnel can locate victims more easily.*
	Discovery. CAISP data show that any person who lives or works on or near a farm could potentially be the first to arrive at the scene of an injury.	*All adults and older children on farms and ranches need to know the emergency and communication procedures that should be used when an agricultural injury occurs.*

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 non-fatal agricultural injuries. CAISP is a national program with partners in each of the ten provinces of Canada.

This national report from CAISP describes the occurrence of serious agricultural injuries in Canada from 1990-2000. Past reports have included national investigations of fatalities and hospitalized agricultural injuries, as well as specialized reports on more focused injury patterns including childhood agricultural injuries, tractor runovers, and variation of injury patterns by gender.

The current report combines contemporary hospitalization and fatality data over an 11-year study period. 1,256 fatalities and over 14,900 hospitalized agricultural injuries were registered in the CAISP system as of December 2000. The large volume of cases observed over this time period, though disturbing, has allowed us to describe meaningful trends and patterns of agricultural injury in Canada. We have also been able to identify several new and emerging patterns of injury.

The report is organized into several sections. Following this introduction, there is a description of the methods used in our surveillance program. Fatal and hospitalized agricultural injuries are then reviewed comprehensively. Important trends and patterns are highlighted. These lead to focused recommendations for injury prevention and further research.

In the past, the CAISP reports have been well received and cited by a variety of individuals and organizations including educators, researchers, health professionals, policy makers, occupational health and safety specialists, the media, and agricultural organizations and worker groups. Our hope is that the CAISP surveillance program will continue to provide information that is of value to these groups in their efforts to plan and implement effective agricultural safety programs in Canada.

1.2 HISTORY OF THE AGRICULTURAL INJURY ISSUE IN CANADA

Injuries are a leading cause of death, disability and illness among Canadians. Agricultural injuries have been recognized as a particularly 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 in earnest, but it was only recently that substantial national resources were 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 loss annually (Leigh et al., 2001). Canadian estimates of economic burden are in the hundreds of millions of dollars annually (Locker et al., 2003).

One of the reasons that agricultural injuries are a recurrent problem is the uniqueness of agricultural work environments. In addition to being industrial worksites, farm and ranch properties are homes and places to live and play. Groups who are particularly vulnerable to injury include agricultural operators and workers, but also children and the elderly. Because of this diversity, there are a variety of injury patterns that are unique to the agricultural population.

Until the establishment of CAISP, Canadian data on agricultural injuries were historically limited. This surveillance program has filled an important void in that it has provided national evidence 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 funded by the Canadian Agricultural Safety Association (CASA). CAISP was funded as a pilot project in December 1995, and became a national CASA program in September 1996.

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 have since grown to cover eleven years of data collection (1990-2000). They 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**. The fatality and hospital data used in this report are collected, compiled, and analyzed in a standard manner by all provinces. During 2001-2002, a sub-committee of CAISP researchers worked to improve these procedures. These efforts have led to an increased level of confidence in the data itself and the patterns of injury observed within the data.

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 THE 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 has 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

The prevention of injuries in agricultural work settings is challenging because of the unique nature of the agricultural work environment. Not only are farms and ranches places of work, they are also places where recreational and general living activities take place. People begin to work on farms and ranches at an early age and, unlike other industries, it is not uncommon for farmers and ranchers to work well into their 70s and 80s.

Agricultural operators and their employees are exposed to diverse mechanized and non-mechanized work hazards. A typical agricultural worker may be responsible for the operation and maintenance of many pieces of machinery, and will be faced with a variety of physical, chemical and zoonotic risks. There are also wide variations in work methods among agricultural operations. These may be associated with unique environmental and other hazards.

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. There has traditionally been reliance upon voluntary rather than regulatory safety standards; however, the effectiveness of voluntary safety standards has not been well evaluated.

1.7 FUNDING (CASA AND IN KIND)

The Canadian Agricultural Injury Surveillance Program is a national initiative. It is currently funded through direct contributions from the Canadian Agricultural Safety Association (CASA), as well as in-kind contributions from various government, academic and industry-based organizations across Canada.

1.8 THE CANADIAN AGRICULTURAL SAFETY ASSOCIATION

The Canadian Agricultural Safety Association (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 collaborated to address issues related to rural health, including problems of illness, injury, and accidental death in farmers, ranchers, their families and agricultural workers.

CASA's mission is to have Canadian agriculture free of workplace injuries and illnesses. This is accomplished by fostering collaboration with and among the Canadian provinces, selling the message of agricultural safety, tangibly impacting agricultural safety and health in Canada, and building solid foundations for current and future efforts toward this cause.

2 METHODS

2.1 FATAL AGRICULTURAL INJURIES

2.1.1 Identification of Agricultural Fatalities

The process used in the identification of agricultural fatalities varies by province. This is a general description of this 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.

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 / provincial police reports. (See Table 2.1, below).

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) and a database program that has been developed centrally. Data abstraction is generally done on-site at the Provincial Chief Coroners' Office by reading and abstracting the relevant information from coroners' files. Data are then sent to the national site for "data cleaning" – which means further checking, verification, and analysis.

TABLE 2.1. Approach to the identification of fatality cases by province and data source

	Source Used for Case Identification				
Province	**Coroner / Medical Examiner**	**Media**	**Police**	**Registrar General / Vital Stats.**	**Other***
BC	x			x	x
AB	x			x	x
SK	x	x			x
MB	x	x	x		x
ON	x			x	x
QC	x		x	x	x
NB	x				
NS	x		x		x°
PE	x				x
NL					x

* "Other" includes provincial occupational health and safety organizations.

° For NS "Other" includes Nova Scotia Department of Labour reports.

2.1.2 Key Definitions

Agricultural fatalities are included in this analysis if they meet the following definition:

Agricultural Fatalities: *CAISP defined an agricultural injury fatality as: 1) Any unintentional injury resulting in death that occurred during activities related to the operation of a farm (as defined below) 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. CAISP further sub-divided agricultural injury fatalities into two types: work-related agricultural fatalities and non work-related agricultural fatalities.*

Work-Related Agricultural Fatalities: *Work-related agricultural fatalities are deaths that occurred during the course of agricultural work. This includes deaths that took place away from the farm or ranch if agricultural work was being done (e.g., transporting livestock or harvested crops on public highways.) Deaths where the victim(s) were killed while a third party was engaged in agricultural work are also included.*

Non Work-Related Agricultural Fatalities: *This category includes those deaths that, while occurring on a farm (as defined below) or ranch, or caused by some aspect of the agricultural environment, were either not directly related to agricultural work or not collected in a consistent manner across the country. For the purposes of clarity, they are analyzed separately from the work-related agricultural fatalities. Examples of these fatalities include deaths on agricultural vehicles being used for recreational purposes.*

CAISP also uses the following definitions:

Study Population: *All persons who live, work on, or visit a Canadian farm (as defined below).*

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

Other Inclusion/Exclusion Criteria: CAISP has established several decision rules to help in judging whether or not to include specific types of fatalities. These rules are provided in Appendix A.

A glossary of terms used in this report is provided in Appendix B.

2.1.3 Fatality Coding and Consensus

The Data Cleaning Committee is a sub-committee of CAISP researchers responsible for the coding, checking and verification of all data. During 2001-2002, this committee updated procedures to be used during data cleaning activities. These are documented in two manuals, one each for fatalities and hospitalizations.

In the data cleaning process, key data elements in the fatality database are reviewed by the data cleaning

committee. Each case is reviewed independently by at least two members of the committee. Ineligible fatalities are excluded (Appendix A. Decision Rules for Inclusion/Exclusion of Cases). The eligible fatalities are categorized as either work-related agricultural fatalities or other agricultural fatalities (those caused by a hazard of the farm environment). Pattern of injury codes are then assigned to the fatality cases. These codes are used to develop prevention-oriented analyses.

For the cause of injury, at least two members of the data cleaning committee review and code/recode assigned values for each fatality using the procedures described in the data collection manuals. Cases where there was poor agreement are brought to the attention of other members of the data cleaning committee for discussion and resolution. Adjudicated decisions are arrived at for difficult individual cases.

The hospitalized agricultural injury data cleaning process is similar to that used for fatality data; however, due to the generally limited descriptions of injury event circumstances available in hospital records, the work related and pattern of injury coding cannot be applied.

2.1.4 Fatality Data Collection Issues

There are several challenges inherent to the CAISP data collection process. It has been difficult to standardize the process of obtaining access to data among provinces. For fatalities, CAISP collaborators from individual provinces rely upon different types of agencies in order to identify cases. All provinces except Newfoundland & Labrador access coronial databases, but some provinces enhance case identification by accessing other mortality databases.

There are also discrepancies in terms of the organization and computerization of case files within provincial mortality databases. Some provinces do not have a centralized computer-based system for the storage and retrieval of coronial records, while other provinces have highly organized central registries and well established computerized data retrieval systems. Although every effort is made to identify all eligible cases, we recognize that some provinces are more efficient than others with respect to case identification. Hence, we believe that the counts presented in this report are conservative.

Every effort is made to standardize data collection efforts in order to minimize variation in the detail available in data abstractions. However we recognize that some variation will exist. This process is under the control and scrutiny of CAISP collaborators.

2.2 HOSPITALIZED AGRICULTURAL INJURIES

2.2.1 Identification of Hospitalized Agricultural Injuries

2.2.1.1 Basic Hospital Separation Data

Hospital separation data are obtained by CAISP collaborators through agreements with their provincial Departments of Health. Agricultural machinery-related injuries are identified using a systematic computer search of these hospital separation databases. Cases are considered for inclusion if the primary external cause of injury (International Classification of Diseases – version 9, World Health Organization E-code) is E919.0: *Accidents Caused by Agricultural Machines*. The process used for the initial identification of non machine-related injuries within individual provinces is summarized in Table 2.2. Non machine-related agricultural injuries are identified where the fifth digit of the external cause of injury (ICD-9 E-code) is "1" (indicating that the location of injury is a farm) or the place of occurrence code indicates that the injury occurred on a farm (E849.1). CAISP acknowledges that 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. Some provinces do have the ability to identify and code transportation-related injuries, but these injuries are generally not included in the national report. CAISP will publish a separate technical report on transportation injuries. It should be noted that the data cleaning process used by CAISP results in the reclassification of some machine-related injuries as non machine-related, and *vice versa*.

TABLE 2.2 Approach to the identification of non machine-related cases, by province

Province	E849.1	Fifth Digit	Other	Enhanced Data Available
BC		x		Yes
AB	x			Yes
SK		x		Yes
MB			x	Yes
ON		x		Yes
QC		x		Yes
NB		x		Yes
NS	x			Yes
PE*			x	Yes
NL*				No

* Formal process for case identification not yet established

Some provinces use a slightly different approach to case identification than is implied by the description above. Manitoba has an existing, unique code on its hospital discharge records that has long been used to indicate the location of any injury event, including whether the injury occurred on a "farm". Prince

Edward Island does not currently have computerized hospital records that allow the systematic identification of agricultural-related injuries; however, CAISP investigators in the Atlantic Provinces were able to go directly to the two major hospitals in Prince Edward Island to perform an internal record search for injuries coded as E919.0 (i.e., machinery-related injuries).

2.2.1.2 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.

These processes vary slightly among provinces. For example, in Saskatchewan, the patient identifiers and institution codes are retained by Saskatchewan Health and replaced with study numbers. Also, Saskatchewan Health personnel facilitate the data abstraction process. The information needed to identify hospital charts and the data abstraction forms are sent directly from Saskatchewan Health to the medical records personnel of the hospitals involved.

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.

This national report is based upon enhanced data collected by fiscal year in nine of the ten Canadian provinces, representing over 98% of the Canadian farm population. No data were available from Newfoundland and Labrador. In Nova Scotia, enhanced data for the seven fiscal years ending March 31, 1997 were available for the present analysis. In Alberta, enhanced data for the eight fiscal years ending March 31, 1998 were available. For the other seven provinces, enhanced data were available for all ten fiscal years ending March 31, 2000. Rates of response were consistently high, whether measured in terms of hospital participation or the percentage of completed abstracts returned. For Nova Scotia and Alberta, data were imputed for the missing years by calculating the average number of annual cases for the fiscal years April 1995-March 1997 in Nova Scotia and for the fiscal years April 1995-March 1998 in Alberta.

2.2.2 Key Definitions

Agricultural (Farm) Machine-related Injury: *Agricultural machine-related injuries include cases admitted to a Canadian hospital, where the International Classification of Diseases (version 9, W.H.O.) external cause of injury (E-Code) was E919.0, Injuries Caused by Agricultural Machinery. These cases are identified using E-Codes recorded on the hospital discharge record. Cases coded with the location of injury code indicating a farm are also included if the incident involved a machine or a motorized vehicle (see Appendix B for more detailed definitions).*

Non Machine-related Injury: *Non machine-related agricultural injuries include those cases admitted to Canadian hospitals, where the location of injury code indicates that the injury occurred on a farm and a machine/motorized vehicle was not involved.*

Other Inclusion/Exclusion Criteria: *CAISP has developed decision rules to assist in determining whether specific types of hospitalizations should be included and to help establish their classification. These rules are provided in Appendix A.*

Other Definitions: Definitions of terms used in this report are provided in Appendix B.

2.2.3 Issues and Challenges

Different provinces operate under different legislative frameworks concerning access to hospital discharge records. The CAISP program requires access to individual case records. CAISP recognizes the privilege and responsibility associated with access to these records. Since each province negotiates access to provincial data according to the ethical guidelines and processes required by their respective Ministries of Health, the time required to conduct periodic surveillance varies from one province to another. This affects the availability of data for each reporting period.

For hospitalizations, the enhanced data abstraction is completed by many medical records technicians at hospitals across Canada. 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.

There are important discrepancies among the provinces in the completeness of case identification on non machine-related injuries. Non machine-related injuries are identified through location of injury codes, the use of which is mandatory in some provinces (e.g., Alberta), but optional in others. We expect that our most complete data on non machine-related injuries will come from those provinces where location coding is mandatory.

Because of these coding differences, it is difficult to compare non machine-related injury patterns among

provinces. For this reason, we have not presented provincial analyses of hospitalizations in this report. People who require specific data for their province are encouraged to consult with the provincial CAISP representative listed in Appendix E. CAISP is also recommending that organizations governing the coding of hospital separation records institute a policy to make the coding of injury location mandatory. With time, this will allow the surveillance program to identify the full spectrum of hospitalized agricultural injuries in Canada. CAISP is continually improving its data collection and coding procedures by identifying and resolving any disparities.

2.3 CONFIDENTIALITY AND CAISP DATA

2.3.1 Case Identifiers

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. Researchers are never allowed to access unique identifiers. Paper and electronic copies of data abstraction forms are retained in the province of origin by the provincial collaborators.

2.3.2 Database Management and Access

Data are maintained in an electronic database that is managed by the national co-ordinator under the supervision of the program co-directors. The provincial collaborators retain the complete data set for their own provinces.

Access to the national dataset is strictly limited to CAISP collaborators for the following activities:

1. CAISP provincial collaborators assigned the task of producing special technical reports for Canada.
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 co-ordinator and program co-directors for the purpose of maintaining the database and producing periodic comprehensive reports for Canada.
4. To support agricultural injury prevention initiatives by others through analyses presented as tabular data.

2.3.3 Analysis Issues - Reporting

The reporting of patterns of injury in this document is based on analyses of group data only. No individual cases are presented, except for hypothetical cases that illustrate certain patterns of agricultural injury. Descriptions of typical injuries provided in CAISP reports are modified to be representative, and are not actual occurrences of agricultural injuries. For hospitalized agricultural injuries, where analysis of the data results in a group size of less than five cases, the results are generally aggregated with another category or "<5" is presented instead of the actual number.

Where data elements are missing, these are reported as missing and are not replaced. Where it is not possible to categorize a variable for a case due to insufficient information, these are reported as unknown.

2.4 ANALYSIS

2.4.1 APPROACH TO ANALYSIS

The analysis presented in this report is descriptive. It has three main objectives: 1) to describe the magnitude of the agricultural injury problem in Canada and within the provinces; 2) to describe trends in the causes and occurrence of fatal and hospitalized agricultural injuries in Canada; and 3) to identify emerging patterns of injury.

The fatality database contains a wide variety of variables that can be used to describe injury occurrences. There are descriptive characteristics for the victims (for example the victim's age, gender and role on the farm), the geographic location (province and region), as well as variables that specify when each death occurred (year, month, day of the week). In addition, there are data describing what caused each of the fatalities including the circumstances surrounding the injury occurrence. Similar information is obtained for each hospitalized case, although the level of detail is reduced.

The basic approach to the analysis was to summarize, in a simple manner, risks, trends and other patterns among fatal and hospitalized injuries. Where possible, these patterns were represented in bar charts. The statistics used include simple counts and frequencies as well as cross-tabulations. Where appropriate, injury rates were calculated. Statistics that describe trends in the occurrence of agricultural injuries over time were provided. In general, this report is not aimed at a statistical audience and formal hypothesis-testing methods were not employed in most comparisons.

2.4.1.1 Use of Calendar Versus Fiscal Year

Fatalities are reported on a calendar year basis. Records of hospitalization data are kept according to fiscal years (April 1 to March 31). For this reason, hospitalization data have been analyzed and reported on a fiscal year basis.

2.4.1.2 Length of Stay Analyses

For hospitalized cases, 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 analyses 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 and takes into account all reported days in hospital for transfers and re-admissions.

2.4.1.3 Identification of Cases Outside the Established E-Code Protocol

Five of the provinces identify non machine-related injuries using the 'place of occurrence' code available as a fifth digit sub-classification in the ICD E-Code system for the code ranges E850-E869 and E880-E928. Most of the smaller provinces do not use the place of occurrence code to identify agricultural injuries. The range of codes where the 'place of occurrence' fifth digit is not available includes all of the transportation categories (motor vehicle traffic, motor vehicle non traffic, rail, water, animal and air) and the late effects of accidental injuries. Only Manitoba is able to identify whether these injuries occurred on a farm through the use of a unique code on its hospital discharge records.

To investigate the potential for under-reporting agriculture-related transportation injuries, a special analysis of cases in Saskatchewan was conducted on two of the transportation codes, E827 (animal-drawn vehicles) and E828 (animals used for transportation). These codes were selected because they were likely to involve agricultural activities. Farms and ranches are where animals that are ridden and/or used in transportation are generally housed.

All cases in Saskatchewan that contained these codes were abstracted for the years 1997-1998 through 1999-2000. It was anticipated that the location of injury could be identified from these chart abstractions. In the majority of cases, the location of injury did not appear in the medical chart. If the Saskatchewan analysis reflects general coding practice, it is difficult to verify that these injuries occurred on farms or ranches. However logic dictates that a substantial proportion of these are likely to be agricultural injuries since large animals, such as horses, are primarily located on farms or ranches. We conclude that this is likely a significant cause of under-reporting, one that cannot be addressed easily within ICD-9 or ICD-10 coding practices.

2.4.1.4 Rates and Trends

Selected rates of fatal agricultural injury are presented in this report. Numerators in these rates are work-related agricultural injury fatalities identified in the CAISP registry. These include injuries to farm residents, agricultural workers and a small number of visitors to the farms. Denominators for these rates are taken from the 1996 Canada Census of Agriculture. The 1996 census data were used for the denominators in rate calculations because they were collected roughly halfway through the surveillance period.

Some caution is warranted in the interpretation of the fatality 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 excludes visitors to farms (as defined by Statistics Canada) and some agricultural workers, but it includes all farm residents, some of whom have relatively little exposure to agricultural work hazards. The accuracy of agriculture census information may vary among provinces, but is the best source of denominator information available at this time.

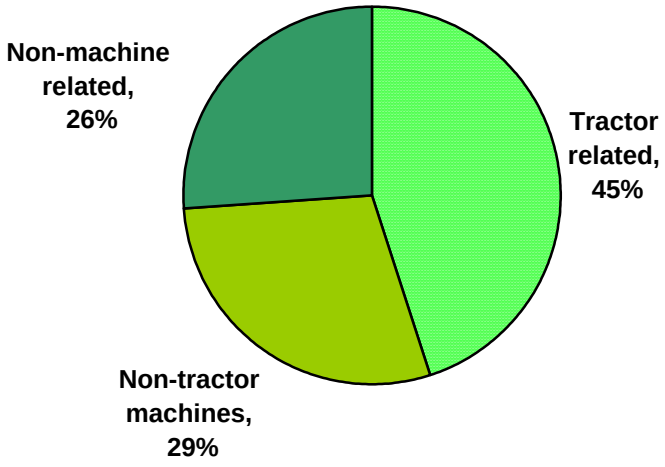
This report presents temporal trends in the annual occurrence of some groups of fatal agricultural injuries. These are supported with correlation statistics and associated probabilities that describe the direction, strength and statistical significance of the trends. These trends must be interpreted with caution as they are all based upon annual *counts* as opposed to *rates* of injury events. Possible contributors to the 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 Canada has declined over the 1990s. Because of variations among provinces and between years in the completeness of case identification, neither rates of hospitalized agricultural injuries nor trend statistics are presented in this report.

3 WORK-RELATED AGRICULTURAL FATALITIES: OVERVIEW

3.1 INCIDENCE

There were a total of 1,086 work-related agricultural fatalities in Canada between 1990 and 2000. Tractors were involved in 45% of these deaths. Tractor-related fatalities included rollovers (228 deaths) and runovers (117 deaths). Fatalities attributed to other agricultural machinery involved more than twenty types of machines. Non-machinery deaths were most often due to animal-related trauma, being struck by an object and falls.

FIGURE 3.1 **Work-related fatalities by cause, 1990-2000 (1,086 deaths)**



3.2 PROVINCIAL BREAKDOWN

The distribution of work-related agricultural fatalities in Canada, by province, is shown in Table 3.2. There were modest variations in risk for agricultural fatalities across the country.

TABLE 3.2 **Work-related fatalities by province, 1990-2000 (1,086 deaths)**

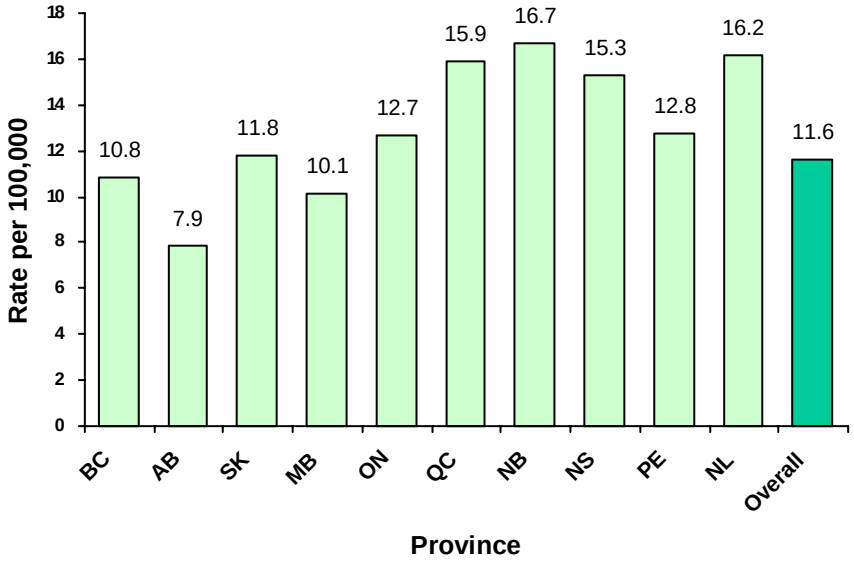
Province	Deaths		Farms*		Farm Population*		Crude Annual Rate Per 100,000/yr
	No.	%	No.	%	No.	%	
BC	82	7.6	20,290	8.2	68,770	8.1	10.8
AB	163	15.0	53,652	21.7	188,510	22.1	7.9
SK	189	17.5	50,598	20.5	145,560	17.1	11.8
MB	89	8.2	21,071	8.5	79,835	9.4	10.1
ON	308	28.4	59,728	24.2	221,225	26.0	12.7
QC	200	18.3	32,139	13.0	114,605	13.5	15.9
NB	19	1.7	3,034	1.3	10,350	1.2	16.7
NS	22	2.0	3,923	1.6	13,060	1.5	15.3
PE	11	1.0	1,845	0.7	7,810	0.9	12.8
NL	3	0.3	643	0.2	1,680	0.2	16.2
Canada	**1,086**	**100.0**	**246,923**	**100.0**	**851,405**	**100.0**	**11.6**

Source: * Statistics Canada, Canada Census of Agriculture, 1996.

3.3 CRUDE FATALITY RATES BY PROVINCE

The overall provincial rates displayed in Table 3.2 are shown graphically in Figure 3.3. The crude annual rates suggest there are modest variations in risk for agricultural fatalities across the country.

FIGURE 3.3 **Crude rates* of work-related agricultural fatalities by province, 1990-2000 (1,086 deaths)**

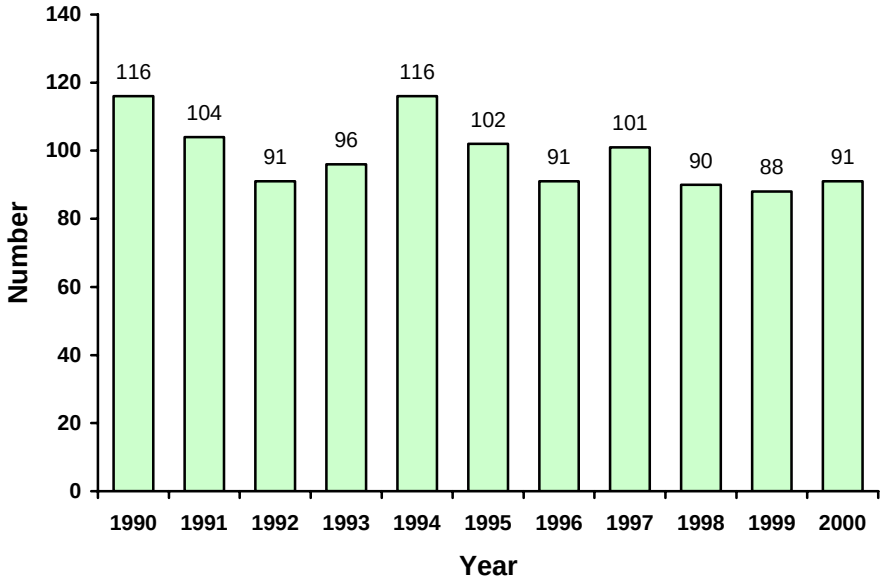


* Crude average annual rate per 100,000 farm population.

3.4 FATALITIES BY YEAR

Counts describing the annual distribution of Canadian agricultural fatalities are shown in Figure 3.4. There was no significant decline in the annual number of agricultural fatalities over the ten-year surveillance period.

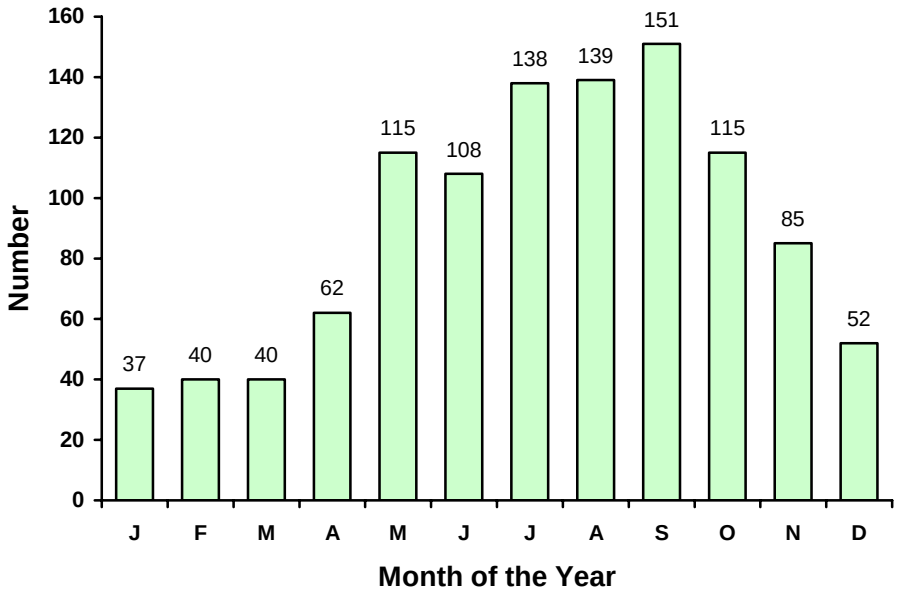
FIGURE 3.4 **Work-related agricultural fatalities by year, 1990-2000 (1,086 deaths)**



3.5 FATALITIES BY MONTH

The monthly distribution of Canadian agricultural fatalities is shown in Figure 3.5. There were more deaths in the warmer months of May through October and fewer deaths in the colder months of November through April. This distribution reflects seasonal changes in exposure to agricultural work and associated agricultural occupational hazards.

FIGURE 3.5 **Work-related fatalities by month of the year, 1990-2000 (1,082 deaths*)**

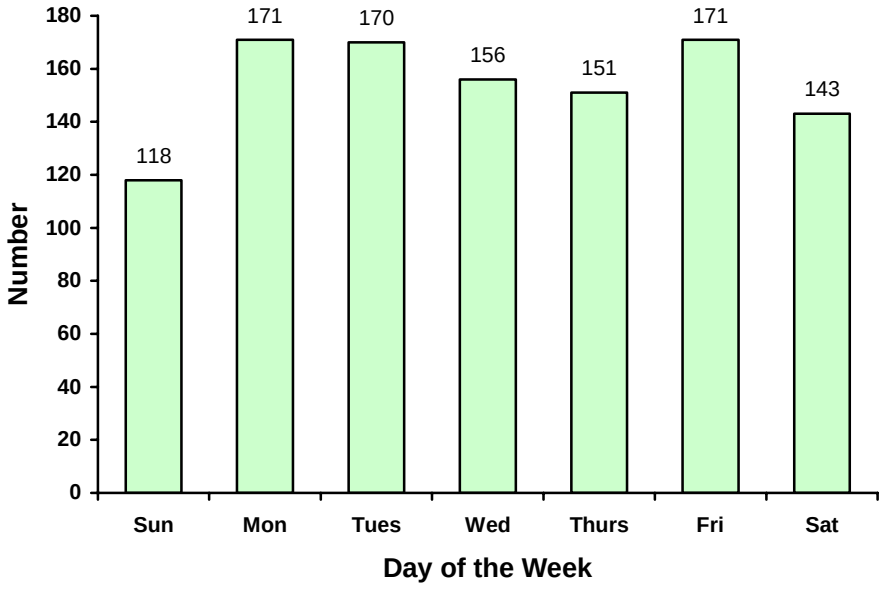


* This information was not available for 4 cases.

3.6 FATALITIES BY DAY OF THE WEEK

The distribution of agricultural fatalities in Canada by day of the week is shown in Figure 3.6. There were fewer fatalities on Sundays than on any other day of the week.

FIGURE 3.6 **Work-related fatalities by day of the week, 1990-2000 (1,080 deaths*)**

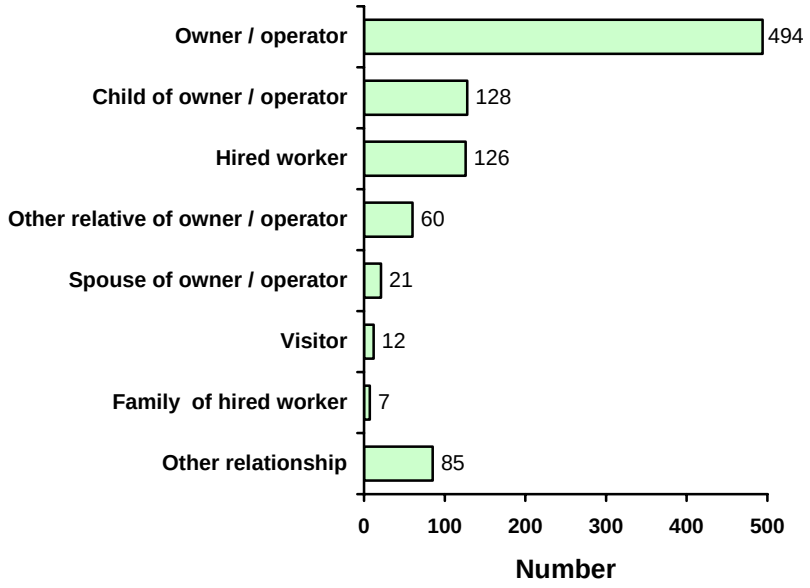


* This information was not available for 6 cases.

3.7 FATALITIES BY RELATIONSHIP

Agricultural owner-operators were most commonly involved in work-related agricultural fatalities, accounting for 53% of the deaths where the relationship of the victim was known. The second-largest category involved children of owner-operators, followed by hired workers. Visitors represented a very small proportion (1.3%) of those killed in agricultural work-related events.

FIGURE 3.7 **Work-related agricultural fatalities by relationship of deceased to farm owner, 1990-2000 (933 deaths*)**

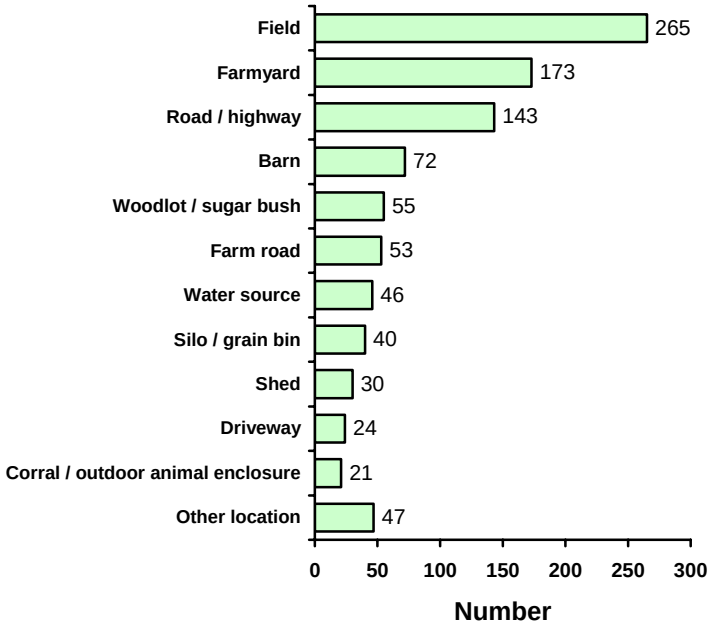


Other relationship includes, but is not limited to, neighbour, motorist, service/repair person.
* This information was not available for 153 cases.

3.8 FATALITIES BY LOCATION

Figure 3.8 shows that fields, farmyards and highways are the most frequent locations of work-related fatal agricultural injuries.

FIGURE 3.8 **Work-related agricultural fatalities by location of injury event, 1990-2000 (969 deaths*)**

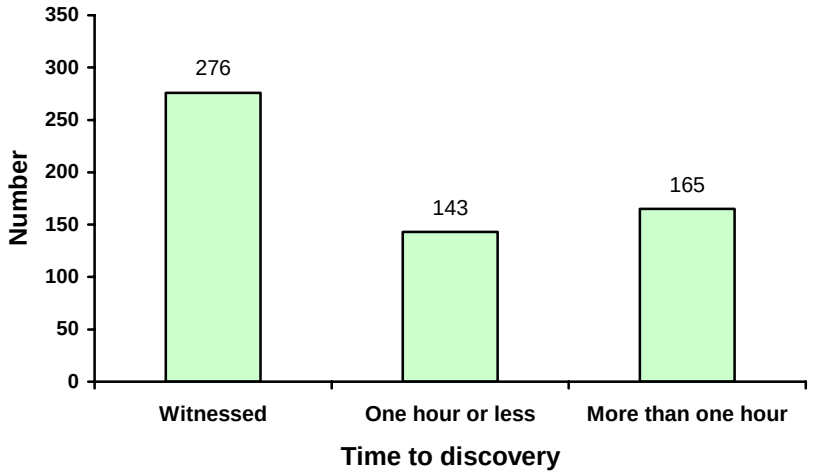


Other location includes, but is not limited to, orchard, trench, dyke, hill, river bank.
* This information was not available for 117 cases.

3.9 TIME TO DISCOVERY

This chart only shows fatal injury events where discovery time is known. Of those events, 28% were not discovered for more than one hour, which has a negative impact on the survival rate for trauma victims. The greater length of time required to discover persons injured while working alone and/or at isolated locations might be associated with the occurrence of otherwise preventable deaths.

FIGURE 3.9 **Fatal work-related agricultural injuries by time until discovery of the injured person, 1990-2000 (584 deaths*)**



* This information was not available for 502 cases.

3.10 LOCATION OF INJURY AND DEATH

Figure 3.10 shows the percentage of deaths at the scene, at a hospital and *en route* to a hospital for each location of fatal injury where location of death was recorded. There is a tendency for there to be more deaths at the scene at more remote locations such as fields, woods, farm roads and highways. Apart from corral/animal pen fatalities, there appear to be fewer deaths at the scene at locations closer to the farmhouse, like barns, farmyards, driveways and sheds. The high percentage of total deaths at the scene of injury (71.7%) reflects both the catastrophic nature of many agricultural injuries and the relative difficulty in obtaining rapid emergency assistance.

TABLE 3.10 **Work-related agricultural fatalities by location of injury and location of death, 1990-2000 (854 deaths*)**

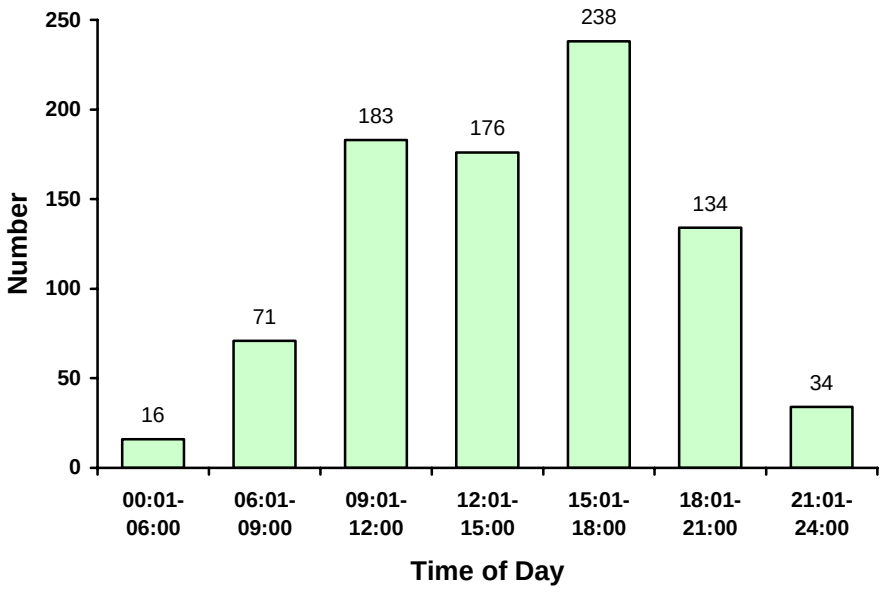
Location of Injury	Died at the Scene		Died in Hospital		Died *en route*		Total**
	No.	%°	No.	%°	No.	%°	No.**
Field	174	75.3	47	20.4	10	4.3	231
Farm yard	99	64.7	42	27.5	12	7.8	153
Road / highway	85	73.9	21	18.3	9	7.8	115
Barn	28	43.8	28	43.8	8	12.4	64
Woods, sugar bush	41	78.9	6	11.5	5	9.6	52
Farm road	38	84.4	3	6.7	4	8.9	45
Silo / grain bin	28	71.8	9	23.1	2	5.1	39
Water source	40	88.9	4	8.9	1	2.2	45
Shed	18	66.7	6	22.2	3	11.1	27
Driveway	12	57.1	5	23.8	4	19.1	21
Corral / animal pen	18	90.0	2	10.0	0	0	20
Other	31	73.8	9	21.4	2	4.8	42
Total	**612**	**71.7**	**182**	**21.3**	**60**	**7.0**	**854**

*For 232 cases, either the location of injury, or location of death, or both were unknown.
**Total by injury location where both injury and death location were known.
°For each injury location where location of death is known, percentage of deaths at the scene, at hospital or *en route* to hospital.

3.11 TIME OF DAY

There is an apparent peak in the occurrence of farm fatalities during the late afternoon. This may reflect the intensity of work activity at that time of day as well as fatigue and diminished concentration.

FIGURE 3.11 **Work-related agricultural fatalities by time of day of injury event, 1990-2000 (852 deaths*)**

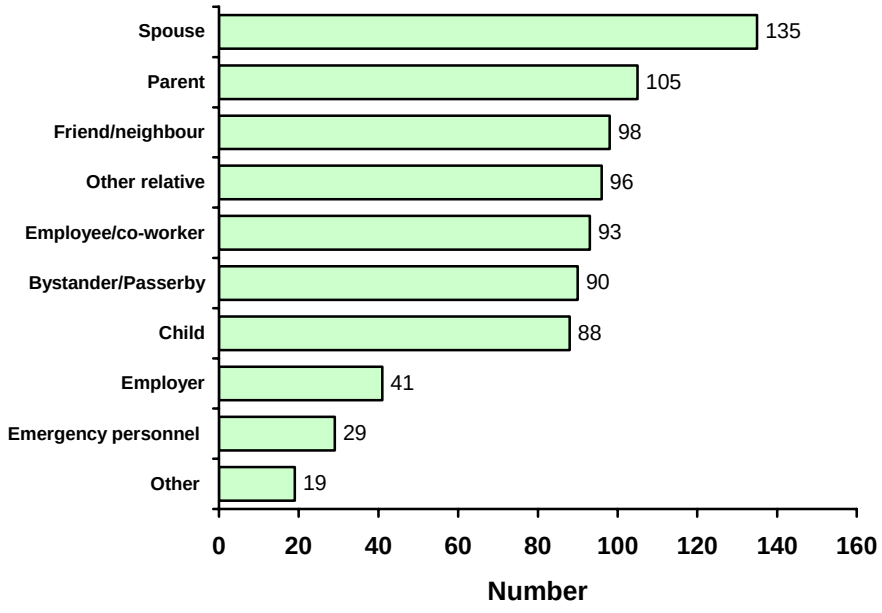


* This information was not available for 234 cases.

3.12 FIRST ON THE SCENE

Any person who lives or works on or near a farm may be first on the scene of an injury event. All farm residents and workers need to be made aware of emergency procedures including first aid and CPR. Local contact numbers for emergency assistance should be posted in prominent locations including the dashboards and control panels of farm machinery.

FIGURE 3.12 **Relationship of person first on the scene to the victim, 1990-2000 (794 deaths*)**



*This information was not available for 292 cases.

4 WORK-RELATED AGRICULTURAL FATALITIES BY AGE AND CAUSE

4.1 AGE

Table 4.1 shows the distribution of work-related deaths by age group. Rates of agricultural fatality were high among the very young, declined in children aged 5-9 and then generally increased with increasing age. The bulk of the fatalities were observed in the adult age groups. Children and youth aged 1-19 years accounted for 14.6% of all fatalities. Children 1-4 years represented more than half of the deaths under age 15. Persons aged 70 years and older are a known high-risk group. The rates presented for the older age group may be inflated due to the limitations of the available denominator data.

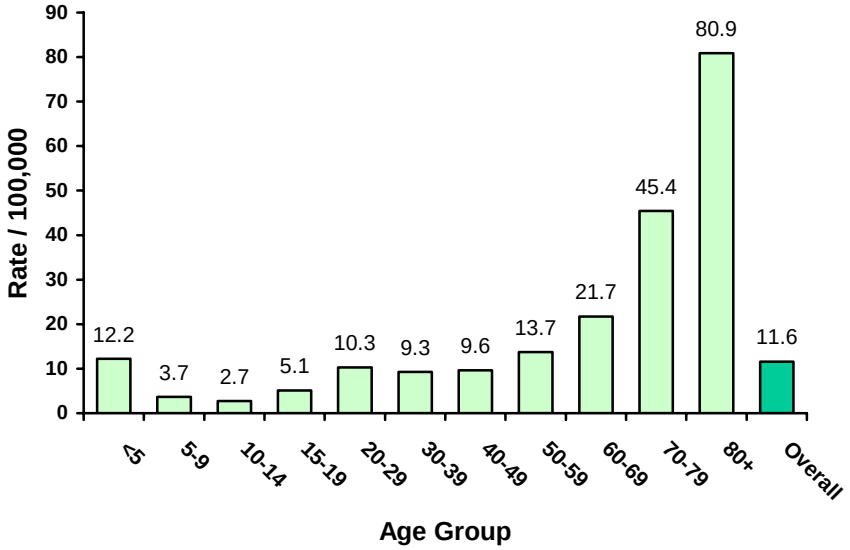
TABLE 4.1 Work-related fatalities by age group, 1990-2000 (1,084 deaths*)

Age Group (Years)	Deaths		Farm Population**		Crude Annual Rate Per
	No.	%	No.	%	100,000/yr
<1	0	--	8,810	1.0	--
1 - 4	58	5.4	43,315	5.1	12.2
5 - 9	29	2.7	71,035	8.3	3.7
10 - 14	25	2.3	84,025	9.9	2.7
15 - 19	46	4.1	80,455	9.4	5.1
20 - 29	92	8.5	80,775	9.5	10.3
30 - 39	123	11.4	121,230	14.2	9.3
40 - 49	147	13.5	139,425	16.4	9.6
50 - 59	166	15.3	110,135	12.9	13.7
60 - 69	176	16.2	73,620	8.6	21.7
70 - 79	154	14.2	30,825	3.6	45.4
80 +	68	6.4	7,755	1.0	80.9
Total	***1,084**	**100.0**	**851,405**	**100.0**	**11.6**

* Age is not available for two cases.
** Statistics Canada, Census of Agriculture, 1996

The estimated rates for work-related farm injuries increased in the older age categories.

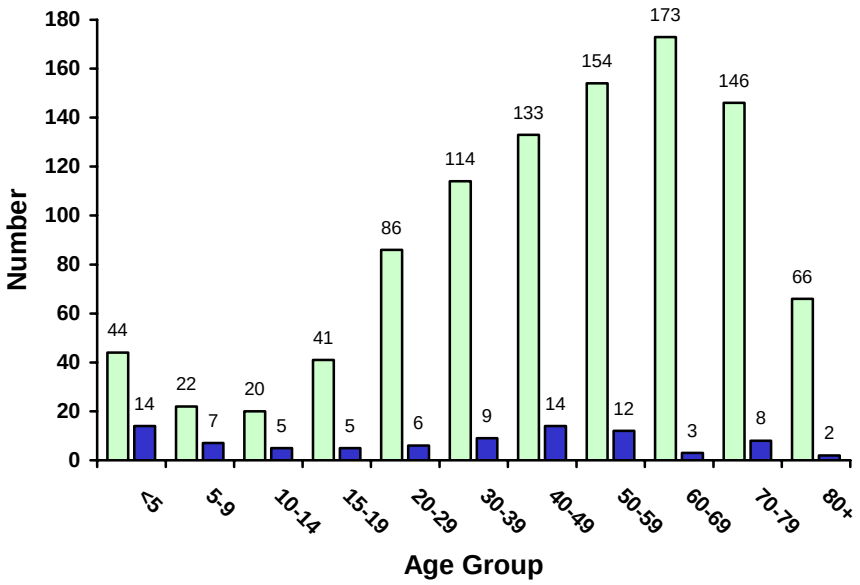
FIGURE 4.1 Work-related age-specific fatality rates, 1990-2000 (1,086 deaths)



4.2 AGE AND GENDER

Numbers of deaths, by age and gender, are shown for work-related fatalities in Figure 4.2. This analysis shows that work-related deaths happen most frequently to adult males. All age groups had more male deaths than female deaths. The ratio of male to female deaths ranged from a low of 3 males to 1 female in children under ten years of age, to a high of 58 males to 1 female in 60-69 year old adults.

FIGURE 4.2 **Work-related agricultural fatalities by age and gender, 1990-2000 (1,084 deaths*)**



* Age not available for two cases

4.3 AGE AND YEAR

The eleven years of data available in the CAISP fatality registry suggest that there are no distinct trends in age-specific distribution of agricultural fatalities over time.

TABLE 4.2 **Number and percentage of work-related agricultural fatalities by age group and year, 1990-2000 (1,084 deaths*)**

Number and Percentage of Deaths in Each Age Group Annually

	Year:	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Age Group	0-14	20 17.2	6 5.8	8 8.8	8 8.3	17 14.8	12 11.8	5 5.5	13 13.0	7 7.8	10 11.4	6 6.6
	15-59	58 50.0	63 60.6	52 57.1	47 49.0	60 52.2	46 45.1	54 59.3	54 54.0	51 56.7	41 46.6	46 50.5
	60+	38 32.8	35 33.6	31 34.1	41 42.7	38 33.0	44 43.1	32 35.2	33 33.0	32 35.5	37 42.0	39 42.9
Total Number:		**116**	**104**	**91**	**96**	**115***	**102**	**91**	**100***	**90**	**88**	**91**

*Age is not available for two cases, one in 1994 and one in 1997.

4.4 CAUSE OF INJURY

4.4.1 ALL AGE GROUPS

TABLE 4.3 **Work-related agricultural fatalities by age group, showing both machine and non machine-related causes of injury, 1990-2000 (1,084 deaths*)**

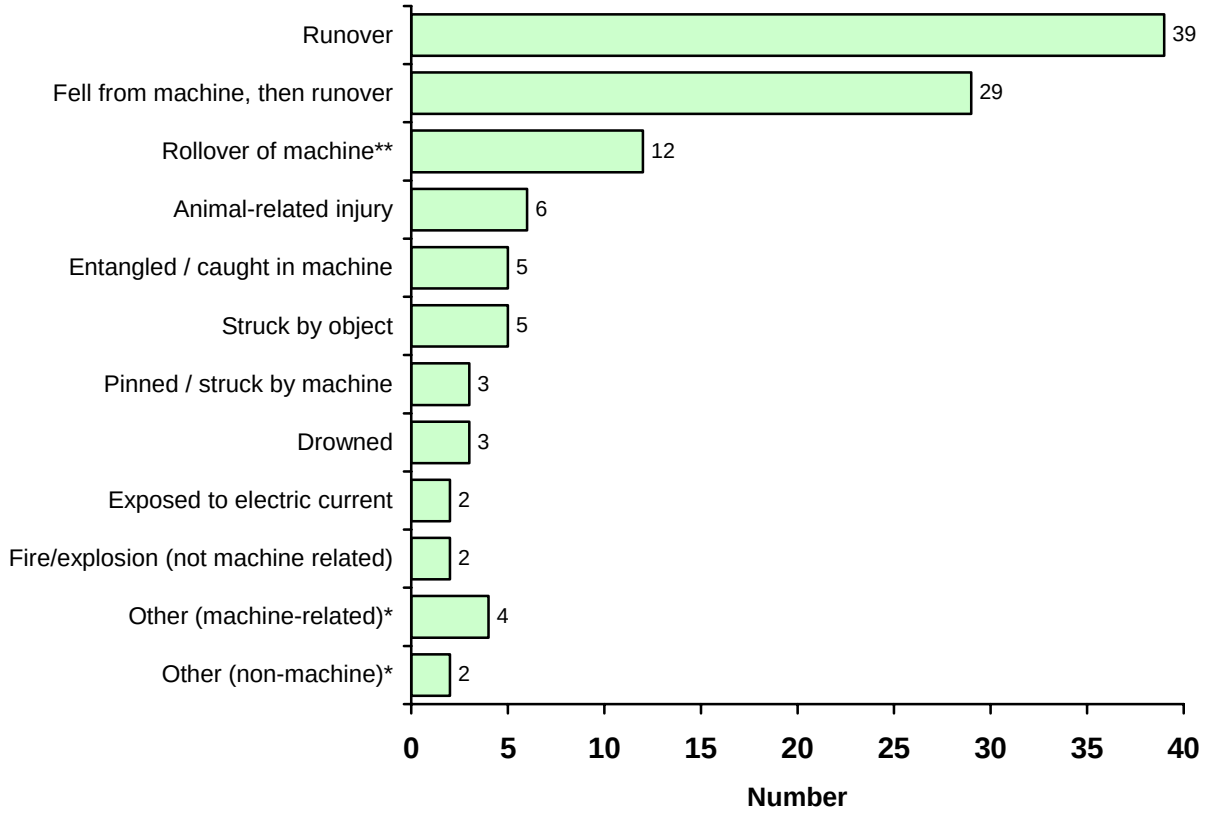
	0 – 14 years		15 – 59 years		60 + years		TOTAL	
Cause of Injury	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Machine-related:								
Machine rollover	**12**	**10.7**	**135**	**23.6**	**101**	**25.3**	**248**	**22.9**
Fell from machine, then runover	**29**	**25.9**	18	3.1	25	6.3	72	6.6
Bystander runover by machine	**31**	**27.7**	5	0.9	9	2.2	45	4.2
Runover by unmanned machine	1	0.9	14	2.4	**36**	**9.0**	51	4.7
Passenger left machine then runover	**7**	**6.2**	0	0	1	0.2	8	0.7
Entangled/caught in machine	5	4.5	**72**	**12.6**	**29**	**7.3**	**106**	**9.8**
Pinned or struck by machine	3	2.7	**56**	**9.8**	**39**	**9.7**	**98**	**9.0**
Collision	1	0.9	**58**	**10.1**	19	4.7	**78**	**7.2**
Fell from machine	1	0.9	6	1.1	13	3.3	20	1.8
Struck by bale	0	0	6	1.1	10	2.5	16	1.5
Machine-related fire/explosion	0	0	8	1.4	2	0.5	10	0.9
Contact with overhead power lines	0	0	8	1.4	2	0.5	10	0.9
Other (machine-related)	2	1.8	25	4.3	12	3.0	39	3.6
Non machine-related:								
Animal-related injury	**6**	**5.3**	19	3.3	**33**	**8.3**	**58**	**5.4**
Struck by object	5	4.5	**31**	**5.4**	21	5.3	57	5.3
Fell	0	0	20	3.5	15	3.8	35	3.2
Toxic substances	0	0	27	4.7	4	1.0	31	2.9
Asphyxiated by grain or soil	1	0.9	18	3.1	4	1.0	23	2.1
Fire/explosions (non-machine)	2	1.8	9	1.5	11	2.8	22	2.0
Electric current	2	1.8	16	2.8	1	0.2	19	1.8
Drowned	3	2.6	6	1.1	2	0.5	11	1.0
Caught in, under or between objects	1	0.9	5	0.9	5	1.3	11	1.0
Temperature extremes	0	0	3	0.4	1	0.2	3	0.3
Overexertion	0	0	0	0	2	0.5	2	0.2
Firearms	0	0	1	0.2	1	0.2	2	0.2
Other (non-machine)	0	0	5	0.9	1	0.2	6	0.5
Unknown	0	0	2	0.4	1	0.2	3	0.3
TOTAL*	**112**	**100.0**	**572**	**100.0**	**401**	**100.0**	**1,084**	**100.0**

* Age is missing for two cases.
The number and percent values for the five leading causes overall and in each age group are bolded.

This table shows the age-specific causes of injury. There are clear differences in the leading causes of injury among age groups. These differences will be highlighted in Figures 4.3 to 4.5.

4.4.2 CHILDREN 0 – 14 YEARS

FIGURE 4.3 **Work-related agricultural fatalities among children (0 – 14 years) by cause of injury, 1990-2000 (112 deaths)**



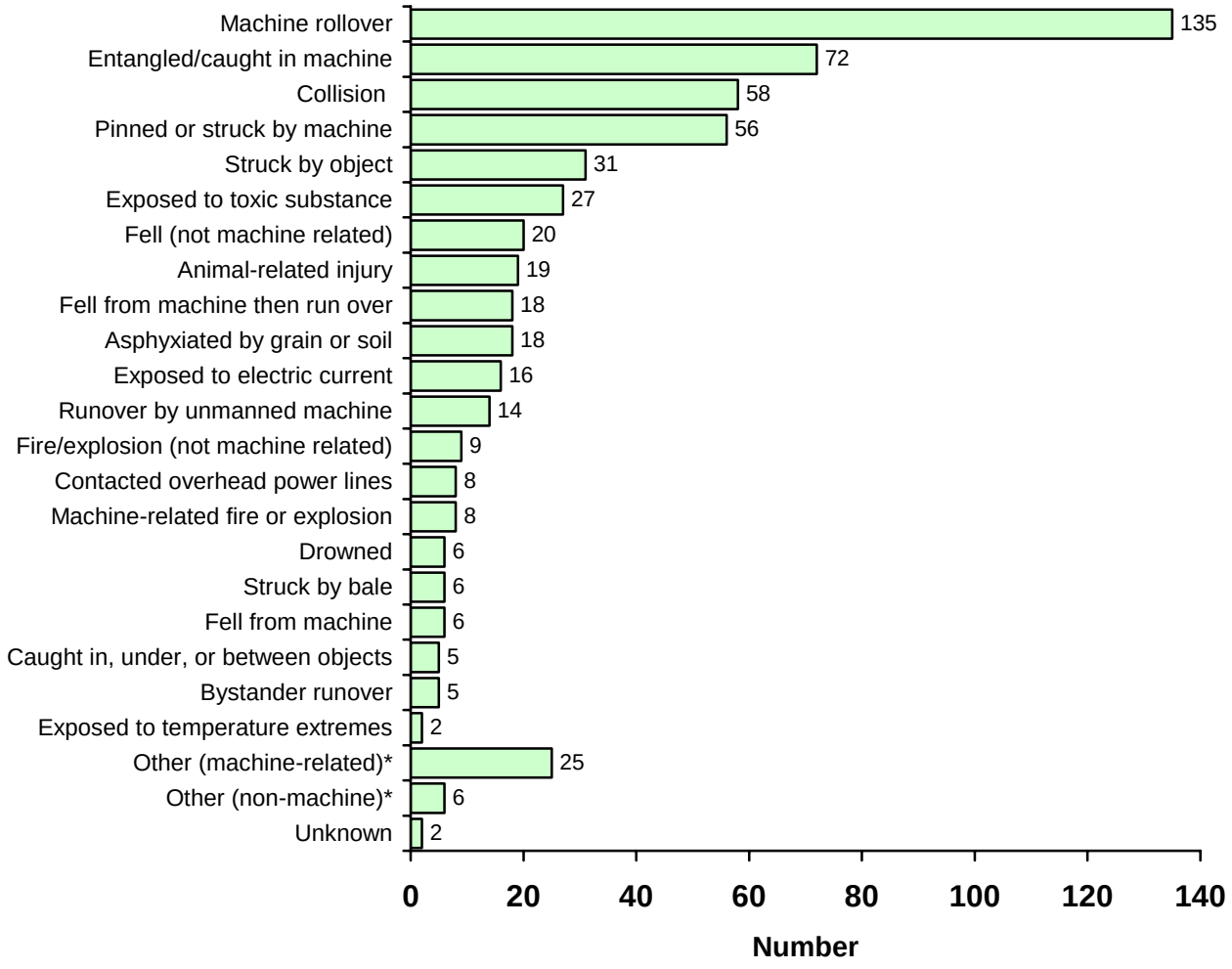
*Causes of injury with fewer than two cases are included in the appropriate "Other" category.
** Six of these rollover deaths were extra riders on farm machinery.

Machinery runovers, including falling off a machine then being runover, were by far the leading cause of injury causing death in children under 15, accounting for 60% of all deaths in this age group. Of those children under 15 killed in bystander/pedestrian runover events, 67% were less than five years old. Young children should not be allowed to access the farm or ranch work site.

The data also show that almost 31% of fatalities were "extra rider deaths", where children have fallen from machines and then been run over, or have been involved in a rollover event while riding on a farm machine. 50% of the rollover deaths were of children who were extra riders on machinery driven by older relatives. Children should not be taken as extra riders on tractors and other agricultural machines. The other 50% of rollover fatalities were juvenile operators of farm machinery. Children as young as six died in rollovers while operating lawn tractors, ATVs and full-sized tractors. All of these deaths were work-related. The North American Guidelines for Children's Agricultural Tasks are available at www.nagcat.org/childdevelop2.htm. Parents and employers should adhere to these guidelines when assigning any agricultural work to children and youths under 17. The National Children's Center for Rural and Agricultural Health and Safety also publishes useful information on childhood injury prevention at http://research.marshfieldclinic.org/children/

4.4.3 ADULTS 15 – 59 YEARS

FIGURE 4.4 **Work-related agricultural fatalities among adults (15–59 years) by cause of injury, 1990-2000 (572 deaths)**

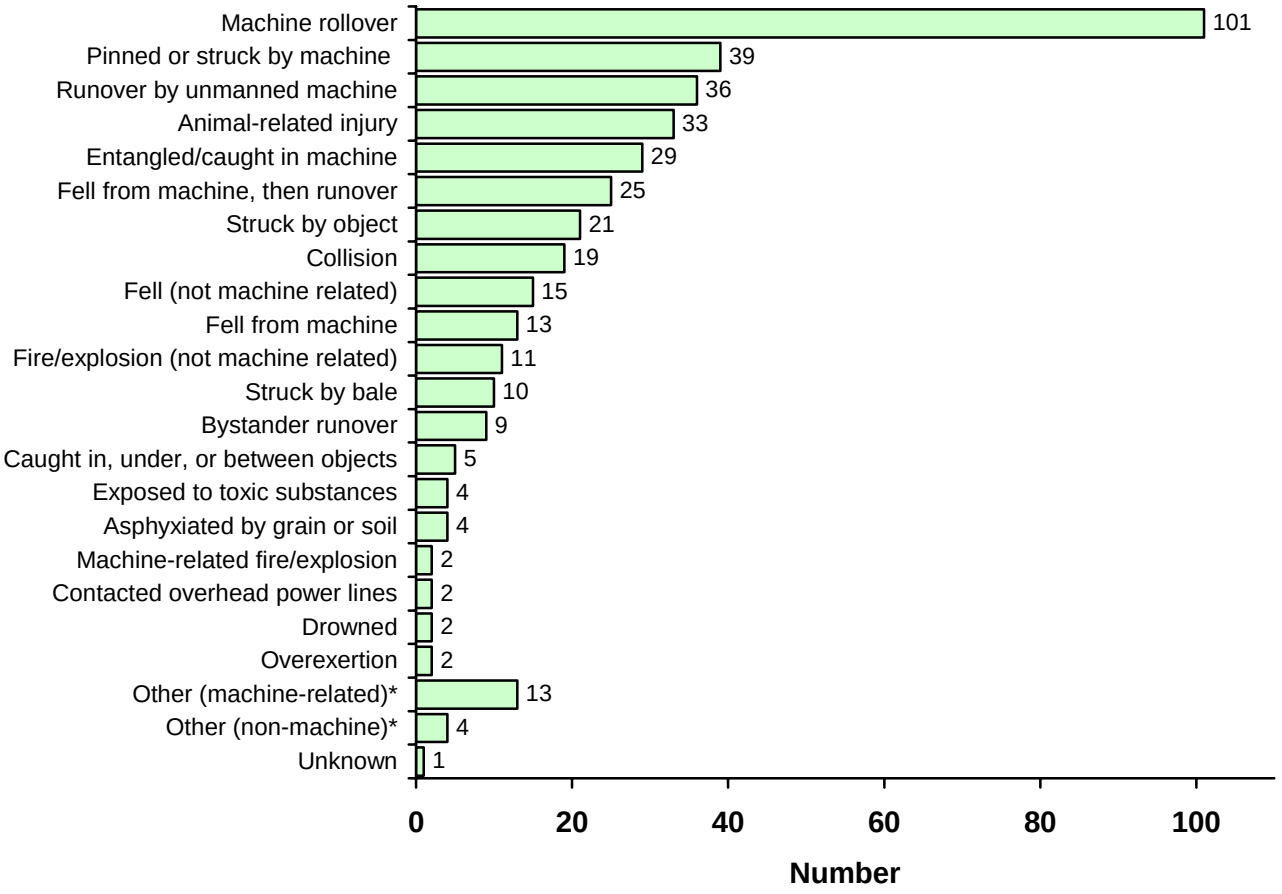


*Causes of injury with fewer than two cases are included in the appropriate "Other" category.

There were clear differences in the causes of fatal injury observed in this age group compared with the youngest age group. First, persons aged 15-59 were involved in many more different types of fatalities than children aged 0-14 years. Also, working with machinery was associated with the vast majority of deaths. The four leading causes of fatal injury were all machine-related. Together they accounted for 56% of the fatalities in persons aged 15-59. Deaths due to rollovers (24% of the age group total) and entanglements (13% of the age group total) have the greatest potential for reduction through proven prevention strategies, including roll over protection structures (ROPS), seatbelts, and the appropriate guarding of machinery.

4.4.4 OLDER ADULTS 60+ YEARS

FIGURE 4.5 **Work-related agricultural fatalities among older adults (60+ years), by cause of injury, 1990-2000 (400 deaths)**



*Causes of injury with fewer than two cases are included in the appropriate "Other" category.

The types of fatalities observed in older agricultural workers continue to reflect risks associated with the use of agricultural machines. Rollovers were the leading cause of fatalities, but runovers re-emerged as an important cause of injury among persons in this age group. The types of machinery runover deaths differed from those involving children. Among persons 60 years and older, 51% of machinery runover deaths occurred when the dismounted operator was run over by his/her unmanned machine, often subsequent to a jump starting procedure. 30% of the runover deaths occurred when the operator fell from his/her machine and was then run over by it. Of the "pinned or struck by machine" fatalities, 18% were due to operators being pinned against fixed objects by their unmanned tractors or trucks. These fatalities have the same mode of occurrence as the unmanned machine runovers.

Fatalities related to the handling and tending of animals, especially bulls and cows, also emerged as an important cause of fatal injury in this older age group.

5 CAUSES OF AGRICULTURAL FATALITIES

TABLE 5.1 **Percentage of work-related agricultural fatalities by major cause and year, 1990-2000 (1,086 deaths)**

Major Cause	Percentage of Deaths by Major Cause for Each Year										
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
% Tractor related	51.7	51.9	48.3	56.2	41.4	44.1	37.4	41.6	32.2	46.6	41.7
% Non-tractor machine	25.0	21.2	26.4	25.0	31.9	32.4	26.3	28.7	40.0	29.5	33.0
% Non-machine related	23.3	26.9	25.3	18.8	26.7	23.5	36.3	29.7	27.8	23.9	25.3
Total Number:	**116**	**104**	**91**	**96**	**116**	**102**	**91**	**101**	**90**	**88**	**91**

Tractor-related injury events were generally the leading cause of fatal injuries during the eleven-year surveillance period.

TABLE 5.2 **Percentage of work-related agricultural fatalities by major cause and province, 1990-2000 (1,086 deaths)**

Major Cause	Percentage of Deaths by Major Cause for Each Province										
	BC	**AB**	**SK**	**MB**	**ON**	**QC**	**NB**	**NS**	**PE**	**NL**	**Total**
% Tractor	51.2	37.4	35.4	35.9	49.7	52.0	42.1	77.3	45.5	--	45.0
% Non-tractor machine	24.4	36.2	39.7	32.6	26.9	18.5	5.3	13.6	54.5	33.3	28.9
% Non machine	24.4	26.4	24.9	31.5	23.4	29.5	52.6	9.1	--	66.7	26.1
Total Number:	**82**	**163**	**189**	**89**	**308**	**200**	**19**	**22**	**11**	**3**	**1,086**

The variation among provinces in the percentage of fatal injuries by major cause may reflect provincial differences in the prominent types of agricultural production. Due to the small number of fatal injury events recorded for the Atlantic provinces, it would be inappropriate to infer a relationship between major cause of injury and type of agricultural production for those provinces.

5.1 OVERVIEW

Tractors were the dominant machine type involved in fatal injuries on the farm. The majority of tractor injury events involved rollovers. In the youngest and oldest age groups, tractor runovers were also a leading cause of fatal injury. Tractor-related fatalities involving children were generally bystander runovers or runovers subsequent to a fall from a tractor. Persons aged 60 or over were especially likely to be involved in tractor-related fatalities. Most of these were rollovers, but runovers by unmanned tractors and runovers after falls from tractors were also leading causes of fatal injury for this age group.

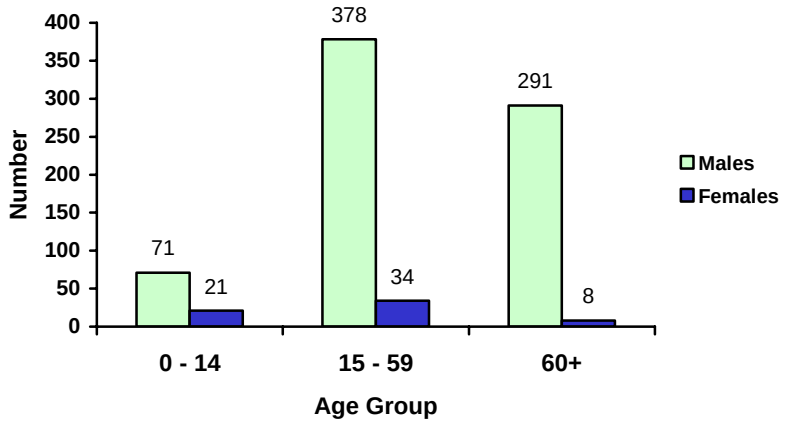
TABLE 5.3 Machinery related fatalities by machine type and age group, 1990-2000 (803 deaths)

Machine Type	0 – 14 years		15 – 59 years		60+ years		Total	
	No.	%	No.	%	No.	%	No.	%
Tractor	52	56.4	229	55.6	208	69.6	489	60.9
Motor vehicle	16	17.3	32	7.8	16	5.4	64	8.0
Power take off	--	--	22	5.3	13	4.3	35	4.3
Combine / harvester	3	3.3	20	4.9	8	2.7	31	3.9
Baler	1	1.1	14	3.4	4	1.3	19	2.4
Skid steer	1	1.1	13	3.1	2	0.7	16	2.0
Auger	--	--	21	5.1	3	1.0	24	3.0
Recreational vehicle	1	1.1	5	1.2	5	1.7	11	1.4
Farm wagon	7	7.6	12	2.9	7	2.3	26	3.2
Plough / disk	1	1.1	3	0.7	6	2.0	10	1.2
Swather	--	--	2	0.5	7	2.3	9	1.1
Mower	3	3.3	2	0.5	2	0.7	7	0.9
Manure spreader	1	1.1	2	0.5	4	1.3	7	0.9
Hay elevator / conveyor	2	2.2	3	0.7	--	--	5	0.6
Other machine	3	3.3	30	7.3	9	3.0	42	5.2
Unknown	1	1.1	2	0.5	5	1.7	8	1.0
Total	**92**	**100.0**	**412**	**100.0**	**299**	**100.0**	**803**	**100.0**

5.1.1 AGE AND GENDER

In all age groups, males are at greater risk for machinery-related injuries than females. In the youngest age group, many of the girls who were injured were toddlers or small children.

FIGURE 5.1 Machinery related fatalities by age group and gender, 1990-2000 (803 deaths)

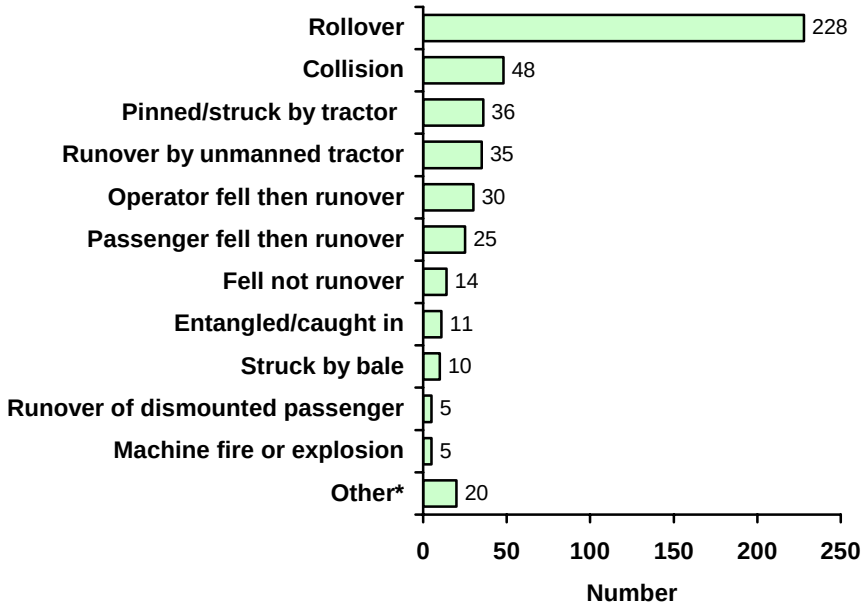


5.2 TRACTOR FATALITIES

5.2.1 BY CAUSE

Deaths from rollovers represented 47% of all tractor-related fatal injuries.

FIGURE 5.2 **Work-related tractor fatalities by cause of injury, 1990-2000 (489 deaths)**

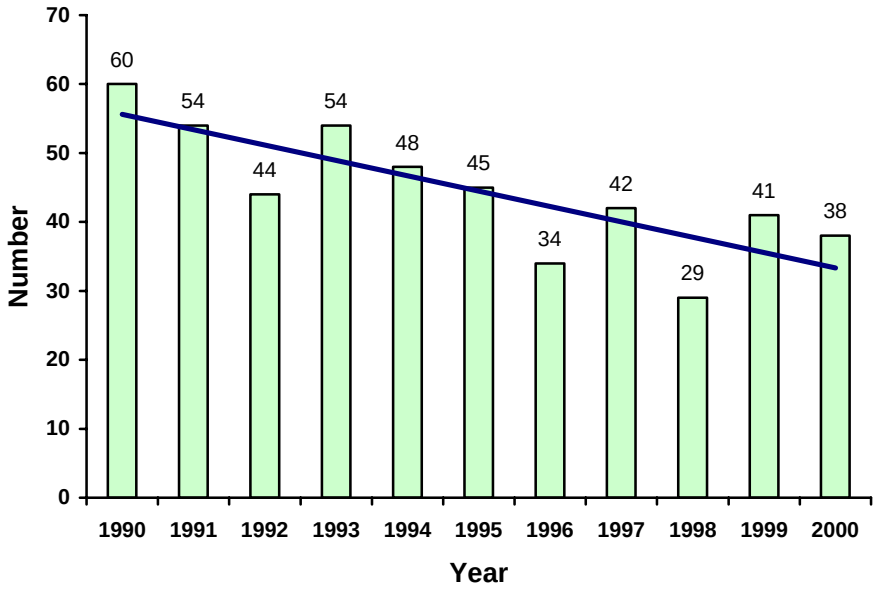


*Other includes, but is not limited to, being struck by a log and contact with overhead power lines.

5.2.2 BY YEAR

There was a decline in the number of tractor-related fatalities over the past decade.

FIGURE 5.3 **Work-related tractor fatalities by year, 1990-2000 (489 deaths)**

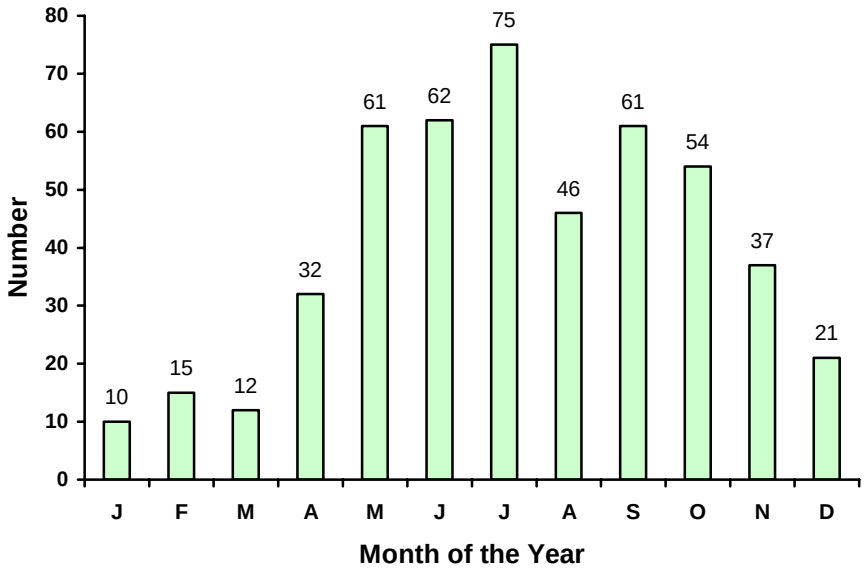


Trend line: r = 0.8, p = 0.003

5.2.3 BY MONTH

The monthly distribution of tractor fatalities shows peaks in their occurrence during the months of May through October. This coincides with times of higher exposure to tractor-related work and associated hazards on Canadian farms and ranches.

FIGURE 5.4 **Work-related tractor fatalities by month of the year, 1990-2000 (486 deaths*)**

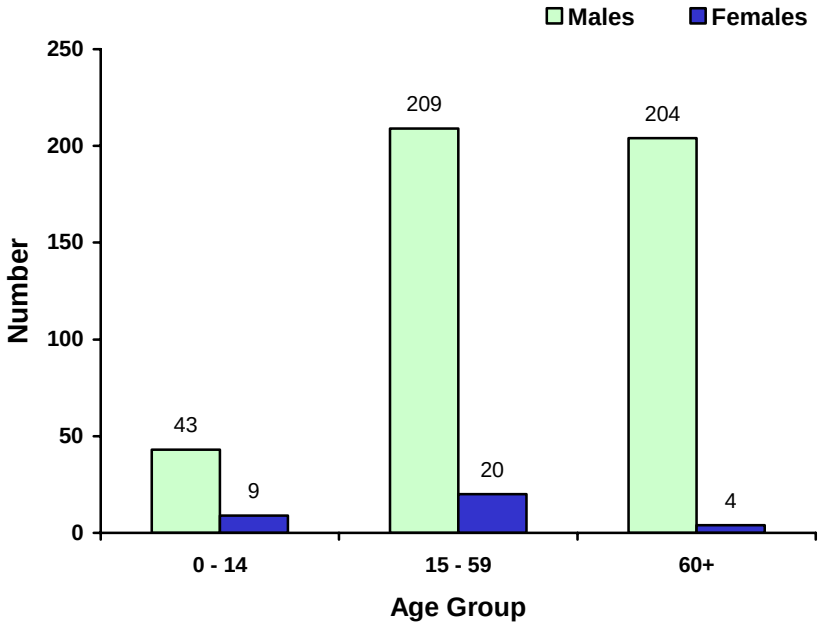


*Month is not available for three cases.

5.2.4 BY AGE AND GENDER

In all age groups, males experienced far more tractor-related fatalities than females.

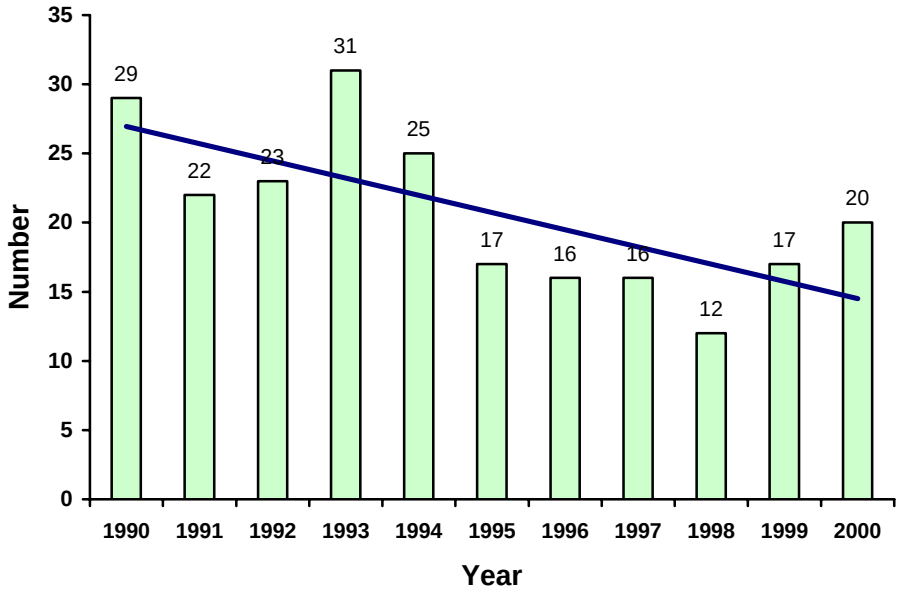
FIGURE 5.5 **Work-related tractor fatalities by age group and gender, 1990-2000 (489 deaths)**



5.2.5 TRACTOR ROLLOVERS BY YEAR

There was a decline in the frequency of tractor rollovers during the surveillance period.

FIGURE 5.6 **Work-related tractor rollover fatalities by year, 1990-2000 (228 deaths)**

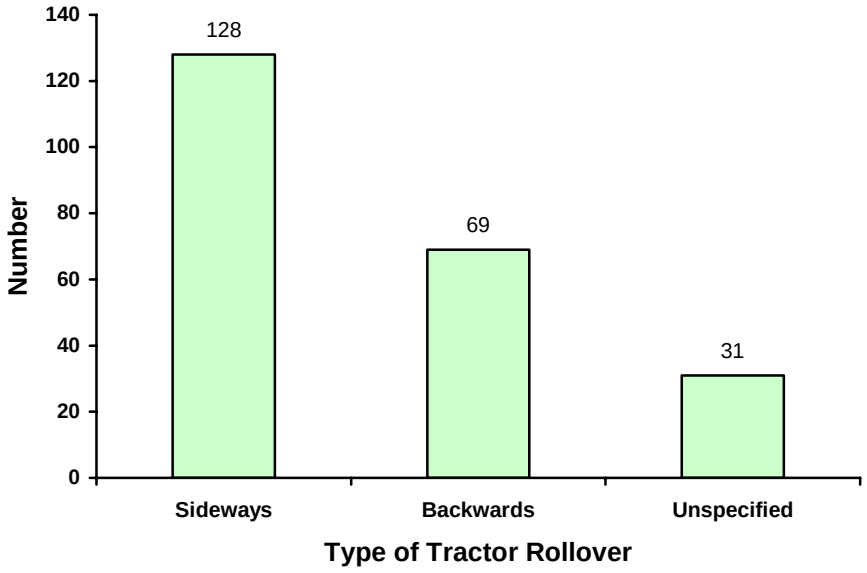


Trend line: r = 0.7, p = 0.016

5.2.6 TRACTOR ROLLOVERS BY TYPE

Both sideways and backwards rollovers were important causes of tractor related fatalities. Each type of rollover results from distinctly different tractor use activities, but injuries from both are preventable through the use of seatbelts and Roll Over Protection Structures.

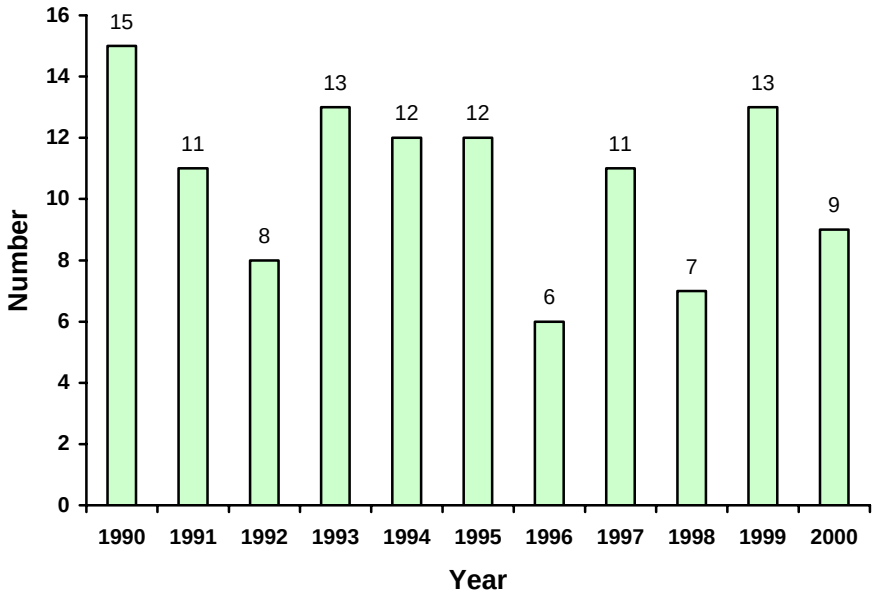
FIGURE 5.7 **Work-related tractor rollover fatalities by type, 1990-2000 (228 deaths)**



5.2.7 TRACTOR RUNOVERS BY YEAR

There was no change in the frequency of tractor runover injuries during the past decade. These injuries continue to be an injury prevention priority, especially for children and older agricultural workers. (See Figures 4.3 and 4.5).

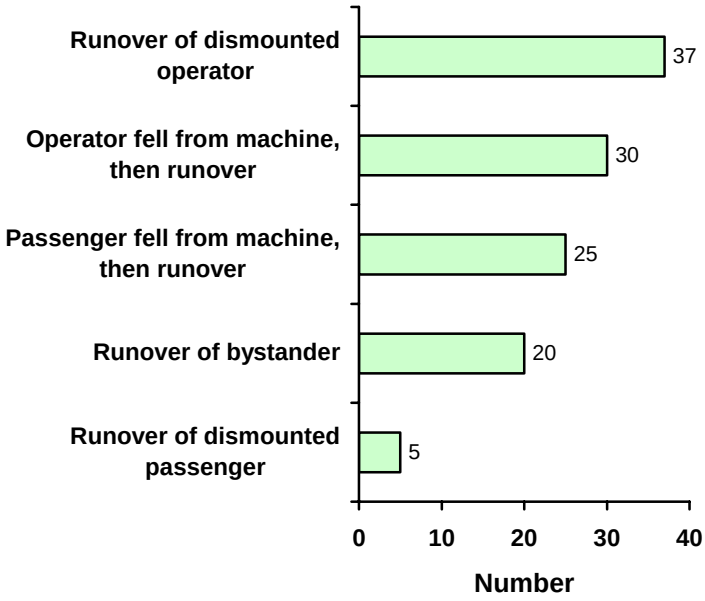
FIGURE 5.8 **Work-related tractor runover fatalities by year, 1990-2000 (117 deaths)**



5.2.8 TRACTOR RUNOVERS BY TYPE

There are distinct activities in tractor use that lead to runover-related fatalities. These are presented in Figure 5.9 and in a special CAISP report on runover injuries available on the CAISP website www.caisp.ca.

FIGURE 5.9 **Work-related tractor runover fatalities by type, 1990-2000 (117 deaths)**

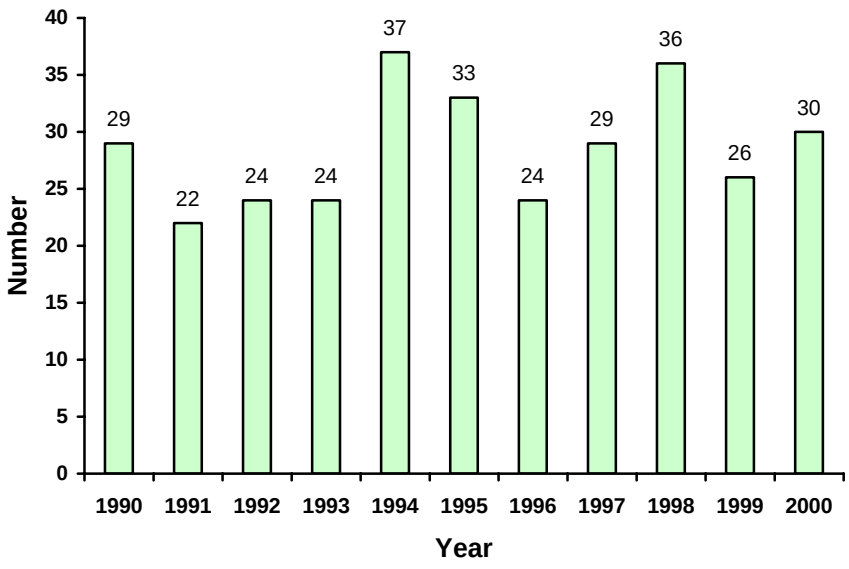


5.3 NON-TRACTOR MACHINE FATALITIES

5.3.1 BY YEAR

Fatalities involving agricultural machinery (excluding tractors) are shown by year in Figure 5.10. In contrast to the modest declining trend observed for the occurrence of tractor fatalities, there was no apparent change in the frequency of non-tractor machine-related deaths during the surveillance period.

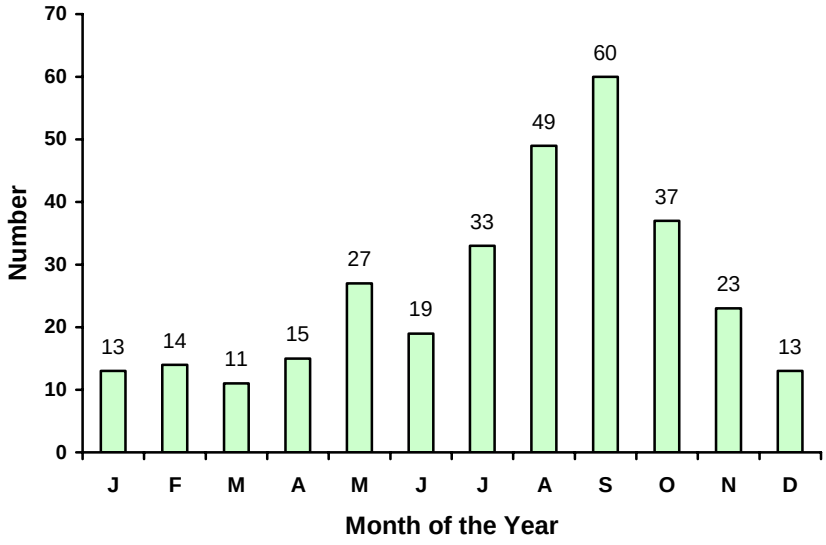
FIGURE 5.10 **Work-related non-tractor machine fatalities by year, 1990-2000 (314 deaths)**



5.3.2 BY MONTH

Non-tractor, work-related machinery deaths were concentrated in the months of July through October, with a strong peak in September. This suggests that harvesting rather than planting activities are associated with a greater risk of non-tractor machine-related fatal injuries.

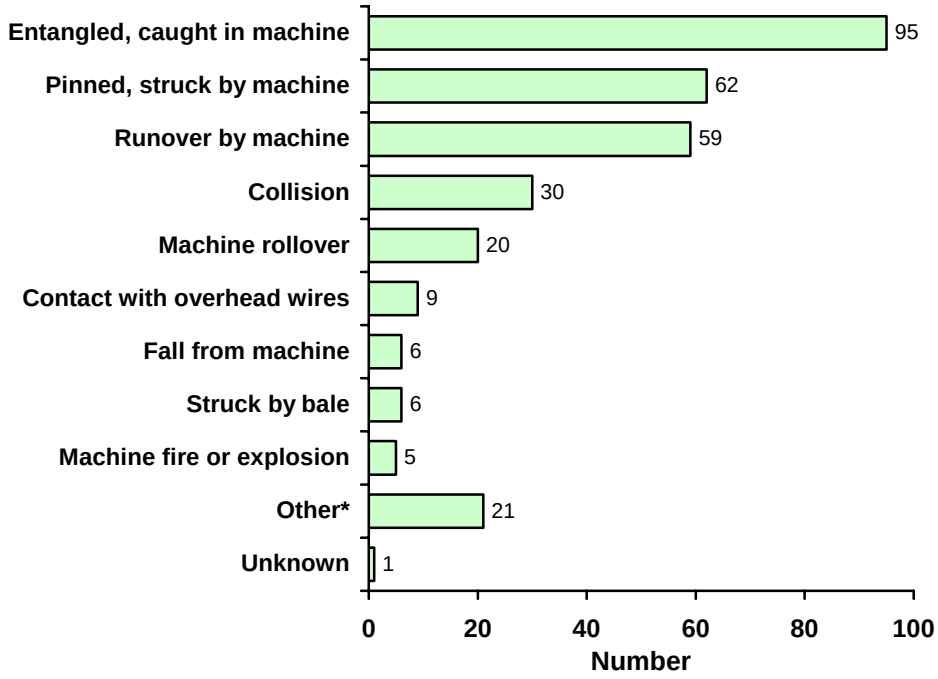
FIGURE 5.11 **Work-related non-tractor machine fatalities by month, 1990-2000 (314 deaths)**



5.3.3 BY CAUSE OF INJURY

Among non-tractor machine fatalities, entanglements were the leading cause of injury. These were also a major cause of hospitalized agricultural machine injuries. (Section 10.8, Table 10.4.)

FIGURE 5.12 **Work-related non-tractor machine fatalities by cause of injury, 1990-2000 (314 deaths)**

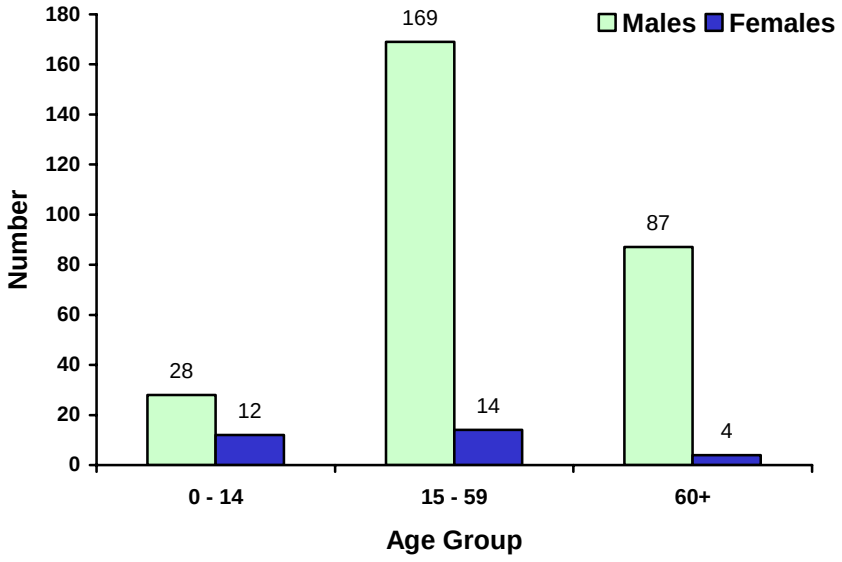


*Other includes, but is not limited to, being struck by a log, being struck by lightening while in a machine and agricultural aircraft crashes.

5.3.4. BY AGE AND GENDER

As was the case with tractor-related fatal injuries, males were far more likely than females to be fatally injured in work-related injury events involving non-tractor machines.

FIGURE 5.13 **Work-related non-tractor machine fatalities by age and gender, 1990-2000 (314 deaths)**

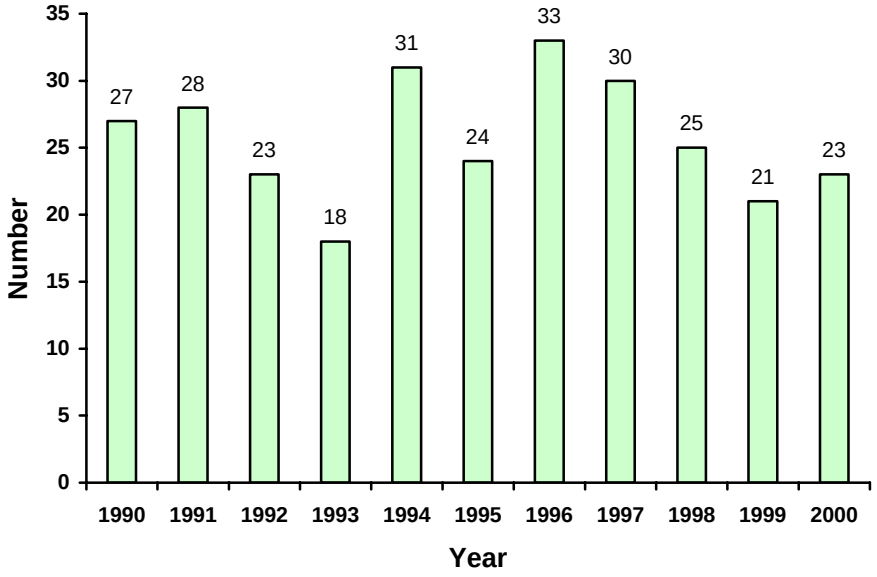


5.4 NON MACHINE-RELATED FATALITIES

5.4.1 BY YEAR

The annual count of non machine-related agricultural fatalities ranged from a low of 18 in 1993, to a high of 33 in 1996. There is no indication that the annual number of these deaths has changed consistently over the past ten years.

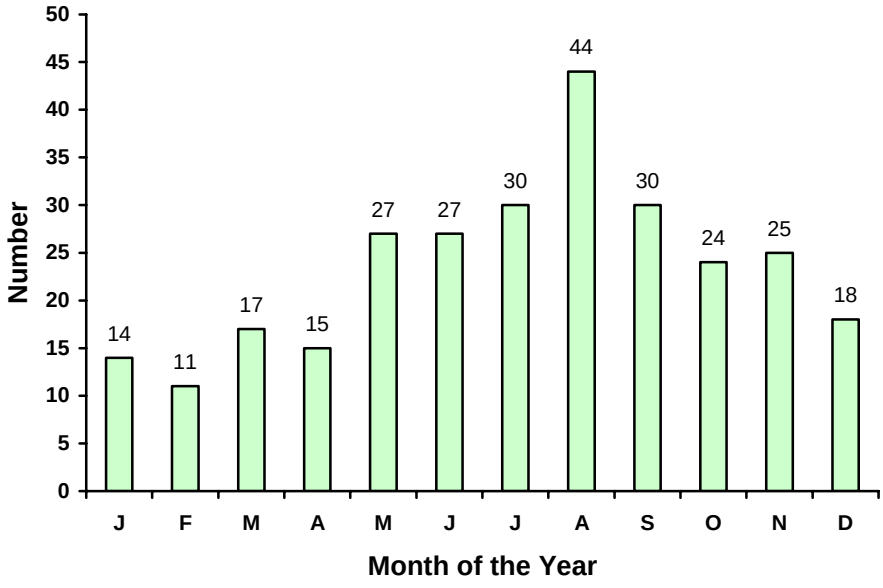
FIGURE 5.14 **Work-related non-machine fatalities by year, 1990-2000 (283 deaths)**



5.4.2 BY MONTH

There was a pronounced peak in the occurrence of non machine-related fatalities during warm weather months, especially August. There were 47% more fatalities in August than in the months of July and September. In general, non-machine related fatalities were more evenly distributed throughout the year than non-tractor machine-related fatalities.

FIGURE 5.15 **Work-related non-machine fatalities by month, 1990-2000 (282 deaths*)**

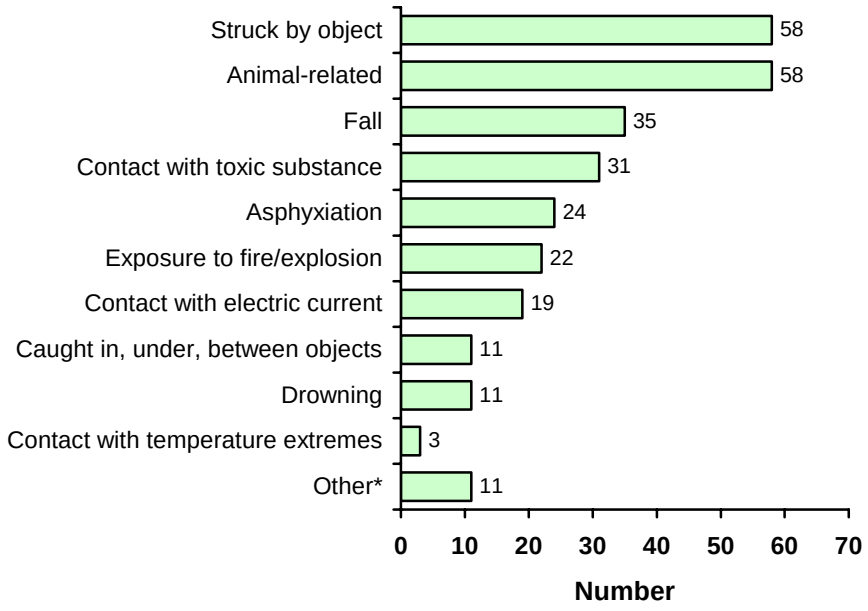


* Month is not available for one case.

5.4.3 BY CAUSE OF INJURY

Being struck by an object or being injured while engaged in animal care activities were the two leading causes of non-machine related fatal injuries. Falls and contact with toxic substances, particularly confinement gases like hydrogen sulfide, were also important causes of these fatalities.

FIGURE 5.16 **Work-related non-machine fatalities by cause of injury, 1990-2000 (283 deaths)**

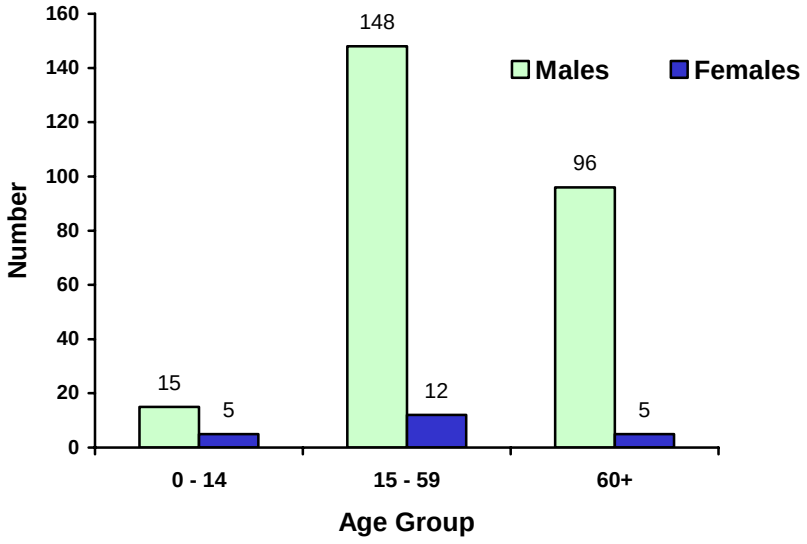


*Other includes, but is not limited to, being struck by lightening, firearm injuries and overexertion.

5.4.4. BY AGE AND GENDER

The pattern of fatal injuries by gender for non-machine related deaths was the same as for tractor and non-tractor machine-related deaths. The number of male deaths was far greater than the number of female deaths, especially for persons over 14 years of age.

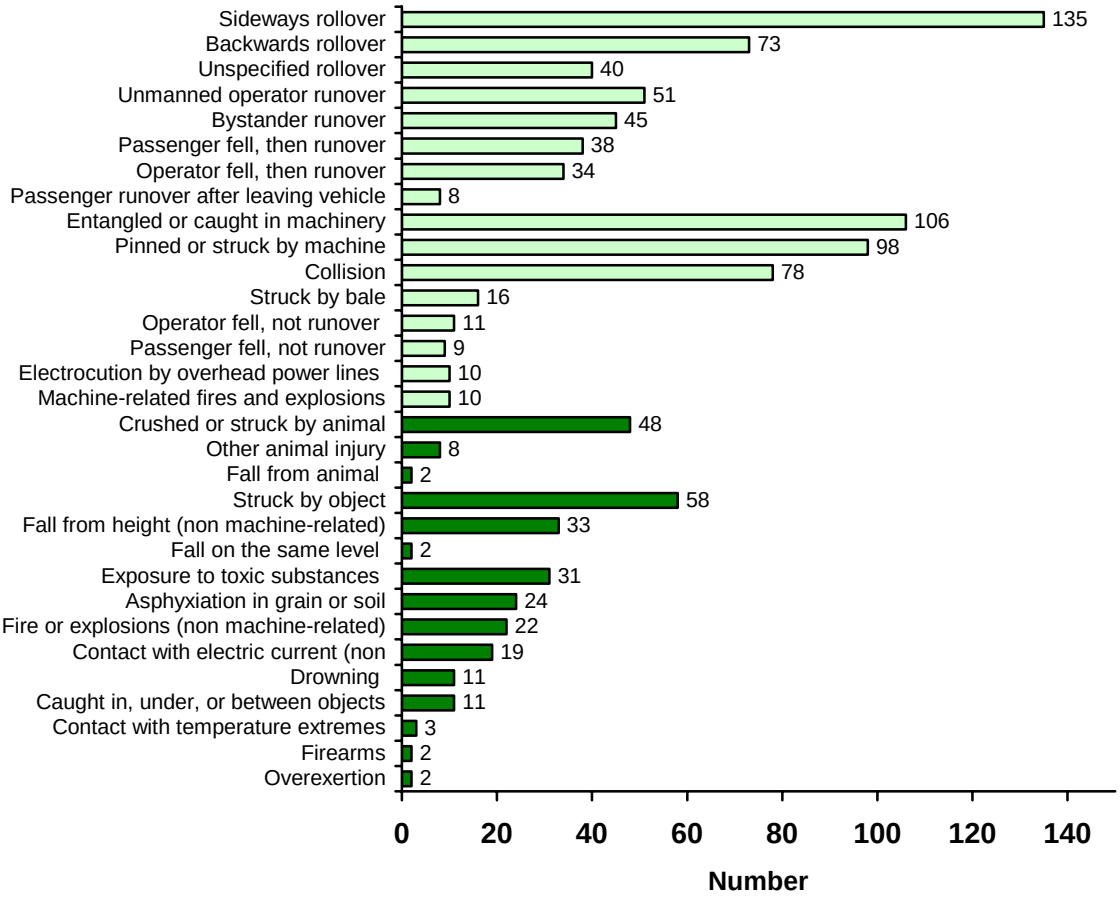
FIGURE 5.17 **Work-related non-machine fatalities by age and gender, 1990-2000 (281 deaths*)**



* Age is not available for two cases.

5.5 SUMMARY OF ALL CAUSES OF FATAL WORK-RELATED AGRICULTURAL INJURIES

FIGURE 5.18 Causes of fatal work-related agricultural injuries (1,086 deaths)



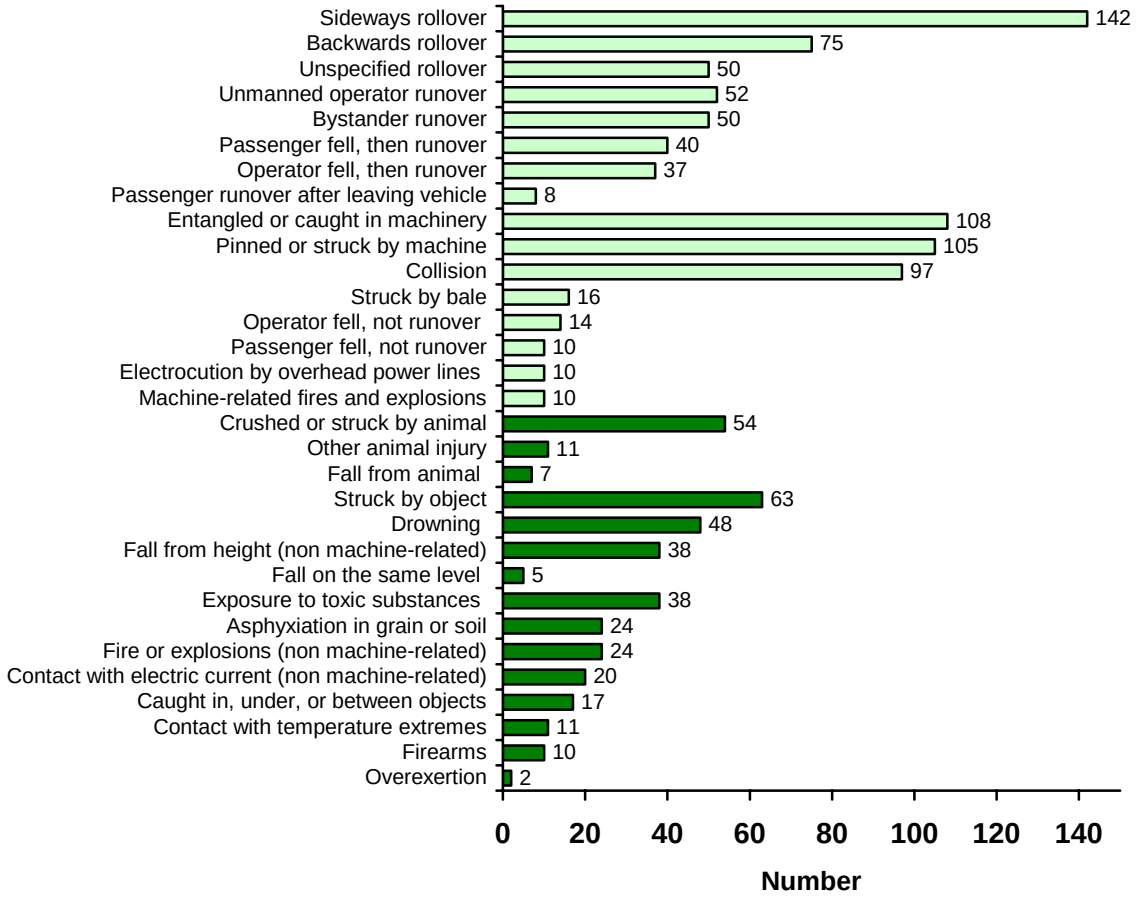
Numbers of cases for other categories not shown in the figure: unknown non machine-related 1, unknown machine-related 2, other non machine-related 6 (includes, but not limited to, being struck by lightening), other machine-related 39 (includes, but is not limited to, being struck by lightening while in a machine, aircraft crashes, and log roll backs).

The ten leading causes of fatal work-related agricultural injuries are: rollovers (248), runovers (176), entanglements (106), being pinned or struck by a machine (98), collisions (78), animal-related injuries (58), being struck by an object (58), falls that are not machine-related (33), exposure to toxic substances (31) and asphyxiation in grain or soil (24).

5.6 SUMMARY OF ALL CAUSES OF FATAL AGRICULTURAL INJURIES (INCLUDING NON WORK-RELATED INJURIES)

FIGURE 5.19 **Causes of fatal agricultural injuries, including-non work related injuries (1,256 deaths)**

This chart includes both work-related and non work-related* fatalities. Cause of injury categories that have proportions of non work-related injuries greater than 50% are: firearms (80%), contact with temperature extremes (72.7%), drowning (77.1%), falls from animals (71.4%), and falls on the same level (60%). Many of these types of fatalities occurred during play or recreational activities. Non work-related fatalities are discussed in detail in Chapter 7.



Numbers of cases for other categories not shown in the figure: unknown non machine-related 1, unknown machine-related 3, other non machine-related 8 (includes, but not limited to, being struck by lightening), other machine-related 48 (includes, but is not limited to, being struck by lightening while in a machine, aircraft crashes, and log roll backs).

The ten leading causes of fatal agricultural injuries (including non-work-related injuries) are: rollovers (267), runovers (187), entanglements (108), being pinned or struck by a machine (105), collisions (97), animal-related injuries (72), being struck by an object (63), drownings (48), falls that are not machine-related (43), and exposure to toxic substances (38).

*The numbers of non-work related agricultural fatalities are likely to be significantly underestimated (Chapter 7). The counts for non work-related fatalities should be interpreted with caution due to inconsistencies in data collection procedures for these fatalities among provinces.

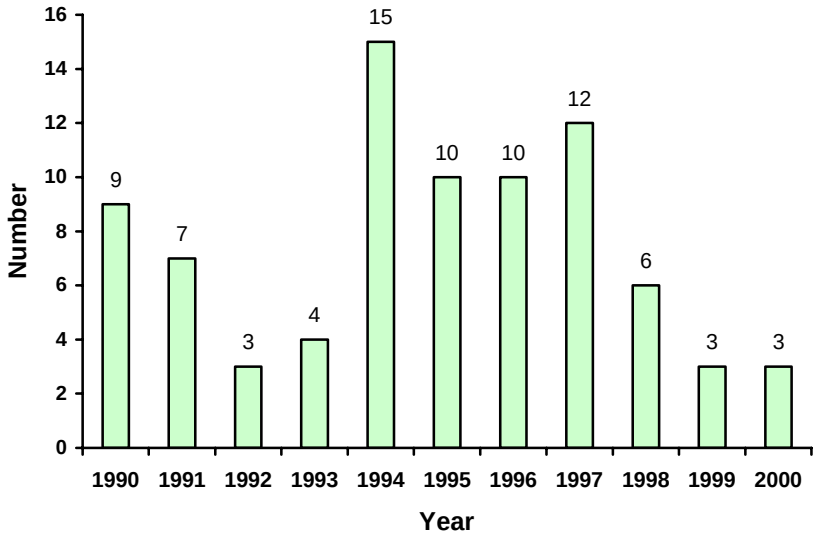
6 WORK-RELATED AGRICULTURAL FATALITIES BY PROVINCE

6.1 BRITISH COLUMBIA

6.1.1 COUNTS

There was no clear trend in the annual occurrence of agricultural fatalities in British Columbia.

FIGURE 6.1 **Work-related agricultural fatalities in British Columbia per year, 1990-2000 (82 deaths)**



6.1.2 AGE

This table presents the work-related agricultural fatalities by age for British Columbia. The age distribution of the provincial farm population is provided for comparative purposes.

Persons aged 60 and over were over-represented as fatalities relative to their proportion of the general farm population.

TABLE 6.1 **Work-related agricultural fatalities in British Columbia, 1990-2000, by age (81 deaths*)**

Age Group	Deaths		Farm Population	
	No.	%	No.	%
0-14	7	8.6	16,255	23.6
15-59	45	55.6	43,160	62.8
60+	29	35.8	9,360	13.6
Total	**81**	**100.0**	**68,775**	**100.0**

Sources: Statistics Canada, Canada Census of Agriculture, 1996
Canadian Agricultural Injury Surveillance Program
*Age is not available for one case.

6.1.3 FARM TYPE

Table 6.2 describes the types of farms in British Columbia. The counts represent the number of farms where the commodity category listed accounts for more than fifty percent of sales, except for the "miscellaneous specialty" category. Changes between 1996 and 2001 reflect the change in specialty production emphasis on farms and the merging of some farm operations.

TABLE 6.2 British Columbia farms with gross receipts of $2,500 of more by farm type and counts

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Miscellaneous Specialty* **	**4,784**	**4,775**	**-0.2**
Cattle (beef)	**4,413**	**4,690**	**6.3**
Fruit	**2,836**	**2,521**	**-11.1**
Field crop*	**1,621**	**1,808**	**11.5**
Dairy	**1,184**	**795**	**-32.9**
Poultry and egg	**925**	**973**	**5.2**
Livestock combination	**623**	**636**	**2.1**
Vegetable	**595**	**416**	**-30.1**
Other combination	**476**	**376**	**-21.0**
Grain and oilseed**	**240**	**184**	**-23.3**
Hog	**206**	**146**	**-29.1**
Wheat	**119**	**62**	**-47.9**
All farms in the province	**18,022**	**17,382**	**-3.6**

* Field crop – except grain and oilseed
** Grain and oilseed – except wheat
*** Farms where no single commodity accounts for 50 percent of sales
Source: Statistics Canada, Census of Agriculture, 1996 and 2001

6.1.4 CAUSE

Table 6.3 shows the five leading causes of fatal agricultural injuries in British Columbia. This information may be useful in planning and targeting injury prevention programs.

Machine rollovers were the leading cause of fatal agricultural injuries in British Columbia, as was the case nationally.

TABLE 6.3 The five most common causes of work-related agricultural fatalities in British Columbia, 1990-2000 (82 deaths)

Cause	Number	% of total fatalities
Machine rollover	28	34.2
Machine runover	9	11.0
Entangled, caught in machine	9	11.0
Pinned, struck by machine	8	9.7
Animal-related injury	8	9.7
All others	20	24.4
Total	**82**	**100.0**

Source: Canadian Agricultural Injury Surveillance Program

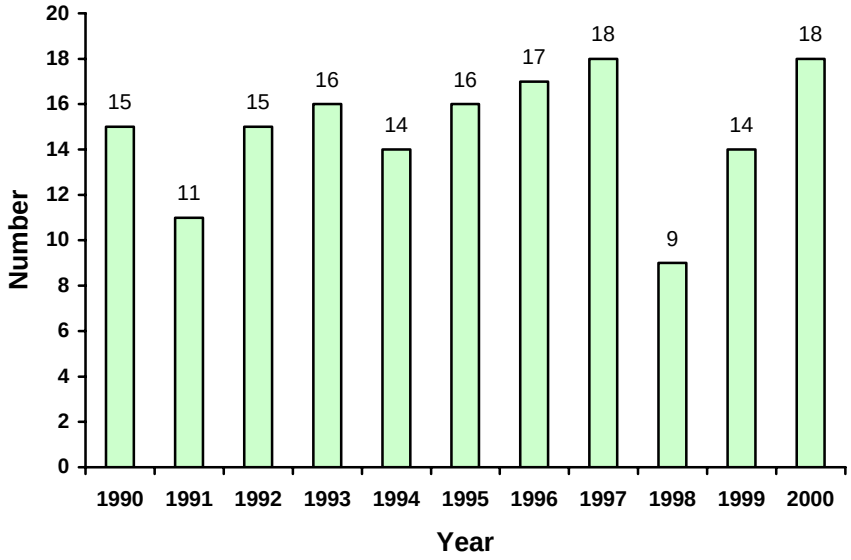
To compare the leading provincial causes of fatal work-related agricultural injuries in this chapter with national trends, please refer to figure 4.3. The ten leading causes of fatal work-related agricultural injuries nationally are: rollovers (all types) 22.9%, runovers (all types) 16.2%, entangled or caught in machine 9.8%, pinned or struck by machine 9%, collision 7.2 %, animal related 5.4%, struck by object 5.3%, falls 3.2%, toxic substances 2.9% and asphyxiation in grain or soil 2.1%.

6.2 ALBERTA

6.2.1 COUNTS

There was no clear trend in the annual occurrence of agricultural fatalities in Alberta.

FIGURE 6.2 **Work-related agricultural fatalities in Alberta per year, 1990-2000 (163 deaths)**



6.2.2 AGE

This table presents the work-related agricultural fatalities by age for Alberta. The age distribution of the provincial farm population is provided for comparative purposes.

Persons aged 60 and over were over-represented as fatalities relative to their proportion of the general farm population.

TABLE 6.4 **Work-related agricultural fatalities in Alberta, 1990-2000, by age (162 deaths*)**

Age Group	Deaths		Farm Population*	
	No.	%	No.	%
0-14	21	13.0	48,355	25.7
15-59	73	45.0	116,380	61.7
60^{+}	68	42.0	23,700	12.6
Total*	**162**	**100.0**	**188,495**	**100.0**

Sources: Statistics Canada, Canada Census of Agriculture, 1996
Canadian Agricultural Injury Surveillance Program
*Age is not available for one case.

6.2.3 FARM TYPE

Table 6.5 describes the types of farms in Alberta. The counts represent the number of farms where the commodity category listed accounts for more than fifty percent of sales, except for the "miscellaneous specialty" category. Changes between 1996 and 2001 reflect the change in specialty production emphasis on farms and the merging of some farm operations.

TABLE 6.5 Alberta farms with gross receipt of $2,500 or more by farm type and counts

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Cattle (beef)	24,718	22,939	-7.2
Grain and oilseed**	10,343	9,327	-9.8
Wheat	5,243	3,718	-29.1
Miscellaneous specialty ***	4,794	5,495	14.6
Field crop*	3,825	4,725	23.5
Livestock combination	1,448	1,165	-19.5
Dairy	1,418	776	-45.3
Hog	1,149	848	-26.2
Other combination	998	998	0.0
Poultry and egg	527	446	-15.4
Fruit	95	73	-23.2
Vegetable	68	70	2.9
All farms in the province	**54,626**	**50,580**	**-7.4**

* Field crop – except grain and oilseed
** Grain and oilseed – except wheat
*** Farms where no single commodity accounts for 50 percent of sales
Source: Statistics Canada, Census of Agriculture, 1996 and 2001

6.2.4 CAUSE

Table 6.6 shows the five leading causes of fatal agricultural injuries in Alberta. This information may be useful in designing and targeting injury prevention programs.

There was an unusually high proportion of pinned or struck by machine injuries in Alberta relative to the national average (9%). This finding warrants additional investigation. Nationally, "pinned or struck by machine" was the fourth leading cause of fatal agricultural injuries.

TABLE 6.6 The five most common causes of work-related agricultural fatalities in Alberta, 1990-2000 (163 deaths)

Cause	Number	% of total fatalities
Pinned / struck by machine	31	19.0
Machine rollover	30	18.4
Machine runover	22	13.5
Entangled, caught in	17	10.4
Animal-related	12	7.4
All others	51	31.3
Total	**163**	**100**

Source: Canadian Agricultural Injury Surveillance Program

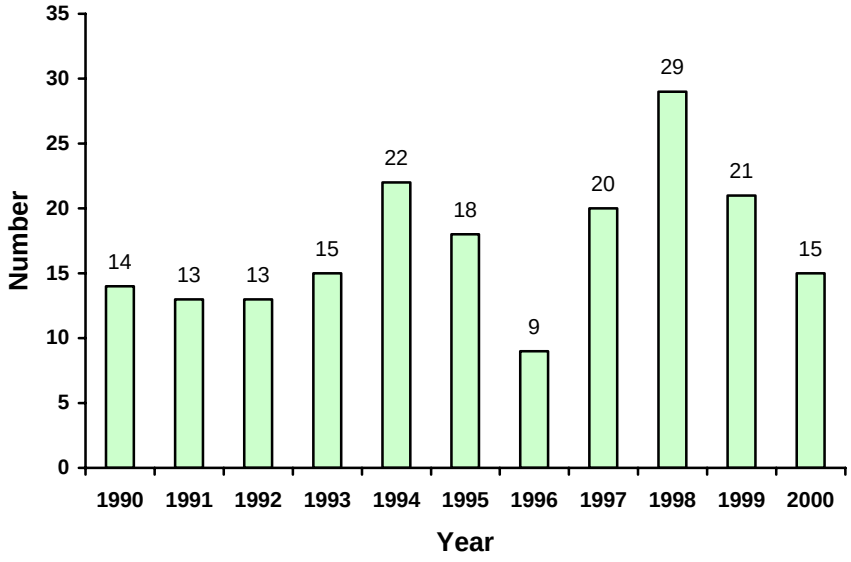
To compare the leading provincial causes of fatal work-related agricultural injuries in this chapter with national trends, please refer to figure 4.3. The ten leading causes of fatal work-related agricultural injuries nationally are: rollovers (all types) 22.9%, runovers (all types) 16.2%, entangled or caught in machine 9.8%, pinned or struck by machine 9%, collision 7.2 %, animal related 5.4%, struck by object 5.3%, falls 3.2%, toxic substances 2.9% and asphyxiation in grain or soil 2.1%.

6.3 SASKATCHEWAN

6.3.1 COUNTS

There was no clear trend in the annual occurrence of agricultural fatalities in Saskatchewan.

FIGURE 6.3 **Work-related agricultural fatalities in Saskatchewan per year, 1990-2000 (189 deaths)**



6.3.2 AGE

This table presents the work-related agricultural fatalities by age for Saskatchewan. The age distribution of the provincial farm population is provided for comparative purposes.

Persons aged 60 and over were over-represented as fatalities relative to their proportion of the general farm population.

TABLE 6.7 **Work-related agricultural fatalities in Saskatchewan, 1990-2000, by age (189 deaths)**

Age Group	Deaths		Farm Population*	
	No.	%	No.	%
0-14	23	12.2	34,130	23.4
15-59	94	49.7	89,985	61.8
60^{+}	72	38.1	21,435	14.7
Total	**189**	**100.0**	**145,550**	**100.0**

Sources: Statistics Canada, Canada Census of Agriculture, 1996
Canadian Agricultural Injury Surveillance Program

6.3.3 FARM TYPE

Table 6.8 describes the types of farms in Saskatchewan. The counts represent the number of farms where the commodity category listed accounts for more than fifty percent of sales, except for the "miscellaneous specialty" category. Changes between 1996 and 2001 reflect the change in specialty production emphasis on farms and the merging of some farm operations.

TABLE 6.8 Saskatchewan farms with gross receipts of $2,500 or more by farm type and counts

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Wheat	20,192	8,992	-55.5
Grain and oilseed**	19,928	21,736	9.1
Cattle (beef)	8,952	12,078	34.9
Field crop*	1,390	2,055	47.8
Miscellaneous specialty***	1,322	1,706	29.0
Livestock combination	1,013	756	-25.4
Other combination	906	843	-7.0
Dairy	512	332	-35.2
Hog	486	293	-39.7
Poultry and egg	179	113	-36.9
Fruit	58	48	-17.2
Vegetable	41	38	-7.3
All farms in the province	**54,979**	**48,990**	**-10.9**

* Field crop – except grain and oilseed
** Grain and oilseed – except wheat
*** Farms where no single commodity accounts for 50 percent of sales
Source: Statistics Canada, Census of Agriculture, 1996 and 2001

6.3.4 CAUSE

Table 6.9 shows the five leading causes of fatal agricultural injuries in Saskatchewan. This information may be useful in designing and targeting appropriate injury prevention programs.

Agricultural machinery runovers were the most common cause of fatal agricultural injuries in Saskatchewan. This finding warrants additional investigation. Nationally, machinery runovers were the second highest cause of fatal agricultural injuries.

TABLE 6.9 The five most common causes of work-related agricultural fatalities in Saskatchewan, 1990-2000(189 deaths)

Cause	Number	% of total fatalities
Runover by machine	46	24.3
Machine rollover	24	12.7
Pinned, struck by machine	17	9.0
Entangled, caught in machine	16	8.5
Collision	13	6.9
All others	73	38.6
Total	**189**	**100.0**

Source: Canadian Agricultural Injury Surveillance Program

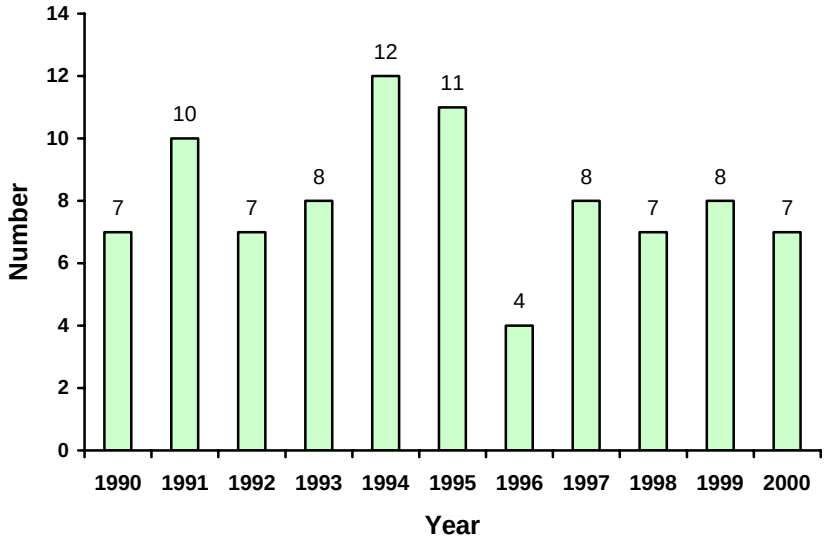
To compare the leading provincial causes of fatal work-related agricultural injuries in this chapter with national trends, please refer to figure 4.3. The ten leading causes of fatal work-related agricultural injuries nationally are: rollovers (all types) 22.9%, runovers (all types) 16.2%, entangled or caught in machine 9.8%, pinned or struck by machine 9%, collision 7.2 %, animal related 5.4%, struck by object 5.3%, falls 3.2%, toxic substances 2.9% and asphyxiation in grain or soil 2.1%.

6.4 MANITOBA

6.4.1 COUNTS

There was no clear trend in the annual occurrence of agricultural fatalities in Manitoba.

FIGURE 6.4 **Work-related agricultural fatalities in Manitoba per year, 1990-2000 (89 deaths)**



6.4.2 AGE

This table presents the work-related agricultural fatalities by age for Manitoba. The age distribution of the provincial farm population is provided for comparative purposes.

Persons aged 60 and over were over-represented as fatalities relative to their proportion of the general farm population.

TABLE 6.10 **Work-related agricultural fatalities in Manitoba, 1990-2000, by age (89 deaths)**

Age Group	Deaths		Farm Population*	
	No.	%	No.	%
0-14	6	6.7	20,945	26.2
15-59	43	48.3	49,385	61.9
60+	40	44.9	9,505	11.9
Total	**89**	**100.0**	**79,835**	**100.0**

Sources: Statistics Canada, Canada Census of Agriculture, 1996
Canadian Agricultural Injury Surveillance Program

6.4.3 FARM TYPE

Table 6.11 describes the types of farms in Manitoba. The counts represent the number of farms where the commodity category listed accounts for more than fifty percent of sales, except for the "miscellaneous specialty" category. Changes between 1996 and 2001 reflect the change in specialty production emphasis on farms and the merging of some farm operations.

TABLE 6.11 Manitoba farms with gross receipts of $2,500 or more by farm type and counts

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Cattle (beef)	7,018	7,232	3.0
Grain and oilseed**	6,110	5,325	-12.8
Wheat	3,407	2,007	-41.1
Miscellaneous specialty***	1,334	1,318	-1.2
Field crop*	1,248	1,276	2.2
Dairy	946	600	-36.6
Hog	946	968	2.3
Livestock combination	489	355	-27.4
Other combination	407	319	-21.6
Poultry and egg	401	284	-29.2
Fruit	85	72	-15.3
Vegetable	65	62	-4.6
All farms in the province	**22,456**	**19,818**	**-11.7**

* Field crop – except grain and oilseed
** Grain and oilseed – except wheat
*** Farms where no single commodity accounts for 50 percent of sales
Source: Statistics Canada, Census of Agriculture, 1996 and 2001

6.4.4 CAUSE

Table 6.12 shows the five leading causes of fatal agricultural injuries in Manitoba. This information may be useful in designing and targeting injury prevention programs.

Machine runovers and rollovers were the leading causes of fatal agricultural injuries in Manitoba.

TABLE 6.12 The five most common causes of work-related agricultural fatalities in Manitoba, 1990-2000

Cause	Number	% of total fatalities
Runover by machine	13	14.6
Machine rollover	13	14.6
Entangled, caught in machine	10	11.2
Collision	9	10.1
Pinned, struck by machine	7	7.9
All others	37	41.6
Total	**89**	**100.0**

Source: Canadian Agricultural Injury Surveillance Program

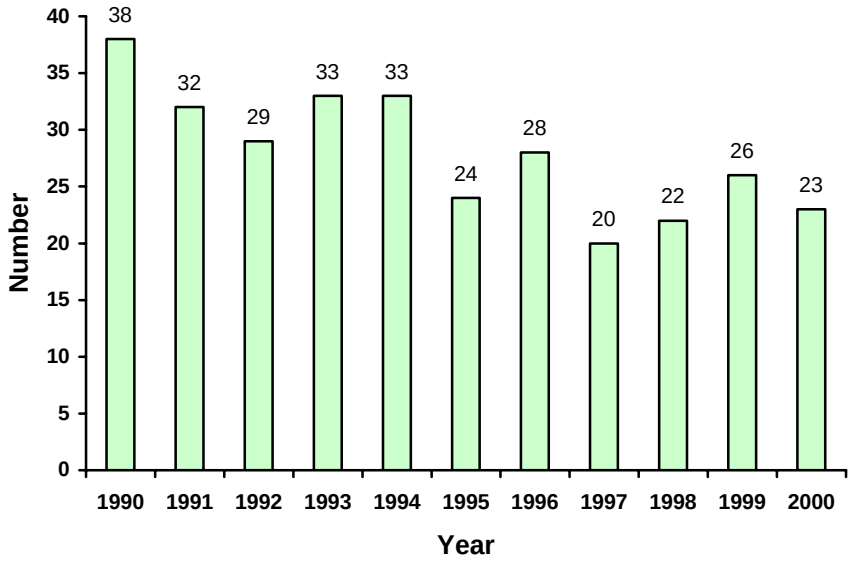
To compare the leading provincial causes of fatal work-related agricultural injuries in this chapter with national trends, please refer to figure 4.3. The ten leading causes of fatal work-related agricultural injuries nationally are: rollovers (all types) 22.9%, runovers (all types) 16.2%, entangled or caught in machine 9.8%, pinned or struck by machine 9%, collision 7.2 %, animal related 5.4%, struck by object 5.3%, falls 3.2%, toxic substances 2.9% and asphyxiation in grain or soil 2.1%.

6.5 ONTARIO

6.5.1 COUNTS

The incidence of work-related agricultural fatalities in Ontario has shown a modest decline over the surveillance period.

FIGURE 6.5 **Work-related agricultural fatalities in Ontario per year, 1990-2000 (308 deaths)**



6.5.2 AGE

This table presents the work-related agricultural fatalities by age for Ontario. The age distribution of the provincial farm population is provided for comparative purposes.

Persons aged 60 and over were over-represented as fatalities relative to their proportion of the general farm population.

TABLE 6.13 **Work-related agricultural fatalities in Ontario, 1990-2000, by age (308 deaths)**

Age Group	Deaths		Farm Population*	
	No.	%	No.	%
0-14	40	13.0	51,780	23.4
15-59	166	53.9	136,940	61.9
60+	102	33.1	32,505	14.7
Total	**308**	**100.0**	**221,225**	**100.0**

Sources: Statistics Canada, Canada Census of Agriculture, 1996
Canadian Agricultural Injury Surveillance Program

6.5.3 FARM TYPE

Table 6.14 describes the types of farms in Ontario. The counts represent the number of farms where the commodity category listed accounts for more than fifty percent of sales, except for the "miscellaneous specialty" category. Changes between 1996 and 2001 reflect the change in specialty production emphasis on farms and the merging of some farm operations.

TABLE 6.14 Ontario farms with gross receipts of $2,500 or more by farm type and counts

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Cattle (beef)	14,172	13,669	-3.5
Grain and oilseed**	12,250	12,863	5.0
Miscellaneous specialty***	8,547	7,301	-14.6
Dairy	8,320	6,414	-22.9
Field crop*	4,965	4,531	-15.2
Hog	2,677	2,454	-8.3
Livestock combination	2,030	1,617	-20.3
Fruit	2,016	1,733	-14.0
Poultry and egg	1,686	1,609	-4.6
Vegetable	1,428	1,233	-13.7
Other combination	1,330	1,273	-4.3
Wheat	466	395	-15.2
All farms in the province	**59,887**	**55,092**	**-8.0**

* Field crop – except grain and oilseed
** Grain and oilseed – except wheat
*** Farms where no single commodity accounts for 50 percent of sales
Source: Statistics Canada, Census of Agriculture, 1996 and 2001

6.5.4 CAUSE

Table 6.15 shows the five leading causes of fatal agricultural injury in Ontario. This information may be useful in designing and targeting injury prevention programs.

Machine rollovers and machine runovers were the leading causes of fatal agricultural injuries in Ontario, as was the case nationally.

TABLE 6.15 The five most common causes of work-related agricultural fatalities in Ontario, 1990-2000 (308 deaths)

Cause	Number	% of total fatalities
Machine rollover	81	26.3
Runover by machine	62	20.1
Entangled / caught in machine	33	10.7
Pinned, struck by machine	25	8.1
Struck by object	16	5.2
All others	91	29.6
Total	**308**	**100.0**

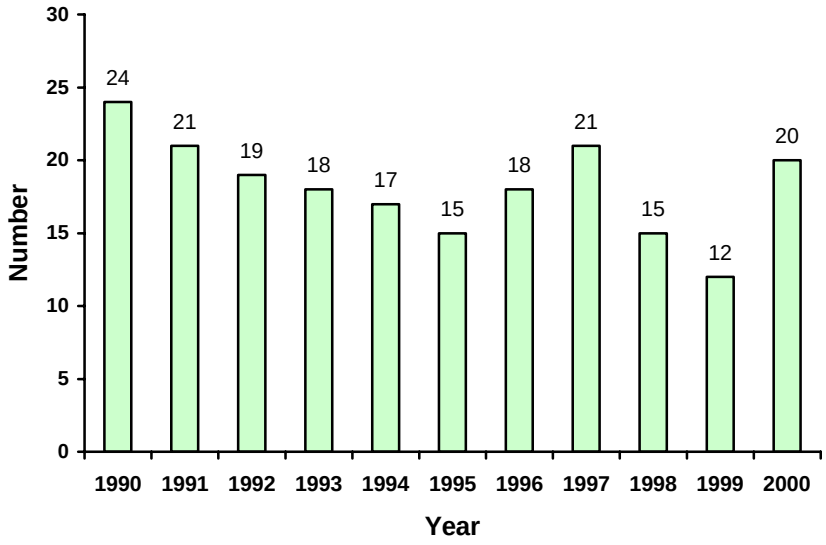
To compare the leading provincial causes of fatal work-related agricultural injuries in this chapter with national trends, please refer to figure 4.3. The ten leading causes of fatal work-related agricultural injuries nationally are: rollovers (all types) 22.9%, runovers (all types) 16.2%, entangled or caught in machine 9.8%, pinned or struck by machine 9%, collision 7.2 %, animal related 5.4%, struck by object 5.3%, falls 3.2%, toxic substances 2.9% and asphyxiation in grain or soil 2.1%.

6.6 QUEBEC

6.6.1 COUNTS

There was no clear trend in the annual occurrence of agricultural fatalities in Quebec.

FIGURE 6.6 **Work-related agricultural fatalities in Quebec per year, 1990-2000 (200 deaths)**



6.6.2 AGE

This table presents the work-related agricultural fatalities by age for Quebec. The age distribution of the provincial farm population is provided for comparative purposes.

Persons aged 60 and over were over-represented as fatalities relative to their proportion of the general farm population.

TABLE 6.16 **Work-related agricultural fatalities in Quebec, 1990-2000, by age (200 deaths)**

Age Group	Deaths		Farm Population*	
	No.	%	No.	%
0-14	14	7.0	58,565	24.9
15-59	124	62.0	75,210	65.6
60^{+}	62	31.0	10,825	9.4
Total	**200**	**100.0**	**114,600**	**100.0**

Sources: Statistics Canada, Canada Census of Agriculture, 1996
Canadian Agricultural Injury Surveillance Program

6.6.3 FARM TYPE

Table 6.17 describes the types of farms in Quebec. The counts represent the number of farms where the commodity category listed accounts for more than fifty percent of sales, except for the "miscellaneous specialty" category. Changes between 1996 and 2001 reflect the change in specialty production emphasis on farms and the merging of some farm operations.

TABLE 6.17 Quebec farms with gross receipts of $2,500 or more by farm type and counts

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Dairy	10,730	8,594	-19.9
Miscellaneous Specialty***	6,260	6,200	-1.0
Cattle (beef)	5,968	5,159	-13.9
Grain and oilseed**	2,639	3,129	18.6
Hog	2,315	2,193	-5.3
Field crop*	2,004	1,700	-15.2
Fruit	1,086	1,042	-4.1
Vegetable	1,003	802	-20.0
Poultry and egg	832	756	-9.1
Other combination	608	599	-1.5
Livestock combination	376	309	-17.8
Wheat	85	56	-34.1
All farms in the province	**33,906**	**30,539**	**-9.9**

* Field crop – except grain and oilseed
** Grain and oilseed – except wheat
*** Farms where no single commodity accounts for 50 percent of sales
Source: Statistics Canada, Census of Agriculture, 1996 and 2001

6.6.4 CAUSE

Table 6.18 shows the five leading causes of fatal agricultural injuries in Quebec. This information may be useful in designing and targeting injury prevention programs.

The leading cause of fatal agricultural injuries in Quebec was machine rollovers, as was the case. nationally. The percentage of fatal agricultural injuries caused by collisions was substantially higher in Quebec than it was nationally. This warrants further investigation.

TABLE 6.18 The five most common causes of work-related agricultural fatalities in Quebec, 1990-2000 (200 deaths)

Cause	Number	% of total fatalities
Machine rollover	49	24.5
Collision	36	18.0
Machine runover	20	10.0
Entangled, caught in machine	18	9.0
Struck by object	17	8.5
All others	60	30.0
Total	**200**	**100.0**

Source: Canadian Agricultural Injury Surveillance Program

To compare the leading provincial causes of fatal work-related agricultural injuries in this chapter with national trends, please refer to figure 4.3. The ten leading causes of fatal work-related agricultural injuries nationally are: rollovers (all types) 22.9%, runovers (all types) 16.2%, entangled or caught in machine 9.8%, pinned or struck by machine 9%, collision 7.2 %, animal related 5.4%, struck by object 5.3%, falls 3.2%, toxic substances 2.9% and asphyxiation in grain or soil 2.1%.

6.7 THE ATLANTIC PROVINCES

6.7.1 COUNTS

Annual fatality counts are presented by province and year. The small number of cases reported for these provinces precludes meaningful trend analysis.

FIGURE 6.19 Work-related agricultural fatalities in the Atlantic provinces, 1990-2000, by year and province (55 cases)

Province:	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland & Labrador	Total
Year					
1990	5	1	3	Not available	9
1991	3	5	2	Not available	10
1992	2	1	2	Not available	5
1993	0	1	1	Not available	2
1994	1	2	0	Not available	3
1995	4	3	1	Not available	8
1996	1	3	1	Not available	5
1997	1	1	0	Not available	2
1998	0	0	0	2	2
1999	1	1	1	1	4
2000	1	4	0	0	5
Tota1:	**19**	**22**	**11**	**3**	**55**

Source: Canadian Agricultural Injury Surveillance Program

6.7.2 AGE

This table presents the work-related agricultural fatalities by age for the Atlantic provinces. The age distribution of the provincial farm population is provided for comparative purposes.

Persons aged 60 and over were over-represented as fatalities relative to their proportion of the general farm population.

TABLE 6.20 Work-related agricultural fatalities in the Atlantic Provinces, 1990-2000, by age group

Age Group	Deaths		Farm Population*	
	No.	%	No.	%
0-14	1	1.8	7,155	21.7
15-59	27	49.1	20,945	63.6
60^{+}	27	49.1	4,815	14.6
Total	**55**	**100.0**	**32,915**	**100.0**

Sources: Statistics Canada, Canada Census of Agriculture, 1996
Canadian Agricultural Injury Surveillance Program

6.7.3 FARM TYPE

Table 6.21 describes the types of farms in the Atlantic Provinces. The counts represent the number of farms where the commodity category listed accounts for more than fifty percent of sales, except for the "miscellaneous specialty" category. Changes between 1996 and 2001 reflect the change in specialty production emphasis on farms and the merging of some farm operations.

TABLE 6.21 Farms in the Atlantic Provinces with gross receipts of $2,500 or more by farm type and counts.

NEW BRUNSWICK

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Cattle (beef)	758	718	-5.3
Miscellaneous specialty* **	542	494	-8.9
Field crop*	449	433	-3.6
Dairy	399	320	-19.8
Fruit	232	304	31.0
Poultry and egg	79	47	-40.5
Other combination	79	51	-35.4
Hog	75	79	5.3
Vegetable	83	54	-34.9
Livestock combination	54	33	-38.9
Grain and oilseed**	22	26	18.2
Wheat	3	4	33.3
All farms in the province	**2,775**	**2,563**	**-7.6**

NOVA SCOTIA

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Cattle (beef)	912	828	-9.2
Miscellaneous specialty* **	868	757	-12.8
Fruit	607	653	7.6
Dairy	502	375	-25.3
Field crop*	176	242	37.5
Vegetable	144	97	-32.9
Poultry and egg	113	111	-1.8
Other combination	101	101	0.0
Hog	93	65	-30.1
Livestock combination	76	73	-3.9
Grain and oilseed**	6	15	150.0
Wheat	2	1	-50.0
All farms in the province	**3,600**	**3,318**	**-7.8**

* Field crop – except grain and oilseed
** Grain and oilseed – except wheat
*** Farms where no single commodity accounts for 50 percent of sales
Source: Statistics Canada, Census of Agriculture, 1996 and 2001

6.7.3 FARM TYPE

TABLE 6.21 ***…Continued*** **Farms in the Atlantic Provinces with gross receipts of $2,500 or more by farm type and counts.**

PRINCE EDWARD ISLAND

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Cattle (beef)	592	455	-23.1
Field crop*	528	461	-12.7
Dairy	337	309	-8.3
Miscellaneous specialty***	125	114	-8.8
Hog	103	94	-8.7
Livestock combination	93	35	-62.4
Fruit	56	91	62.5
Vegetable	54	42	-22.2
Other combination	42	59	40.5
Grain and oilseed**	39	43	10.3
Poultry and egg	37	22	-49.5
Wheat	9	14	55.6
All farms in the province	**2,015**	**1,739**	**-13.7**

NEWFOUNDLAND

Farm Type	1996 Census Number	2001 Census Number	1996 to 2001 % change
Miscellaneous specialty***	139	155	11.5
Vegetable	126	76	-39.7
Dairy	63	59	-6.3
Other combination	60	52	-13.3
Poultry and egg	54	33	-38.9
Field crop*	39	55	41.0
Fruit	36	23	-36.1
Cattle (beef)	28	46	64.3
Hog	13	8	-38.5
Livestock combination	15	12	-20.0
Wheat	0	0	--
Grain and oilseed**	0	0	--
All farms in the province	**573**	**519**	**-9.4**

* Field crop – except grain and oilseed
** Grain and oilseed – except wheat
*** Farms where no single commodity accounts for 50 percent of sales
Source: Statistics Canada, Census of Agriculture, 1996 and 2001

6.7.4 CAUSE

Table 6.22 shows the five leading causes of work-related fatal agricultural injuries in the Atlantic Provinces. Due to the small number of cases recorded for each province, the only conclusion that can reasonably be drawn from these data is that machine rollovers appear to have been the leading cause of fatal agricultural injuries in the Atlantic Region.

TABLE 6.22 The five most common causes of work-related agricultural fatalities in the Atlantic Provinces, 1990-2000 (55 deaths)

Cause	Number	% of total fatalities
Machine rollover	23	41.8
Fall	5	9.1
Pinned, struck by machine	4	7.3
Machine runover	4	7.3
Struck by object	4	7.3
All others	15	27.2
Total	**55**	**100.0**

Source: Canadian Agricultural Injury Surveillance Program

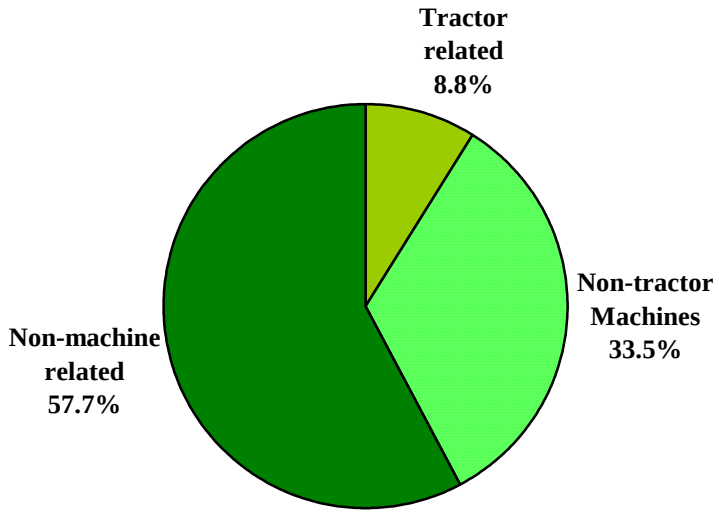
To compare the leading provincial causes of fatal work-related agricultural injuries in this chapter with national trends, please refer to figure 4.3. The ten leading causes of fatal work-related agricultural injuries nationally are: rollovers (all types) 22.9%, runovers (all types) 16.2%, entangled or caught in machine 9.8%, pinned or struck by machine 9%, collision 7.2 %, animal related 5.4%, struck by object 5.3%, falls 3.2%, toxic substances 2.9% and asphyxiation in grain or soil 2.1%.

7 NON WORK-RELATED AGRICULTURAL FATALITIES: OVERVIEW

7.1 MAJOR CAUSES OF INJURY

Over the surveillance period, there were 170 fatal injuries on Canadian farms that were not related to agricultural work. This represented 13.2% of the total number of agricultural fatalities. 57.7% of these non work-related deaths did not involve farm machinery. The counts for the non work-related farm fatalities reported in this chapter should be interpreted with caution due to inconsistencies in data collection procedures for these fatalities among provinces.

FIGURE 7.1 Non work-related farm fatalities by major cause of injury, 1990-2000 (170 deaths)

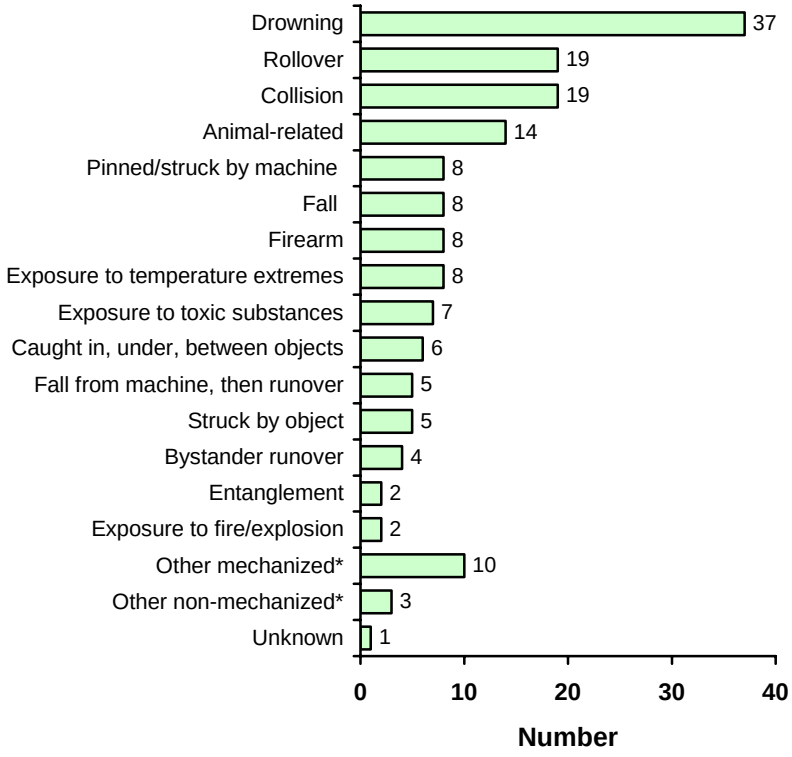


7.2 CAUSE OF INJURY

Drowning was by far the leading cause of non-work related fatalities. 65% of the drowning victims were children under 15. Appropriate fencing around play areas and access to alternative means of providing child supervision could have prevented most of these deaths.

Rollovers and collisions were also leading causes of non work-related fatal injuries. 47% of the rollovers and 37% of the collisions involved the recreational use of ATVs, often by children. Animal-related activities were an important cause of non work-related fatal injuries. Of the animal-related fatalities, 79% involved the recreational use of horses.

FIGURE 7.2 Non work-related farm fatalities by cause of injury 1990-2000 (170 deaths)



* *Other mechanized* includes, but is not limited to, aircraft crashes, and drowning while in a machine. *Other non-mechanized* includes, but is not limited to, being struck by lightening.

7.3 AGE AND GENDER

Most of the victims of non work-related fatal agricultural injuries were males. Younger (0-14 years) and older (60+ years) males were over-represented as fatalities relative to their proportion of the general farm population.

TABLE 7.3 Non work-related farm fatalities by age and gender, 1990-2000 (170 deaths)

Gender	Age Group	% of Total Fatalities in Age Group		% of Age Group and Sex in Farm Population*
		No.	%	
Males	**0 - 14 years**	52	30.8	12.6
	15 - 59 years	58	34.3	32.9
	60+ years	34	20.1	7.7
Females	**0 - 14 years**	7	4.1	11.8
	15 -59 years	15	8.9	29.6
	60+ years	3	1.8	5.5
Total		**169****	**100.0**	**100.0**

* Statistics Canada, Census of Agriculture, 1996
**Age is not available for one case.

7.4 LEADING CAUSES OF INJURY BY AGE AND GENDER

57% of the non work-related drowning deaths involved males under the age of 15. Males were also involved in greater numbers of rollover and collision fatalities. 89% of the victims of non work-related collisions were male. Most of the males involved in collisions (76%) were aged 15-59.

95% of the non work-related rollover fatalities were male. There was no association between this cause of fatal injury and any particular age group.

Female fatalities exceeded male fatalities for only one cause of fatal injury and one age group, recreational animal-related activities among females aged 15-59.

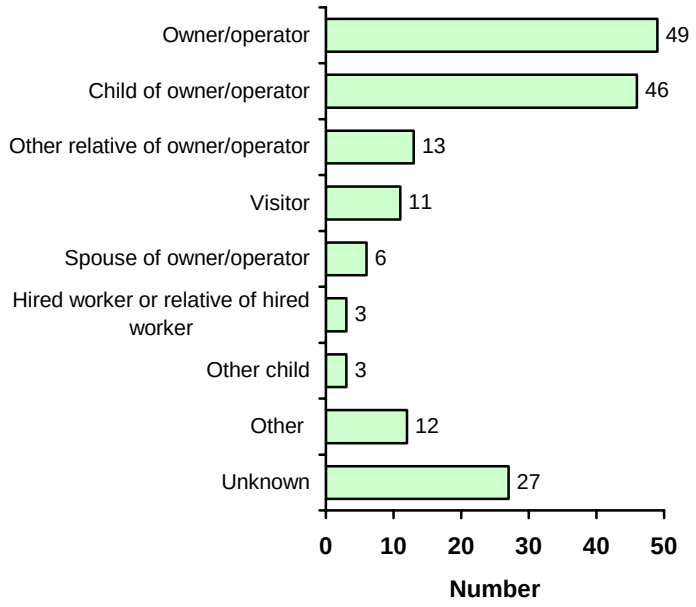
TABLE 7.4 Non work-related farm fatalities by age and gender for the four leading causes of injury, 1990-2000

	Age Group							
	0-14		15-59		60+		Total	
Gender:	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Drowning	21	3	6	3	3	1	**30**	**7**
Rollover	8	1	4	--	6	--	**18**	**1**
Collision	3	--	13	2	1	--	**17**	**2**
Animal-related	3	2	2	4	3	--	**8**	**6**

7.5 RELATIONSHIP TO FARM OWNER

Where relationship to the farm owner/operator was known, 80% of non work-related farm fatalities involved members of the farm family. Farmers and their children were the most frequent victims. Only 6.5% of non work-related fatalities involved visitors to farms.

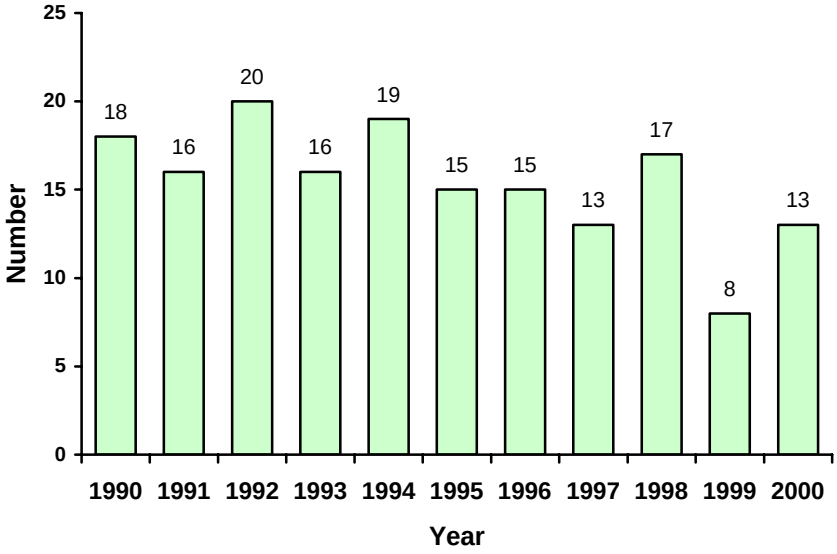
FIGURE 7.5 Non work-related farm fatalities by relationship to farm owner, 1990-2000 (170 deaths)



7.6 YEAR

Annual counts of non work-related fatalities ranged from 8 to 20 per year. Caution must be exercised in the interpretation of these counts due to inconsistencies in the collection procedures for non work-related data among provinces.

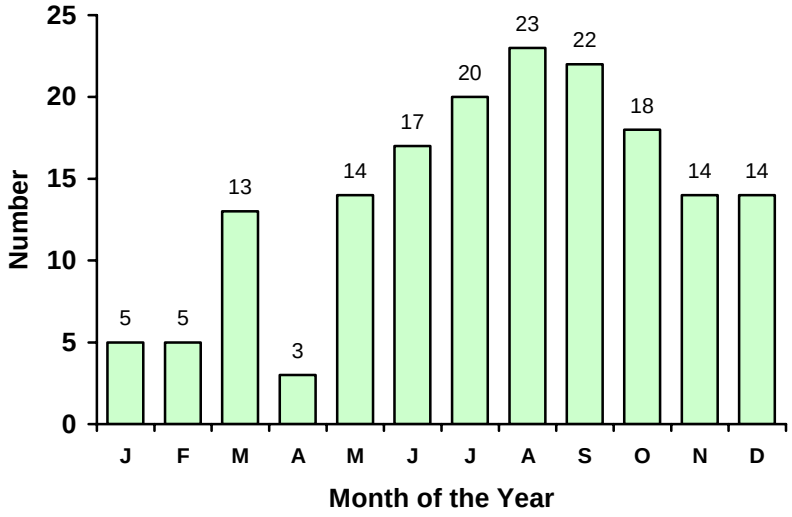
FIGURE 7.6 Non work-related farm fatalities by year, 1990-2000 (170 deaths)



7.7 MONTH

The distribution by month of non work-related fatalities is similar to that for work-related fatalities. A seasonal peak in fatal injuries occurs during warm weather months.

FIGURE 7.7 **Other farm fatalities by month of the year, 1990-2000 (168 deaths*)**



*Month is not available for two cases.

8 PATTERNS OF AGRICULTURAL FATALITIES

To assist in developing appropriate injury prevention programs, it may be informative to classify data into patterns of injury in addition to the standard causes of injury CAISP has used in the past. For instance, drownings, falls, and deaths by fire or explosion can have both machine-related and non machine-related causes of injury. The total number of drownings, falls, and deaths due to fires or explosions can be presented more clearly if both machine-related and non machine-related causes of the same type of fatality are combined in a pattern. It is also useful to examine activities and tasks as patterns; for example, Woodcutting or Forestry and Jump Starting or Ground Starting Machinery. An activity pattern may include several different causes of injury and mechanical causes of injury. Using this reporting method, a fatality can be assigned to several patterns as long as it meets the criteria for inclusion in each pattern. For instance, a struck-by-tree fatality might be assigned to both the Woodcutting or Forestry pattern and to the Struck by Falling, Collapsing or Propelled Material pattern.

Definitions for the following patterns are provided in Appendix B: animal-related, backwards rollover (non-collision, non-RV), blind runover, collisions on public roadways, contact with overhead power lines, drowning (all causes), entanglement, exposure to toxic or caustic substances, extra rider fatalities, failed hydraulics or improper blocking, falls from height, fires or explosions (all types), jumpstarting or ground starting, recreational vehicles (off road), runover or pinned by unmanned vehicle, sideways rollover (non-collision, non-RV), suffocation or asphyxiation by grain, suffocation or asphyxiation by soil, struck by falling, collapsing or propelled material, and woodcutting or forestry.

8.1 SIDEWAYS ROLLOVERS

97% of the sideways rollover fatalities involved tractors. 50.4% occurred when the victim's tractor slipped off a road or driveway into a ditch.

17.6% of the sideways rollovers that occurred on highways and roads involved a hill or slope.

In most of the fatalities, the victim was crushed by the weight of the rolled vehicle. The installation of Roll Over Protection Structures and seat belts on tractors and other farm machinery would have prevented most of these deaths.

TABLE 8.1 Agricultural fatalities due to sideways rollovers, 1990-2000, by age and sex (137 deaths, 10.9% of total fatalities)

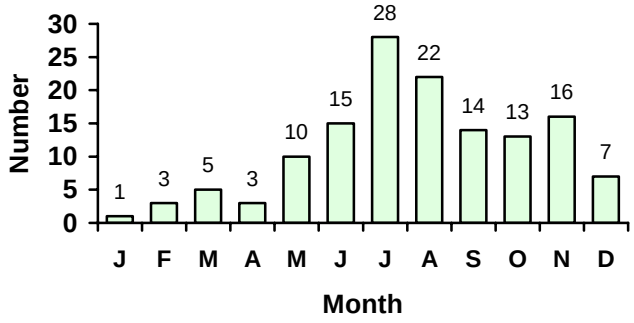
Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	5	3.9	1	10.0	6	4.4
15-59	67	52.8	8	80.0	75	54.7
60+	55	43.3	1	10.0	56	40.9
Total	**127**	**100.0**	**10**	**100.0**	**137**	**100.0**

TABLE 8.2 Agricultural fatalities due to sideways rollovers, 1990-2000, by location of rollover (137 deaths)

Location of Injury Event	No.	%
Highways, roads, driveways (including road-side ditches)	69	50.4
Hills, ravines, natural slopes, uneven ground	24	17.5
Irrigation ditches, pits, bodies of water	20	14.6
Ramps or piles of material	9	6.6
Flat land	7	5.1
Woodlot	4	2.9
Other, unknown	4	2.9
Total	**137**	**100.0**

FIGURE 8.1 **Agricultural fatalities due to sideways rollovers, 1990-2000, by month (137 deaths)**

There are greater numbers of sideways rollovers during the months of June to November.



8.2 BACKWARDS ROLLOVERS

All backwards rollovers involved tractors. 55.1% of the tractors were engaged in towing, pulling, or dragging tasks. 20.3% of these fatalities occurred on a hill or slope. Rollovers on flat land typically involved an attempt to lift a heavy load. For instance, 7.2% of the rollovers occurred when the victim was trying to lift a large bale. The installation of Roll Over Protection Structures and seat belts could have prevented many of these fatalities. In several of the towing fatalities, operators attached a chain beneath the seat rather than at the draw pin. Because of a tractor's high center of gravity, towing any object or vehicle can easily lead to a backwards rollover, especially if the tow rope or chain is not attached at the level of the draw pin.

TABLE 8.3 **Agricultural fatalities due to backwards rollovers, 1990-2000, by age and sex (69 deaths, 5.5% of total fatalities)**

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	4	6.2	--	--	4	5.8
15-59	30	46.1	4	100	34	49.3
60+	31	47.7	--	--	31	44.9
Total	**65**	**100.0**	**4**	**100.0**	**69**	**100.0**

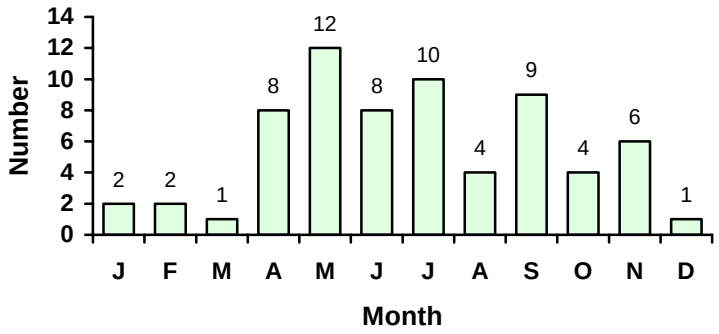
TABLE 8.4 **Agricultural fatalities due to backwards rollovers, 1990-2000, by location of rollover (69 deaths)**

Location of Injury Event	No.	%
Highways, roads, driveways (including road-side ditches)	8	11.6
Hills, ravines, natural slopes, uneven ground	15	21.7
Irrigation ditches, pits, bodies of water	1	1.5
Piles of material	3	4.3
Flat land	24	34.8
Woodlot	16	23.2
Other, unknown	2	2.9
Total	**69**	**100.0**

Source: Canadian Agricultural Injury Surveillance Program

FIGURE 8.2 **Agricultural fatalities due to backwards rollovers, 1990-2000, by month (67 deaths*)**

Backwards rollovers were less frequent in the winter months of December to March.



* This information is not available for two cases.

8.3 RUNOVER OR PINNED BY UNMANNED VEHICLE

TABLE 8.5 **Agricultural fatalities due to unmanned vehicles, 1990-2000, by age and sex (92 deaths, 7.3% of total fatalities)**

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	1	1.1	2	50.0	3	3.3
15-59	36	40.9	--	--	36	39.1
60+	51	58.0	2	50.0	53	57.6
Total	**88**	**100.0**	**4**	**100.0**	**92**	**100.0**

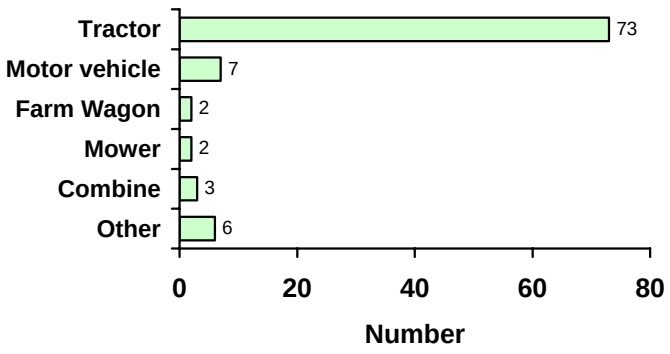
57.6% of those killed by unmanned machinery were over age 59. Almost all of the victims were males. 85.9% of the vehicles were tractors. More than half of these events occurred after the operator of a vehicle dismounted while the vehicle was still under power. Typically, while the operator was engaged in a task near the vehicle, the vehicle slipped into gear or rolled down an incline crushing the operator. 40.2% of unmanned runovers resulted when the operator fell or jumped from a vehicle and was runover or pinned by it as it continued to move.

TABLE 8.6 **Agricultural fatalities due to unmanned vehicles, 1990-2000, by circumstance (92 deaths)**

Cause of Injury	No.	%
Operator dismounted vehicle to make adjustments or complete another task and vehicle ran over operator or pinned operator between vehicle and fixed object	50	54.4
Operator fell, was knocked off, or jumped from moving vehicle. Operator then runover by vehicle or pinned between vehicle and fixed object	37	40.2
Unable to determine	5	5.4
Total	**92**	**100.0**

These types of fatalities could be reduced if power was shut off automatically whenever the operator left or was thrown from the driver's seat of a tractor or other farm machine.

FIGURE 8.3 **Agricultural fatalities due to unmanned vehicles, 1990-2000, by machine type (92 deaths)**



Safe operating procedures used in other industrial workplaces should also be practiced on farms:

The vehicle's engine should be shut off and the parking brake should be engaged before the operator leaves the vehicle. If the vehicle is parked on an incline, the wheels should be blocked.

8.4 BLIND RUNOVERS

Of those killed in bystander or alighted passenger runover events, 51.9% were children younger than five. For children less than five, 46.4% of fatalities occurred in the farmyard or driveway. Many victims were killed by vehicles that were reversing. Eliminating the exposure of young children to agricultural work sites could prevent these deaths. This could be accomplished by providing fenced and secure play areas for young children on agricultural sites, and by providing child care alternatives that do not involve taking young children into the agricultural work site.

TABLE 8.7 **Agricultural fatalities due to blind runovers 1990-2000, by age and sex (54 deaths, 4.3% of total fatalities)**

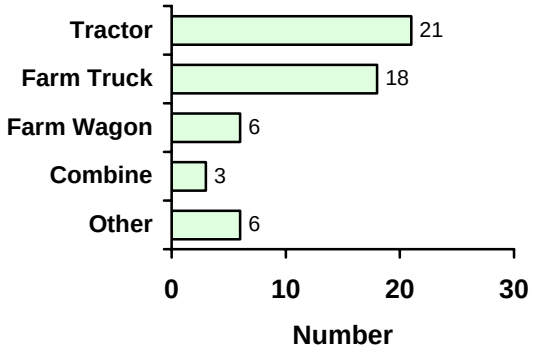
Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	25	62.5	13	92.9	38	70.4
15-59	5	12.5	1	7.1	6	11.1
60+	10	25.0	--	--	10	18.5
Total	**40**	**100.0**	**14**	**100.0**	**54**	**100.0**

TABLE 8.8 **Agricultural fatalities due to blind runovers, 1990-2000, by location of runover (54 deaths)**

	Children < 5 years		Children 5 - 9 years		All Others	
Location of Injury Event	**No.**	**%**	**No.**	**%**	**No.**	**%**
Farm yard /	13	46.4	3	37.5	6	33.3
Field	5	17.9	2	25.0	7	38.9
Farm road / highway	2	7.1	1	12.5	1	5.6
Barn / shed	3	10.7	2	25.0	--	--
Other, unknown	5	17.9	--	--	4	22.2
Total	**28**	**100.0**	**8**	**100.0**	**18**	**100.0**

FIGURE 8.4 **Agricultural fatalities due to blind runovers, 1990-2000, by machine type (54 deaths)**

44.4% of blind runovers involved either farm trucks or wagons. Tractors accounted for another 38.9% of blind runover fatalities.



8.5 EXTRA RIDER FATALITIES

49% of extra rider fatalities occurred in children younger than ten. Children are very susceptible to being thrown from a farm vehicle because of their light body weight and limited strength. They are easily tossed from lurching and bouncing machinery. Death is generally due to a fatal head injury or to a crush if the victim is run over subsequent to the fall. There are several instances of children falling out of tractors and other farm machines with cabs when the door latch failed or when doors were left open deliberately. Children should never be taken as extra riders on farm machinery.

TABLE 8.9 **Agricultural fatalities involving extra riders, 1990-2000, by age and sex (51 deaths, 4.1% of total fatalities)**

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	27	64.3	4	44.5	31	60.8
15-59	9	21.4	3	33.3	12	23.5
60+	6	14.3	2	22.2	8	15.7
Total	**42**	**100.0**	**9**	**100.0**	**51**	**100.0**

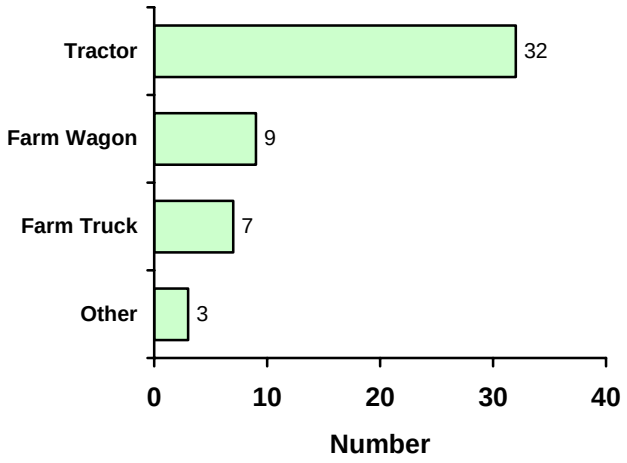
TABLE 8.10 **Agricultural fatalities involving extra riders, 1990-2000, by location of runover (51 deaths)**

Location of Injury Event	Children 0--4 years		Children 5 –9 years		All Others	
	No.	%	No.	%	No.	%
Field	8	50.0	3	33.4	8	30.7
Farm yard or driveway	4	25.0	3	33.3	2	7.7
Farm road / highway	3	18.7	3	33.3	6	23.1
Barn or shed	1	6.3	--	--	2	7.7
Other	--	--	--	--	8	30.8
Total	**16**	**100.0**	**9**	**100.0**	**26**	**100.0**

Source: Canadian Agricultural Injury Surveillance Program

FIGURE 8.5 **Agricultural fatalities due to extra rider fatalities, 1990-2000, by machine type (51 deaths)**

In 65.9% of extra rider fatalities, the victim had been a passenger on a tractor.



8.6 ENTANGLEMENT

TABLE 8.11 **Agricultural fatalities due to entanglement in machinery, 1990-2000, by age and sex (109 deaths, 8.7% of total fatalities)**

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	5	4.9	1	16.7	6	5.5
15-59	68	66.0	5	83.3	73	67.0
60+	30	29.1	--	--	30	27.5
Total	**103**	**100.0**	**6**	**100.0**	**109**	**100.0**

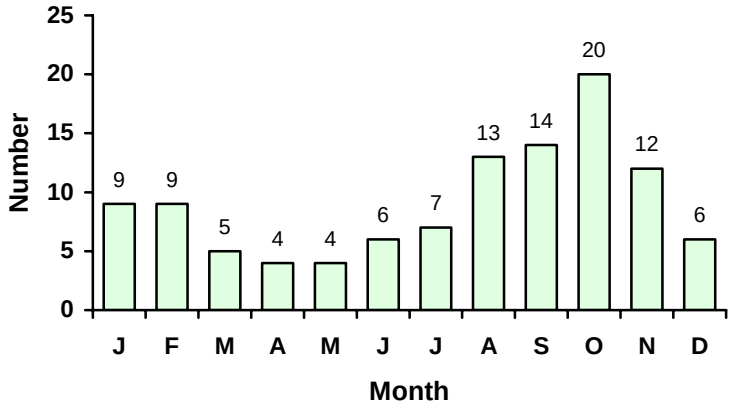
Becoming entangled or caught in the moving parts of agricultural machinery causes about ten deaths annually on Canadian farms and ranches. Entanglements generally occur because of inadequate guards on exposed parts of machines and failure to shut off power prior to making adjustments or inspecting unguarded parts of machines. This type of injury event is often initiated when loose clothing is caught in exposed, moving machinery parts or when a worker falls into a machine under power.

Being caught in a PTO or drive shaft caused 44% of the entanglement fatalities.

TABLE 8.12 **Agricultural fatalities due to entanglement, 1990-2000, by cause of entanglement (109 deaths)**

Cause of Entanglement	No.	%
Entanglement in rotating shaft (PTO or drive shaft)	48	44.0
Caught in the gathering mechanism or ejecting mechanism of a machine (e.g., pick-up table, rotating blades)	18	16.5
Caught in auger flighting	18	16.5
Caught in belts, pulleys, gears, chains	16	14.7
Caught in rollers	5	4.6
Unable to determine cause	4	3.7
Total	**109**	**100.0**

FIGURE 8.6 **Agricultural fatalities due to entanglement, 1990-2000, by month (109 deaths)**



Entanglement injuries occur more frequently during the months of August to November. The incidence of entanglements can be reduced by maintaining all guards in place on machinery, wearing snug-fitting clothing when working on or around operating machinery and always shutting off power to machinery before making adjustments or repairs.

8.7 COLLISIONS ON PUBLIC ROADWAYS

CAISP identifies fatal traffic injuries only when they are coded as agricultural-related injuries in the provincial coroners' data sets. These data are therefore likely to be conservative estimates. Almost 45% of these injury victims were non-agricultural persons killed in a crash involving an agricultural vehicle or farm animal. In some cases, agricultural vehicles involved in collisions had inadequate signage, reflectors, lighting or use of signals. Ensuring that agricultural vehicles conform to regulations for use on public roadways is a priority for injury prevention.

TABLE 8.13 **Collisions on public roadways, 1990-2000, by age and sex (98 deaths, 7.8% of total fatalities)**

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	4	4.7	--	--	4	4.1
15-59	63	74.1	11	84.6	74	75.5
60+	18	21.2	2	15.4	20	20.4
Total	**85**	**100.0**	**13**	**100.0**	**98**	**100.0**

In many of the multiple vehicle collisions where a driver was killed, it was noted that the driver was ejected or thrown from the vehicle. In the truck rollover events, the majority of victims were ejected. Many of these deaths would have been prevented if the driver or occupant had been wearing a seatbelt.

TABLE 8.14 Collisions on public roadways, 1990-2000, injury pattern by type of vehicle occupied by the victim (98 deaths)

		No.	%
Multiple-vehicle collisions		**79**	**80.6**
	Car	18	18.3
	Tractor	22	22.4
	Motorcycle	13	13.3
	Truck	14	14.3
	Off-road vehicle	4	4.1
	Other agricultural machinery	8	8.2
Rollover events		**7**	**7.1**
	Car	1	1.0
	Truck	5	5.1
	Swather	1	1.0
Single-vehicle collisions*		**9**	**9.2**
	Car	4	4.1
	Truck	4	4.1
	Snowmobile	1	1.0
Pedestrian versus motor vehicle events**		**3**	**3.1**
Total:		**98**	**100.0**

*Five of the single-vehicle collisions involved animals. There were two collisions with cows and three with horses.
** All of the pedestrian fatalities occurred when an agricultural worker dismounted from farm machinery on a public roadway and was hit by a passing vehicle.

8.8 RECREATIONAL VEHICLES (OFF ROAD)

Almost all of the victims of RV fatal injury events were male.

TABLE 8.15 Off-road agricultural fatalities involving recreational vehicles, 1990-2000, by age and sex (30 deaths, 2.4% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	10	34.5	1	100	11	36.7
15-59	12	41.4	--	--	12	40.0
60+	7	24.1	--	--	7	23.3
Total	**29***	**100.0**	**1**	**100.0**	**30**	**100.0**

*No age was specified for one male victim.

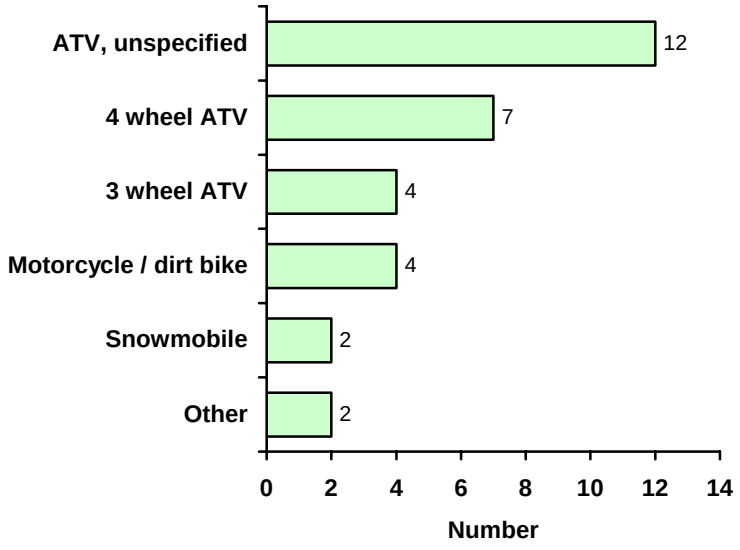
Rollovers caused 54.8% of all RV and ATV deaths. In 19.4% of the events, the victim fell from the RV/ATV. The use of seat belts and helmets may have prevented many of those fatalities.

FIGURE 8.16 **Agricultural fatalities due to non-traffic recreational vehicles 1990-2000, by cause of injury (31 deaths)**

Cause of Injury	No.	%
Rollover	17	54.8
Collision	5	16.1
Operator fell from machine, not runover	3	9.7
Operator / passenger fell from machine, then runover	3	9.7
Other	3	9.7
Total	**31**	**100.0**

ATVs were involved in 74.2% of non-traffic recreational vehicle fatalities.

FIGURE 8.7 **Agricultural fatalities due to non-traffic recreational vehicles, 1990-2000, by machine type (31 deaths)**



8.9 JUMP STARTING OR GROUND STARTING MACHINERY

In these injury events, the vehicle operator jump started the engine, bypassing the starter and its associated safety mechanisms. During this procedure, the operator has to stand near the vehicle. The fatalities occurred when the vehicle being jump started lurched forward and ran over or pinned the operator or a bystander.

64% of the jump starting fatalities involved older males. In 88% of the fatalities, the vehicle jump started was a tractor. Though the farm owner/operator is most often the victim, bystanders have also been killed. These deaths would not occur if safe, standard procedures were used for starting tractors and other farm vehicles.

TABLE 8.17 Agricultural fatalities due to jump starting or ground starting machinery, 1990-2000, by age and sex (25 deaths, 2.0% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	--	--	1	100.0	1	4.0
15-59	8	33.3	--	--	8	32.0
60+	16	66.7	--	--	16	64.0
Total	**24**	**100.0**	**1**	**100.0**	**25**	**100.0**

FIGURE 8.18 Agricultural fatalities due to jump starting / ground starting machinery, 1990-2000, by relationship of decedent to farm owner (25 deaths)

Most of the persons killed while jump starting equipment were owner/operators.

Relationship to farm owner	No.	%
Owner / operator	15	60.0
Child of owner / operator	2	8.0
Hired worker	2	8.0
Other relationship (neighbor, other relative)	4	16.0
Unknown	2	8.0
Total	**25**	**100.0**

8.10 FAILED HYDRAULICS OR IMPROPER BLOCKING

The use of approved blocking devices while making repairs to vehicles or hydraulic equipment could have prevented almost 66% of these fatalities.

TABLE 8.19 Agricultural fatalities due to failed hydraulics or improper blocking, 1990-2000, by age and sex (41 deaths, 3.3% of total fatalities)

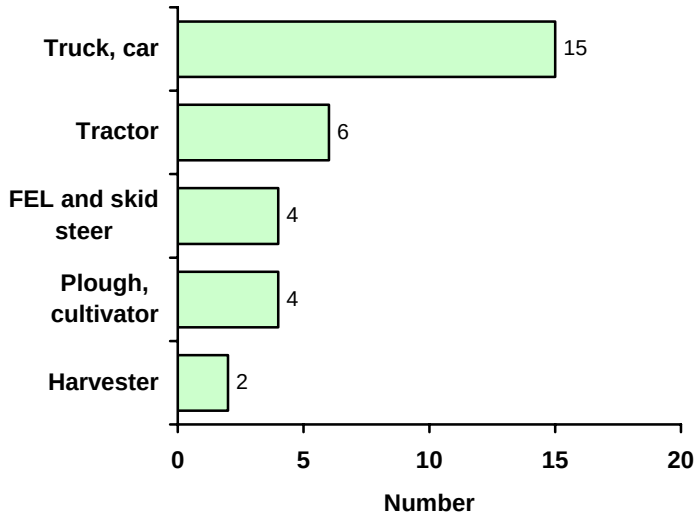
Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	2	5.0	--	--	2	4.9
15-59	22	55.0	1	100	23	56.1
60+	16	40.0	--	--	16	39.0
Total	**40**	**100.0**	**1**	**100.0**	**41**	**100.0**

TABLE 8.20 Agricultural fatalities due to failed hydraulics or improper blocking 1990-2000, by circumstance (41 deaths)

Circumstances of Injury Event	No.	%
Jacks or blocking devices failed or slipped or blocking absent during maintenance activities	14	34.1
Hydraulic failure during repairs to hydraulics, blocking absent or failed	13	31.7
Accidental tripping of hydraulic lever during machine operation (most often initiated by caught clothing)	4	9.8
Hydraulic failure during operation of equipment	4	9.8
Unspecified	6	14.6
Total:	**41**	**100.0**

FIGURE 8.8 Agricultural fatalities due to failed hydraulics or improper blocking 1990-2000, by machine type (41 deaths*)

36.6% of these types of fatalities involved repair work on trucks or cars. Tractors, FELs, ploughs, and harvesters were cited in two or more fatalities. There was one case each of a crush due to a mower, baler, trailer, combine, loader, bale picker, hoist, post pounder, grain bin, and unspecified "farm equipment".



*Machines involved in one fatality were not included in the figure.

8.11 STRUCK BY FALLING, COLLAPSING OR PROPELLED MATERIAL

"Struck by" injuries often result in death due to a fatal blow to the head or a crush injury where the victim is asphyxiated by heavy material lying on top of him or her. 39.8 % of these fatalities occurred when victims were cutting trees and branches or moving logs. Falling round hay bales caused another 20.5% of the fatalities. Guidelines for the safe moving and storage of large round bales should be developed and publicized.

Although a relatively small proportion of these fatalities involved children, they are particularly at risk for being trapped beneath heavy materials that fall on them while they play or climb. Safe storage of such materials can be difficult, so small children should not have access to the agricultural work site.

TABLE 8.21 Agricultural fatalities due being struck by falling, collapsing or propelled material, by age and sex, 1990-2000 (83 deaths, 6.6% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	6	8.0	1	14.3	7	8.5
15-59	37	49.3	4	57.1	41	50.0
60+	32	42.7	2	28.6	34	41.5
Total	**75***	**100.0**	**7**	**10.00**	**83**	**100.0**

* No age was specified for one male.

TABLE 8.22 Agricultural fatalities due to being struck by falling, collapsing or propelled material, by object, 1990-2000 (83 deaths)

Object Victim Struck By	No.	%
Tree, branch or log	33	39.8
Large bale	17	20.5
Collapsing building or structure	8	9.6
Object propelled by machine	4	4.8
Heavy machine (not under power)	2	2.4
Other object	19	22.9
Total	**83**	**100.0**

8.12 FALLS FROM HEIGHT

Falls from machinery are the most frequent type of fatal fall. 72.3% of the falls were due to operators or passengers of agricultural machinery being jolted from the machinery because of uneven ground or sudden maneuvers, or being knocked off the machinery by branches. The use of seatbelts would have prevented many of these fatalities.

21.2% of the falls from height fatalities were attributed to falls from ladders and building lofts or roofs. These fatalities could be reduced through the use of safety cables when working at heights and by securing ladders and scaffolding properly.

TABLE 8.23 Agricultural fatalities due to falls from height, 1990-2000, by age and sex (141 deaths, 11.2% of total fatalities)

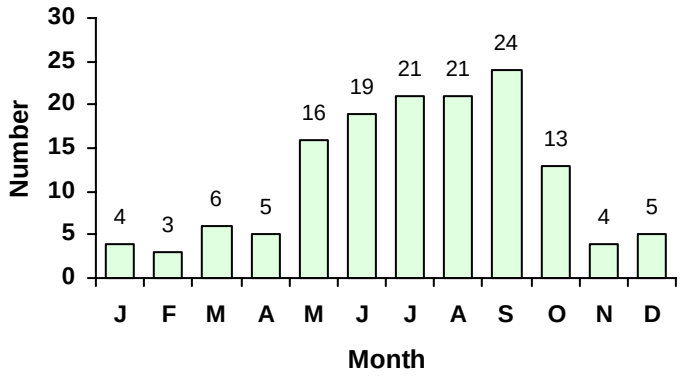
Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	30	23.8	5	33.3	35	24.8
15-59	43	34.1	6	40.0	49	34.8
60+	53	42.1	4	26.7	57	40.4
Total	**126**	**100.0**	**15**	**100.0**	**141**	**100.0**

TABLE 8.24 Agricultural fatalities due to falls from height, 1990-2000, by location victim fell from (141 deaths)

Location	No.	%
Tractor, wagon, truck, agricultural machine	102	72.3
Barn roof, loft	15	10.6
Ladder, scaffold	10	7.1
Bale stack	4	2.8
Other farm building	5	3.6
Other	5	3.6
Total:	**141**	**100.0**

Falls from Height were more frequent in the warmer months of May to September.

FIGURE 8.9 Agricultural fatalities due to falls from height, 1990-2000, by month (141 deaths)



8.13 ANIMAL-RELATED

Females accounted for 20.8% of animal-related fatalities. This represents the highest female to male ratio among all patterns of agricultural injury. Most of the victims of animal-related fatal injury events were males in the oldest age group. They were involved in 45.5% of the fatalities.

Most often, the victims were engaged in the routine care of large animals, or were riding a horse or working in the vicinity of a bull. In seven of the bull attack cases, the victim was engaged in routine animal care tasks near a bull. The other bull attacks appeared to be unprovoked.

Relatively few children were killed in animal-related activities. Of the eleven victims aged 14 and under, nine were killed by horses and two by dogs. Among the persons killed in events involving bulls, nearly two thirds were men 60 years and older.

37.7% of the animal-related deaths were due to horses, 32.5% involved bulls and 19.5% were caused by cows. Of the horse-related fatalities, ten were caused by apparently unprovoked kicks.

TABLE 8.25 Agricultural fatalities involving animals, 1990-2000, by age and sex (77 deaths, 6.1% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	7	11.5	4	25.0	11	14.3
15-59	19	31.1	8	50.0	27	35.1
60+	35	57.4	4	25.0	39	50.6
Total	**61**	**100.0**	**16**	**100.0**	**77**	**100.0**

TABLE 8.26 Agricultural fatalities involving animals, 1990-2000, by task or activity (77 deaths)

Animal Related Task	No.	%
Riding, walking, routine care of horses	24	31.1
Working with a bull, or with other animals near a bull	23	29.9
Routine care of animals other than horses	9	11.7
Bystander in work area, or child playing	7	9.1
Calving	4	5.2
Herding	3	3.9
Other	7	9.1
Total:	**77**	**100.0**

TABLE 8.27 Agricultural fatalities involving animals, 1990-2000, by type of animal and age group (77 deaths)

Type of Animal	Age group		
	0 – 14 yrs	15 – 59 yrs	60+ yrs
Horse	9	11	9
Bull	--	9	16
Cow/cattle	--	1	14
Pig	--	2	--
Dog	2	--	--
Other	--	4	--
Total:	**11**	**27**	**39**

8.14 DROWNING (ALL CAUSES)

47.8% of drowning victims were aged 19 or under. Twenty-one children under age six drowned because they fell into a water hazard, often while their parents were engaged in work tasks. There were three cases of multiple drowning events involving children, where siblings had drowned trying to rescue one another. Small children must not be left unattended near agricultural water hazards. The use of fenced play areas for children under six would have prevented many of these drownings.

Ponds and dugouts were the location of 37.7% of the drowning events.

Most of the adults drowned when their vehicle left a road or field and became overturned or submersed in water.

TABLE 8.28 Agricultural fatalities due to drowning, 1990-2000, by age and sex (69 deaths, 5.5% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	24	41.4	4	36.4	28	40.6
15-59	22	37.9	5	45.4	27	39.1
60+	12	20.7	2	18.2	14	20.3
Total	**58**	**100.0**	**11**	**100.0**	**69**	**100.0**

TABLE 8.29 Agricultural fatalities due to drowning, 1990-2000, by location of drowning event (69 deaths)

Location of Drowning Event	Age group		
	< 10 yrs	10-19 yrs	Adults
Farm pond or dugout	12	4	10
Manure lagoon or sewage pit	4	--	1
Cistern or water trough	4	--	2
River, stream, brook	1	2	10
Lake	1	--	1
Swamp, bog	--	--	1
Irrigation ditch	2	--	6
Falling through ice (any water)	2	1	3
Other	--	--	2
Total:	**26**	**7**	**36**

8.15 FIRE OR EXPLOSION (ALL TYPES)

Several of the fatal fires were caused by very unsafe work practices such as welding fuel tanks and using flammable liquids to start fires.

20% of the deaths were caused when grass or stubble fires burned out of control. At least five of those fires were set deliberately. There is a need to develop and publicize guidelines for safe welding procedures and for the planning and management of controlled burns.

TABLE 8.30 **Agricultural fatalities due to fire and explosion, 1990-2000, by age and sex (35 deaths, 2.8% of total fatalities)**

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	1	3.0	1	100	2	5.7
15-59	20	58.8	--	--	20	57.1
60+	13	38.2	--	--	13	37.2
Total	**34**	**100.0**	**1**	**100.0**	**35**	**100.0**

FIGURE 8.31 **Agricultural fatalities due to fire and explosion 1990-2000, by circumstance (35 deaths)**

Circumstances of Fire or Explosion	No.	%
Using flammable liquids	8	23.0
Grass or stubble fire	7	20.0
Barn fire	7	20.0
Welding	4	11.5
Explosion with fire (gas storage tanks)	4	11.5
Machinery or equipment fire	3	8.5
Other	2	5.7
Total:	**35**	**100.0**

8.16 WOODCUTTING OR FORESTRY

Dragging or pulling stumps and logs caused 32.8% of the fatal injuries. In these injury events, attaching a tow chain or rope too high on a tractor and/or attempting to pull a load that was too heavy for a tractor caused a backwards rollover to occur.

In several cases a tree falling in an unexpected direction either struck the victim directly (28.4%), or was caught up on another tree. In the latter case, attempts to dislodge the tree resulted in it striking the victim (22.4%). Moving a log with a tractor, generally when the log was hung up on another tree, sometimes caused the log to fall on the driver or another worker. Wearing protective helmets while tree cutting would help to prevent head injuries or reduce their severity.

Front-end loader related injuries were caused by a log rolling back onto the operator. Front-end loaders should not be used for moving loads larger than the bucket. Loads must be balanced evenly and secured.

TABLE 8.32 Agricultural fatalities involving woodcutting or forestry, 1990-2000, by age and sex (45 deaths, 3.6% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	--	--	--	--	--	--
15-59	35	53.8	2	100.0	37	55.2
60+	30	46.2	--	--	30	44.8
Total	**65**	**100.0**	**2**	**100.0**	**67**	**100.0**

TABLE 8.33 Agricultural fatalities involving woodcutting or forestry, 1990-2000, by circumstance (45 deaths)

Circumstance of Woodcutting Injury Event	No.	%
Pulling/dragging logs or stumps (backwards rollovers)	22	32.8
Direct blow from tree or branch	19	28.4
Cut tree or branch hung up then fell with attempts to dislodge it	15	22.4
Moving log with tractor	8	11.9
Moving log with front end loader	3	4.5
Total	**67**	**100.0**

8.17 CONTACT WITH OVERHEAD POWER LINES

Moving elevated grain augers under overhead power lines caused 47.4% of electrocutions due to contact with overhead wires. These injuries would be prevented if augers were always lowered prior to being moved. Unloading or carrying pipes and other long metal objects caused a further 31.6% of electrocutions by overhead lines. In recent years, many power companies have assisted in injury control efforts by providing programs to relocate high voltage overhead power lines underground in farmyards.

TABLE 8.34 Agricultural fatalities due to contact with overhead power lines, 1990-2000, by age and sex (19 deaths, 1.5% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	--	--	--	--	--	--
15-59	15	83.3	1	100.0	16	84.2
60+	3	16.7	--	--	3	15.8
Total	**18**	**100.0**	**1**	**100.0**	**19**	**100.0**

TABLE 8.35 Agricultural fatalities due to contact with overhead power lines 1990-2000, by mechanism of contact (19 deaths)

Mechanism of Contact	No.	%
Moving grain auger	9	47.4
Moving, unloading pipe	3	15.8
Moving ladders, scaffolding, telescoping broom	3	15.8
Operating crane, boom	3	15.8
Kite	1	5.2
Total	**19**	**100.0**

8.18 EXPOSURE TO TOXIC OR CAUSTIC SUBSTANCES

97.6% of the persons who died from exposure to toxic substances were male. Exposure to highly poisonous hydrogen sulfide gas caused 43.9% of the deaths attributed to toxic environments. The development of large-scale “factory farm” livestock operations may increase the risk of exposure to hydrogen sulfide, which can reach dangerous concentrations near manure and sewage storage areas. Fatalities have also occurred in barns and manure pits on small farms. All structures where manure and sewage are stored should be ventilated adequately. Confined space entry procedures should be followed by anyone accessing those types of structures.

TABLE 8.36 Agricultural fatalities due to toxic or caustic substances, 1990-2000, by age and sex (41 deaths, 3.3% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	--	--	--	--	--	--
15-59	34	85.0	1	100.0	35	85.4
60+	6	15.0	--	--	6	14.6
Total	**40**	**100.0**	**1**	**100.0**	**41**	**100.0**

Among the fatalities caused by hydrogen sulfide poisoning, there have been four instances of multiple deaths. More than half of the fatalities occurred on hog farms. Almost all the hydrogen sulfide fatalities were associated with improper ventilation during the routine maintenance of sewers, manure pits and tanks. Victims typically lost consciousness and collapsed when they were overcome by fumes, then they either drowned or stopped breathing. Of the eighteen victims, eight were killed during rescue attempts. A safety harness should be worn by anyone who enters a sewer, pit or tank where there might be a high concentration of hydrogen sulfide.

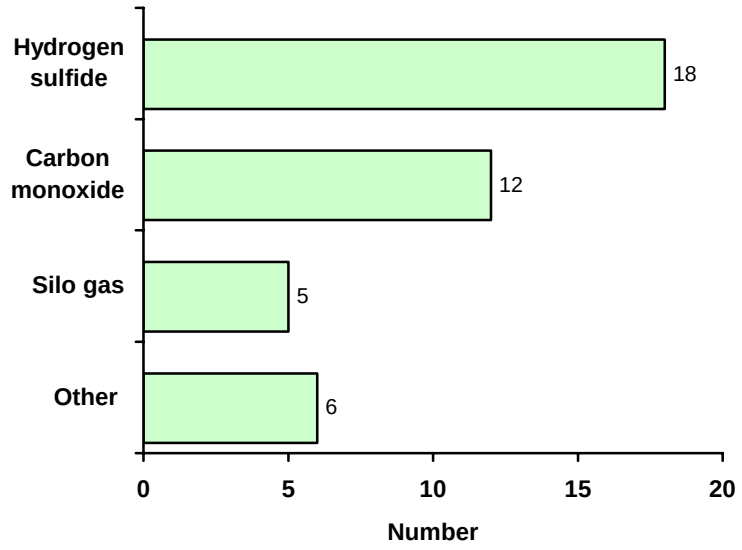
Exposure to carbon monoxide gas accounted for 29.3% of the deaths due to toxic substances. Combustion engines should never be run in confined spaces without adequate ventilation.

Silo gas, which caused 12.2% of the deaths, accumulates and reaches dangerous concentrations when silage ferments in poorly ventilated silos. Silos should be ventilated adequately and workers should be trained in proper silage handling procedures.

TABLE 8.37 Agricultural fatalities due to toxic or caustic substances, 1990-2000, by location (41 deaths)

Location of Injury Event	No.	%
Manure pit, sewage pit or pipe, inspection hole	13	31.7
Farm machine shed	7	17.1
Grain bin, silo	5	12.2
Manure tank on truck	3	7.3
Field	4	9.8
Barn	3	7.3
Other, unknown	6	14.6
Total:	**41**	**100.0**

FIGURE 8.10 Agricultural fatalities due to toxic or caustic substances, 1990-2000, by toxic agent (41 deaths)



8.19 SUFFOCATION OR ASPHYXIATION BY GRAIN

Eleven out of twelve persons who suffocated in grain were male. Typically, suffocation occurred when the victim fell and sank into grain stored in a bulk container or silo.

Adult workers need to be informed of appropriate safety procedures around bulk stores of grain. More than half of the adult victims sank down into the grain while trying to loosen a blockage in the grain flow or while trying to level the grain. It is also important to keep young children out of grain storage areas.

TABLE 8.38 Suffocation or asphyxiation by grain, 1990-2000, by age and sex (12 deaths, 1.0% of total fatalities)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	1	9.1	--	--	1	8.3
15-59	6	54.5	1	100.0	7	58.3
60+	4	36.4	--	--	4	33.4
Total	**11**	**100.0**	**1**	**100.0**	**12**	**100.0**

8.20 SUFFOCATION OR ASPHYXIATION BY SOIL

All but one of the suffocations by soil involved a trench collapse. All of the victims were male. Trench collapse fatalities could be avoided if standard safety practices were followed for shoring up the walls of trenches. The buddy system should always be used when digging trenches.

TABLE 8.39 Suffocation or asphyxiation by soil, 1990-2000, by age and sex (13 deaths, 1.0% of total fatalities*)

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-14	--	--	--	--	--	--
15-59	11	91.7	--	--	11	91.7
60+	1	8.3	--	--	1	8.3
Total	**12***	**100.0**	**--**	**--**	**12***	**100.0**

*The age of one male victim was unavailable.

9 Hospitalized Agricultural Injuries: Overview

9.1 AGE

Estimated rates of injury generally increased with increasing age. Persons in the older age groups (20-80+) were over-represented in sustaining hospitalized injuries relative to their proportion of the general farm population. This was especially true for older adults. The percentage of adults 70 and over who were injured was more than double the percentage of adults aged 70 and over in the farm population.

TABLE 9.1 Hospitalized agricultural injuries, by age group, April 1990-March 2000 (14,987 cases)

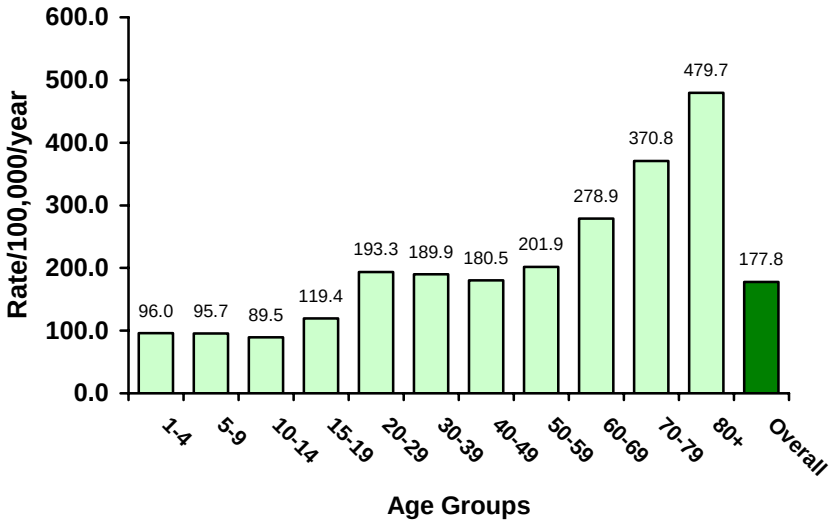
Age Group	Hospitalizations						Farm Population*		Rates/ 100,000/ yr
	Total		Machine-related		Non Machine-Related				
	No.	%	No.	%	No.	%	No.	%	
1-4	416	2.8	193	2.7	223	2.8	43,315	5.1	96.0
5-9	680	4.5	295	4.2	385	4.8	71,035	8.4	95.7
10-14	752	5.0	337	4.8	415	5.2	84,025	10.0	89.5
15-19	961	6.4	511	7.3	450	5.7	80,455	9.6	119.4
20-29	1,561	10.4	735	10.4	826	10.4	80,775	9.6	193.3
30-39	2,302	15.4	1,010	14.3	1,292	16.3	121,230	14.3	189.9
40-49	2,516	16.8	1,110	15.8	1,406	17.7	139,425	16.6	180.5
50-59	2,224	14.8	1,039	14.8	1,185	14.9	110,135	13.1	201.9
60-69	2,053	13.7	1,045	14.8	1,008	12.7	73,620	8.7	278.9
70-79	1,143	7.6	604	8.6	539	6.8	30,825	3.7	370.8
80+	372	2.5	162	2.3	210	2.6	7,755	0.9	479.7
Total	**14,980**	**100**	**7,041**	**100**	**7,939**	**100**	**842,595**[+]	**100**	**177.8**

* Statistics Canada, Census of Agriculture, 1996
[+] Does not include children less than a year old.

9.2 RATES

Estimated rates of injury generally increased with increasing age. Persons 70 and over were at highest risk for sustaining hospitalized agricultural injuries.

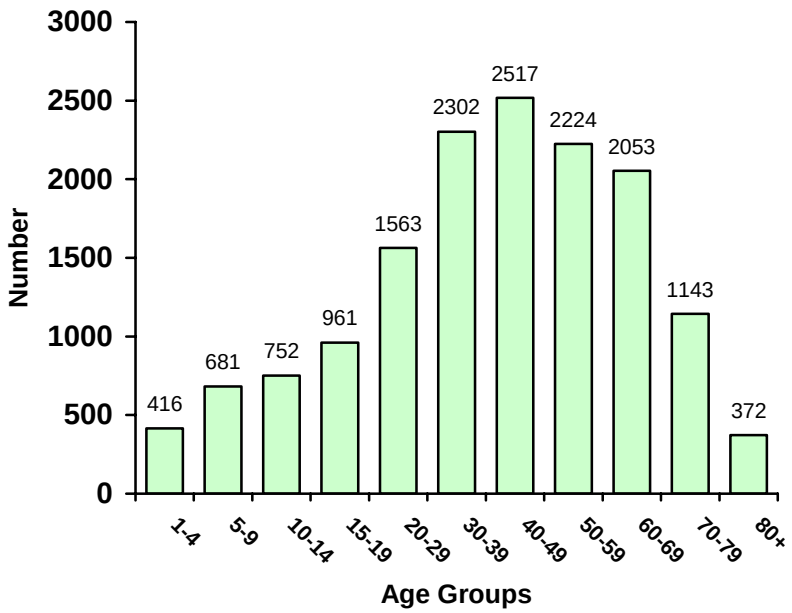
FIGURE 9.1 Rates (per 100,000 farm population per year) of hospitalized agricultural injuries by age group, April 1990-March 2000 (14,987 cases)



9.3 COUNTS

Persons in all age groups experienced hospitalized farm injuries. 81.3% of those injured were adults aged 20 and older.

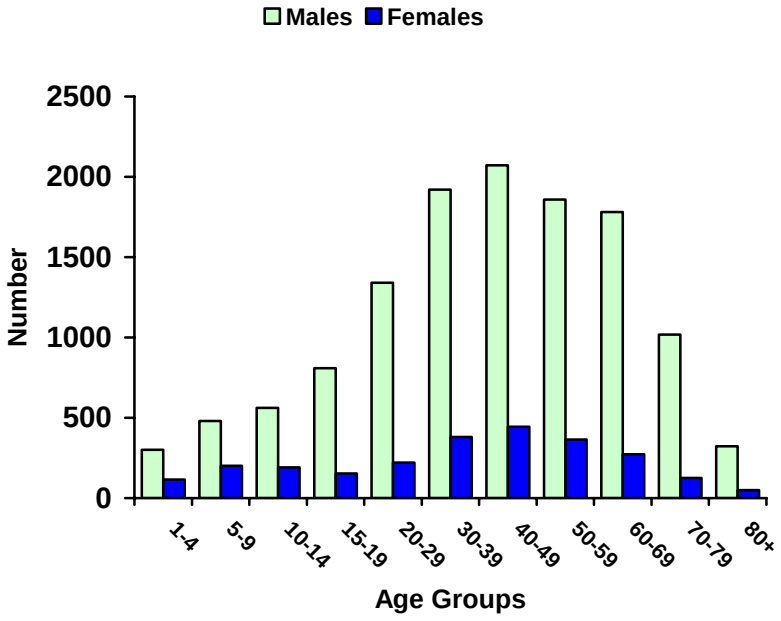
FIGURE 9.2 **Number of hospitalized agricultural injuries, by age group, April 1990-March 2000 (14,987 cases)**



9.4 AGE AND GENDER

The vast majority of hospitalized farm injuries involved males of all ages. The ratio of male injuries to female injuries generally increased with increasing age. These ratios varied from a low of 2.4:1 among children 5-9 years to a high of 8.1:1 among adults 70- 79 years.

FIGURE 9.3 **Hospitalized agricultural injuries, by age and gender, April 1990-March 2000 (14,987 cases)**

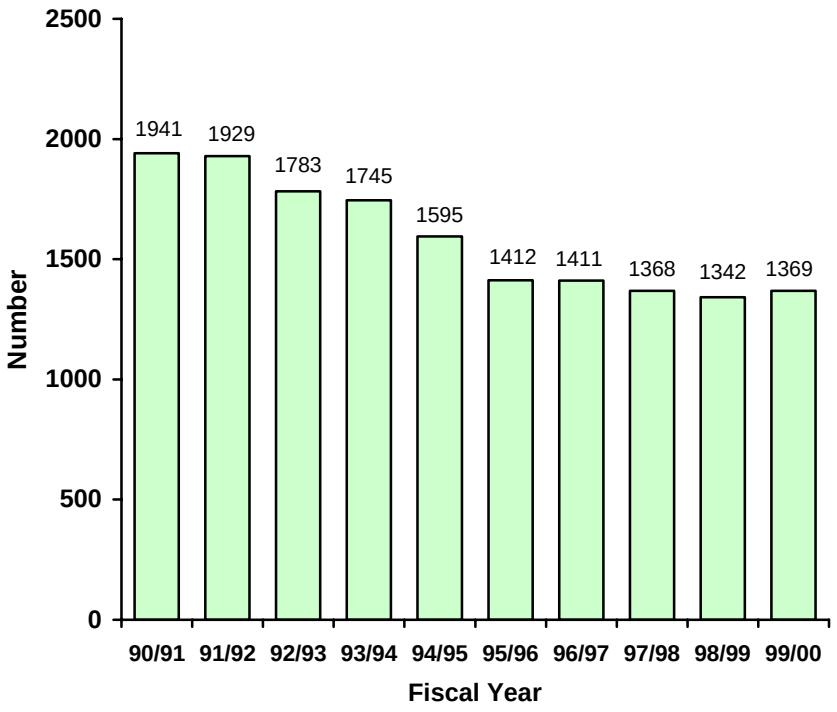


9.5 YEAR

There was a gradual decline in the annual number of farm injuries treated in Canadian hospitals between 1990 and 1996. This trend could be attributed, in part, to a reduction in the proportion of injured persons admitted to hospital relative to the proportion of injured persons who were treated and released.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 414) and for Nova Scotia from April 1, 1997 to March 31, 2000 (n = 27). Imputed values are not included in the total number of cases.

FIGURE 9.4 **Hospitalized agricultural injuries, by fiscal year, April 1990-March 2000 (14,987 cases)**



9.6 AGE AND FISCAL YEAR

The percentage of children (1-14 years) sustaining hospitalized injuries each year, relative to the total number of annual hospitalized injuries, declined over the surveillance period. In contrast, the percentage of adults 60+ injured each year, relative to the total number of annual hospitalized injuries, increased.

TABLE 9.2 **Hospitalized agricultural injuries, by fiscal year and age group, April 1990-March 2000 (14,987 cases)**

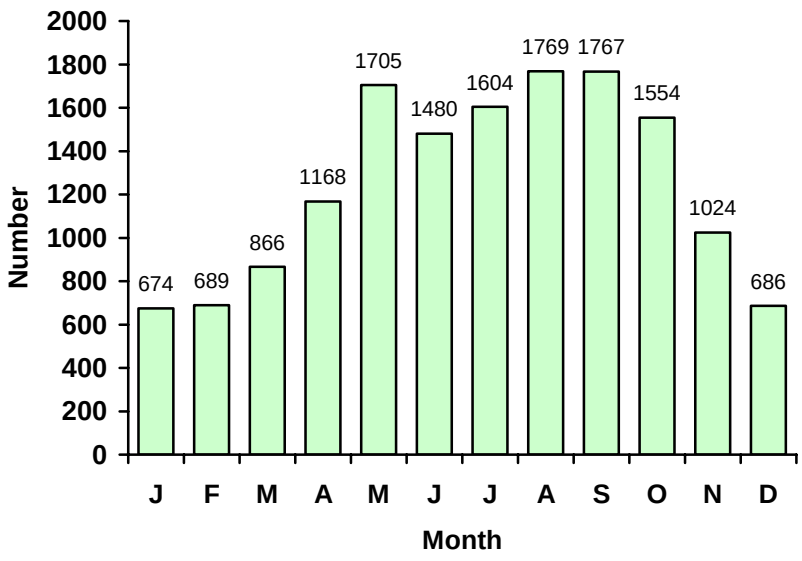
Number and Percentage of Hospitalizations by Fiscal Year

	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00
Age Group										
1-14	309 15.9	255 13.2	231 13.0	201 11.5	175 11.0	186 13.2	171 12.1	136 10.2	94 10.4	91 9.8
15–59	1,230 63.4	1,252 64.9	1,156 64.8	1,138 65.2	1,047 65.6	871 61.6	861 61.0	862 64.3	568 63.0	581 62.6
60+	402 20.7	422 21.9	396 22.2	406 23.3	373 23.4	355 25.1	379 26.9	340 25.4	239 26.5	256 27.6
Total Number	1,941	1,929	1,783	1,745	1,595	1,412	1,411	1,338	901	928

9.7 MONTH

The monthly distribution of agricultural injuries reflects seasonal changes in the volume of work on Canadian farms and ranches. The largest numbers of hospitalized injuries occurred between April and October.

FIGURE 9.5 **Hospitalized agricultural injuries, by month, April 1990-March 2000 (14,987 cases)**



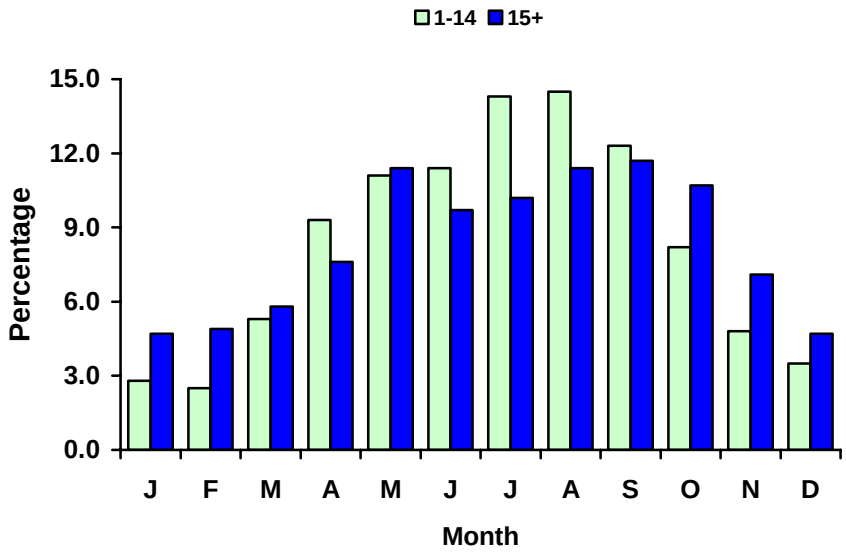
9.8 AGE AND MONTH

There were more injuries to children aged 14 and under during the warmer months, when they were more likely to be engaged in outdoor activities.

The number of injuries to persons aged 15 and older tended to peak during the planting and harvesting seasons.

In this graph, injuries are expressed as percentages within the two age groups. It should be noted that there were 8.1 times as many injuries to persons aged 15 and older as there were to children aged 14 and under.

FIGURE 9.6 **Percentage of hospitalized agricultural injuries, by age group and month, April 1990-March 2000 (14,987 cases)**



9.9 PRIMARY DIAGNOSIS

TABLE 9.3 **Hospitalized agricultural injuries, by primary diagnosis and age group, April 1990-March 2000 (14,987 cases)**

Diagnostic Code*	Description of Diagnostic Code	Total (%)	Age Group		
			1-14	15-59	60+
			Percentage of Age Group Total		
800-804	Fracture: skull	547 (3.7)	6.4	3.7	2.2
805-809	Fracture: spine and trunk	1,319 (8.8)	2.8	8.1	13.8
810-819	Fracture: upper limb	1,984 (13.2)	20.2	13.3	9.4
820-829	Fracture: lower limb	2,317 (15.5)	11.8	14.9	19.0
830-839	Dislocation	394 (2.6)	0.8	3.1	2.3
840-848	Sprains / strains of joints and adjacent muscles	618 (4.1)	0.4	4.8	4.4
850-854	Intracranial injury, excl. those with skull fracture	896 (6.0)	13.2	5.1	4.7
860-869	Internal injury of chest, pelvis, and abdomen	505 (3.4)	3.1	3.1	4.1
870-879	Open wound: head, neck, and trunk	411 (2.7)	5.1	2.5	2.2
880-887	Open wound: upper limb	1,361 (9.1)	6.7	9.9	8.3
890-897	Open wound: lower limb	603 (4.0)	4.7	4.4	2.7
900-904	Injury to blood vessels	40 (0.3)	0.2	0.3	0.3
910-919	Superficial injury	108 (0.7)	1.1	0.7	0.6
920-924	Contusion with intact skin surface	749 (5.0)	4.4	4.9	5.5
925-929	Crushing injury	344 (2.3)	1.9	2.5	1.8
940-949	Burns	368 (2.5)	3.5	2.5	1.7
950-957	Injury to nerves and spinal cord	96 (0.6)	0.4	0.7	0.7
958-959	Traumatic complications and unspecified injuries	591 (3.9)	3.4	3.9	4.3
	Other	1,622 (10.8)	9.2	11.0	11.3
	Missing	111(0.74)	0.7	0.7	0.8
	%	**100.0**	**100.0**	**100.0**	**100.0**
	Total number of cases	**14,984**	**1,849**	**9,567**	**3,568**

*Based on the nature of injury code from: World Health Organization. Manual of the International Classification of Diseases, Injuries, and Causes of Death [9th Revision]. Geneva, Switzerland, 1977.

Leading diagnoses observed in children were upper limb fractures, intracranial injuries (internal injuries to the head) and lower limb fractures. Leading diagnoses in the adult age groups were fractures of the lower limbs, open wounds to the upper limbs, fractures of the upper limbs in 15-59 year olds, and fractures of the spine and trunk in adults aged 60 and over.

9.10 LENGTH OF STAY IN HOSPITAL

TABLE 9.4 Hospitalized agricultural injuries, by primary diagnosis and total length of hospital stay, April 1990-March 2000 (14,987 cases)

Diagnostic Code*	Description of Diagnostic Code	Length of Stay (days)		
		Median	Mean	Standard Deviation
805-809	Fracture: spine and trunk	6	10.5	19.2
860-869	Internal injury of chest, pelvis, and abdomen	5	7.5	8.6
900-904	Injury to blood vessels	5	6.3	8.1
820-829	Fracture: lower limb	4	7.5	11.0
890-897	Open wound: lower limb	4	8.5	14.4
940-949	Burns	4	9.9	18.2
800-804	Fracture: skull	3	5.6	10.7
925-929	Crushing injury	3	6.8	10.8
958-959	Certain traumatic complications and unspecified injuries	3	6.6	15.5
810-819	Fracture: upper limb	2	3.5	5.4
840-848	Sprains / strains of joints and adjacent muscles	2	3.6	3.7
870-879	Open wound: head, neck, and trunk	2	3.6	4.8
880-887	Open wound: upper limb	2	4.3	6.6
910-919	Superficial injury	2	3.9	5.5
920-924	Contusion with intact skin surface	2	3.2	3.7
950-957	Injury to nerves and spinal cord	2	5.6	10.9
830-839	Dislocation	1	3.7	7.6
850-854	Intracranial injury, excl. those with skull fracture	1	2.7	6.2
	Other / missing	2	6.5	15.8
	Overall	**3**	**5.9**	**11.6**

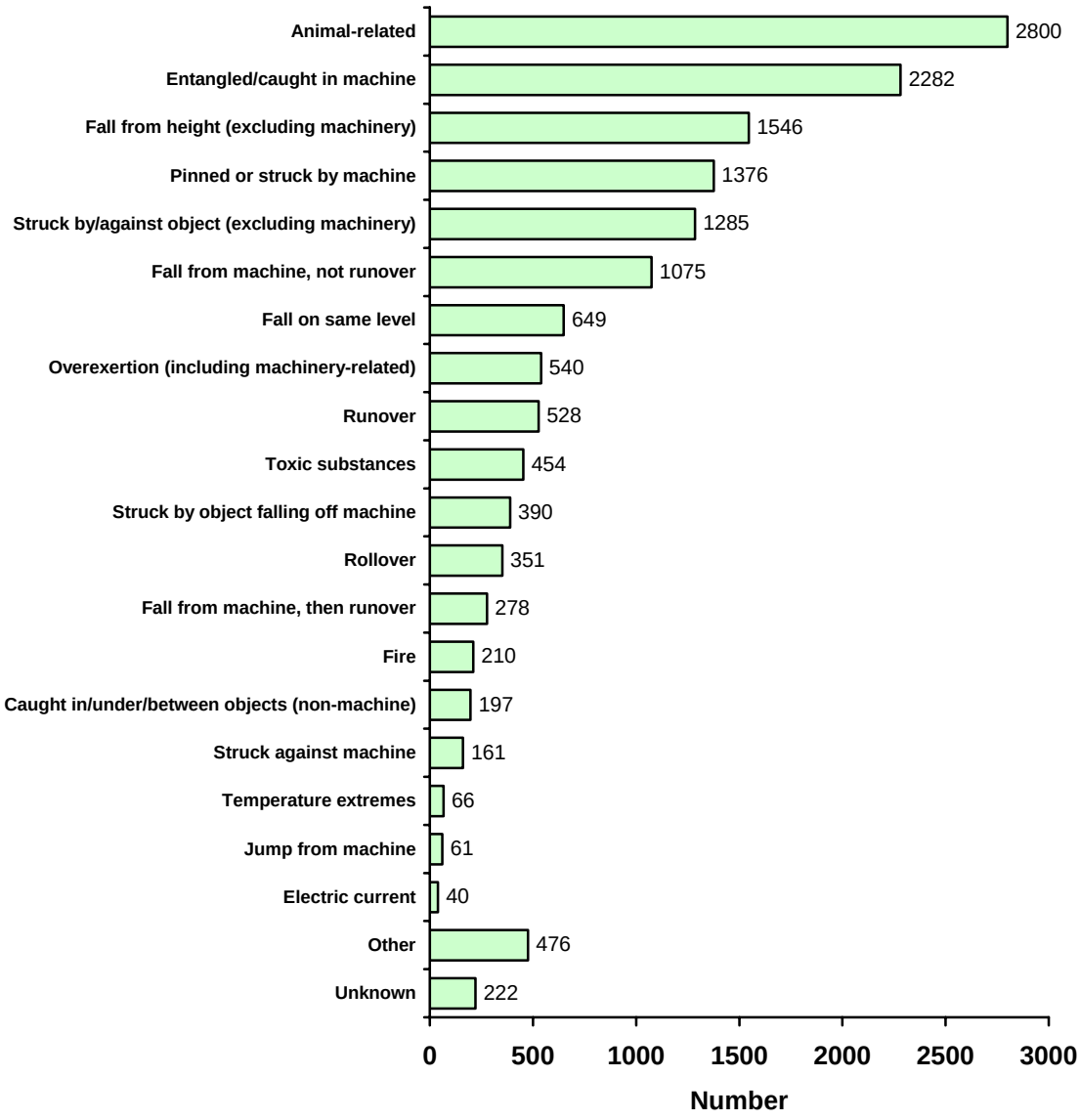
* Based on the nature of injury code from: World Health Organization. Manual of the International Classification of Diseases, Injuries, and Causes of Death [9th Revision]. Geneva, Switzerland, 1977.
**Length of stay includes subsequent admissions for the treatment of the incident injury.

Median lengths of stay in hospital varied by primary diagnosis. The diagnoses associated with the longest median stays in hospital were spine and truncal fractures, internal injuries and injuries to blood vessels.

For these data, the median is a better indicator of central tendency than the mean, because the mean is weighted by a small number of very long hospital stays.

9.11 CAUSE OF INJURY

FIGURE 9.7 **Hospitalized agricultural injuries, by cause of injury, April 1990-March 2000 (14,987 cases)**



The leading cause of hospitalized agricultural injuries was animal related trauma, which accounted for 18.7% of all hospitalized injuries. Other leading causes of injury were being entangled or caught in machinery, falls from a height (not machine related), being pinned or struck by machinery, and being struck by or against a non-machine object.

Note: non-machinery causes of farm injury are likely to be underestimated because of the optional use of location of injury codes in some provinces (section 2.2.3).

10 HOSPITALIZED AGRICULTURAL MACHINE-RELATED INJURIES: OVERVIEW

10.1 AGE

Disproportionately high estimated rates of injury were observed in persons aged 60 and over.

Machine-related injury rates for children are higher than expected given that few children under 15 participate in farm work.

TABLE 10.1 **Hospitalized agricultural machinery injuries, by age group, April 1990-March 2000 (7,043 cases)**

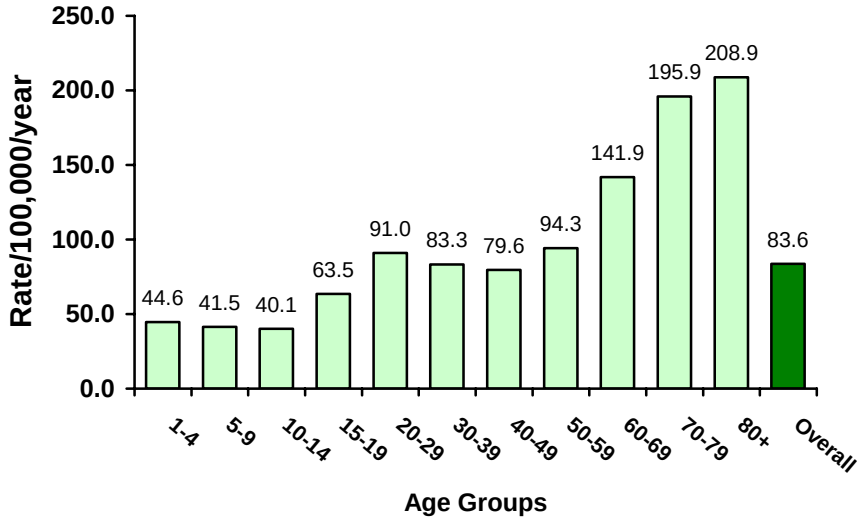
Age Group	Hospitalizations		Farm Population*		Rates per 100,000/year
	No.	%	No.	%	
1-4	193	2.7	43,315	5.1	44.6
5-9	295	4.2	71,035	8.4	41.5
10-14	337	4.8	84,025	10.0	40.1
15-19	511	7.3	80,455	9.6	63.5
20-29	735	10.4	80,775	9.6	91.0
30-39	1,010	14.3	121,230	14.3	83.3
40-49	1,110	15.8	139,425	16.6	79.6
50-59	1,039	14.8	110,135	13.1	94.3
60-69	1,045	14.8	73,620	8.7	141.9
70-79	604	8.6	30,825	3.7	195.9
80+	162	2.3	7,755	0.9	208.9
Total	**7,043**	**100.0**	**842,595**[+]	**100.0**	**83.6**

*Statistics Canada, Census of Agriculture, 1996
[+]Does not include children less than a year old.

10.2 RATES

Very high estimated rates of machine-related injury were observed among persons 60 and over.

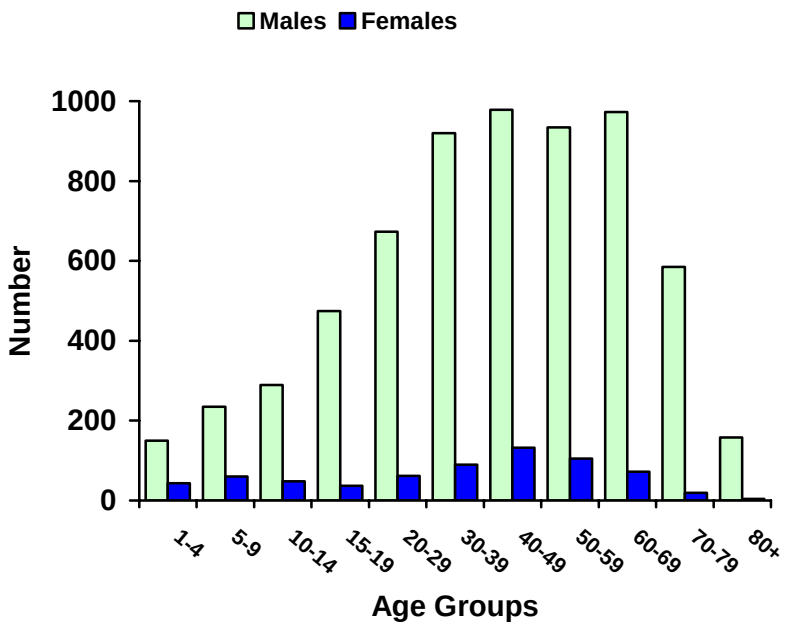
FIGURE 10.1 **Estimated rates (per 100,000 farm population per year) of hospitalized agricultural machinery injuries, by age group, April 1990-March 2000 (7,043 cases)**



10.3 AGE AND GENDER

In all age groups, machine-related injuries to males far exceeded machine-related injuries to females. The lowest ratio of males:females injured was about 3.5:1 (m:f), among children younger than five years old. The higher injury rates among males probably reflect the greater exposure of males to agricultural machinery hazards.

FIGURE 10.2 **Hospitalized agricultural machinery injuries, by age and gender, April 1990-March 2000 (7,043 cases)**

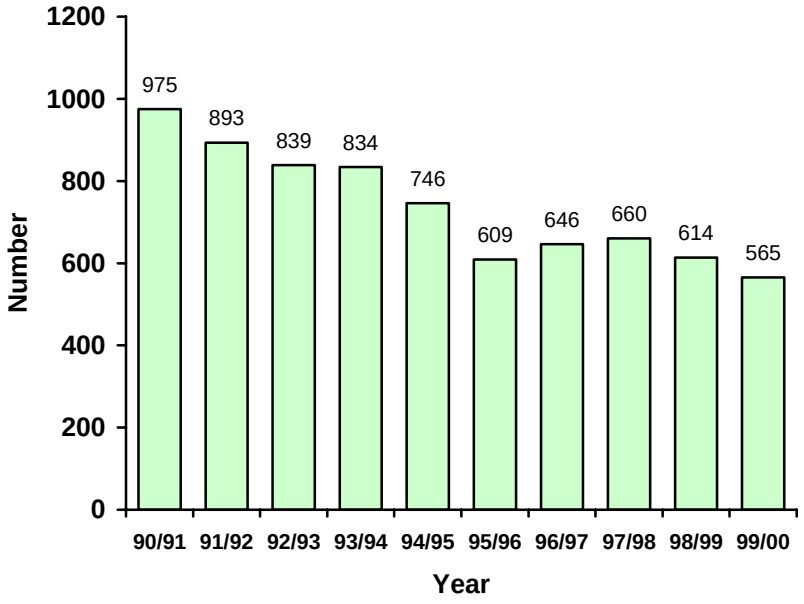


10.4 YEAR

There was a downward trend in the annual number of farm machinery injuries treated in Canadian hospitals, particularly between 1990 and 1995. Though this trend may reflect some reduction in injury rates, it must also be attributed to changes in hospital admission practices. Injured persons who would have been admitted for overnight observation in 1990 were more likely to be treated and released in 2000

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 151) and for Nova Scotia from April 1, 1997 to March 31, 2000 (n = 12). Imputed values are not included in the total number of cases.

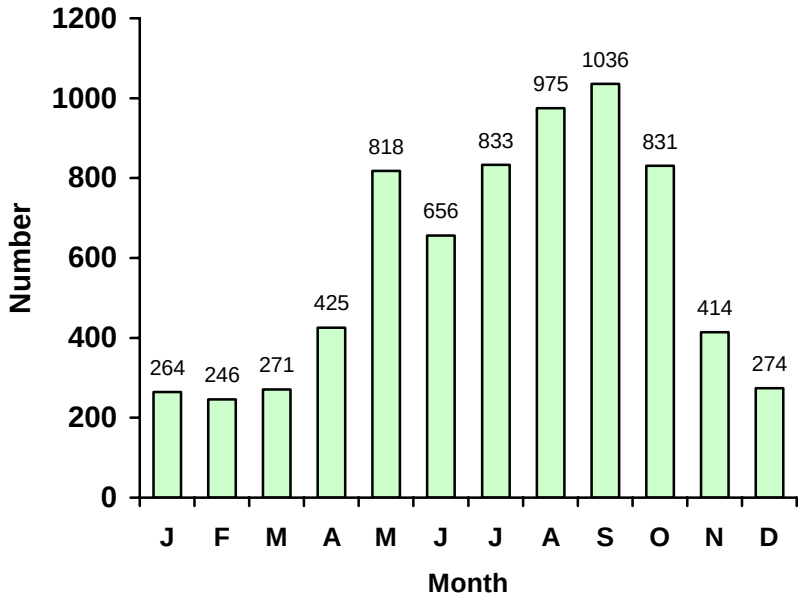
FIGURE 10.3 **Hospitalized agricultural machinery injuries, by fiscal year, April 1990-March 2000 (7,043 cases)**



10.5 MONTH

The monthly distribution of farm machinery injuries follows seasonal changes in production patterns on Canadian farms. Distinct peaks in hospital admissions occurred during planting and harvesting months.

FIGURE 10.4 **Hospitalized agricultural machinery injuries, by month, April 1990-March 2000 (7,043 cases)**



10.6 PROVINCIAL BREAKDOWN

In general, the provinces that had the highest numbers of farms and persons living on farms reported the greatest numbers of hospitalized machine-related agricultural injuries.

TABLE 10.2 **Hospitalized agricultural machinery injuries, by province, April 1990-March 2000 (7,043 cases)**

Province	Hospitalizations		Farms*		Farm Population*	
	No.	%	No.	%	No.	%
BC	509	7.2	20,290	8.2	68,100	8.1
AB	1,565	22.2	53,652	21.7	186,260	22.1
SK	1,493	21.2	50,598	20.5	144,265	17.1
MB	699	9.9	21,071	8.5	78,900	9.4
ON	1,442	20.5	59,728	24.2	219,065	26.0
QC	945	13.4	32,139	13.0	113,385	13.5
NB	253	3.6	3,034	1.3	10,240	1.2
NS	74	1.1	3,923	1.6	12,960	1.5
PE	63	0.9	1,845	0.7	7,745	0.9
NL	**		643	0.2	1,675	0.2
Canada	**7,043**	**100.0**	**246,923**	**100.0**	**842,595**[+]	**100.0**

*Statistics Canada, Census of Agriculture, 1996
**Not available.
[+]Does not include children less than a year old.

10.7 PRIMARY DIAGNOSIS

TABLE 10.3 Hospitalized agricultural machinery injuries, by primary diagnosis and age group, April 1990-March 2000 (7,043 cases)

Diagnostic Code*	Description of Diagnostic Code	Total (%)	Age Group 1-14	15-59	60+
			Percentage of Age Group Total:		
800-804	Fracture: skull	168 (2.4)	4.6	2.3	1.7
805-809	Fracture: spine and trunk	618 (8.8)	4.5	7.5	13.9
810-819	Fracture: upper limb	1,116 (15.9)	19.0	17.0	11.5
820-829	Fracture: lower limb	1,039 (14.8)	15.5	14.7	14.6
830-839	Dislocation	135 (1.9)	0.8	2.1	1.9
840-848	Sprains / strains of joints and adjacent muscles	162 (2.3)	0.0	2.5	2.8
850-854	Intracranial injury, excl. those with skull fracture	265 (3.8)	7.6	3.4	3.0
860-869	Internal injury of chest, pelvis, and abdomen	250 (3.6)	4.0	3.0	4.7
870-879	Open wound: head, neck, and trunk	197 (2.8)	4.7	2.4	2.8
880-887	Open wound: upper limb	1,081 (15.4)	12.7	16.3	14.2
890-897	Open wound: lower limb	397 (5.6)	6.7	6.2	3.7
900-904	Injury to blood vessels	21 (0.3)	0.5	0.2	0.3
910-919	Superficial injury	44 (0.6)	1.3	0.5	0.6
920-924	Contusion with intact skin surface	331 (4.7)	5.0	4.4	5.2
925-929	Crushing injury	296 (4.2)	4.0	4.7	3.2
940-949	Burns	82 (1.2)	0.5	1.5	0.7
950-957	Injury to nerves and spinal cord	63 (0.9)	0.7	0.9	1.0
958-959	Certain traumatic complications and unspecified injuries	334 (4.7)	4.4	4.6	5.2
	Other	415 (5.9)	3.1	5.4	8.5
	Missing	27 (0.4)	0.2	0.3	0.6
	%	**100.0**	**100.0**	**100.0**	**100.0**
	Total number of cases	**7,041**	**825**	**4,405**	**1,811**

* Based on the nature of injury code from: World Health Organization. Manual of the International Classification of Diseases, Injuries, and Causes of Death [9th Revision]. Geneva, Switzerland, 1977.

Leading primary diagnoses in children were upper limb fractures, lower limb fractures, intracranial injuries (internal injuries to the head) and open wounds to the upper limbs. Leading diagnoses in the adult age groups were open wounds to the upper limbs, and fractures to the upper or lower limbs, spine or trunk. The proportions of injuries involving spine or trunk fractures, sprains/strains, and open wounds to the upper limbs increased with increasing age, whereas the proportions of injuries involving skull and upper limb fractures, intracranial injuries, and open wounds to the head and lower limbs decreased with increasing age. Burns were more common in the 15-59 year age group.

10.8 CAUSE OF INJURY AND AGE GROUP

TABLE 10.4 Hospitalized agricultural machinery injuries, by cause of injury and age group, April 1990-March 2000 (7,043 cases)

Cause of Injury	Total (%)	Age Group 1-14	15-59	60+
		Percentage of Age Group Total:		
Entangled / caught in machine	2,282 (32.4)	32.5	35.3	25.3
Pinned or struck by machine	1,376 (19.5)	14.7	21.0	18.1
Operator fell from machine, not runover	335 (4.8)	1.9	4.2	7.3
Passenger fell from machine, not runover	163 (2.3)	7.9	1.5	1.7
Unspecified person fell from machine, not runover	576 (8.2)	7.4	7.1	11.3
Runover of dismounted operator	193 (2.7)	0.4	2.2	5.1
Runover of dismounted passenger	11 (0.2)	0.6	0.1	0.1
Runover of bystander	118 (1.7)	5.8	1.0	1.4
Runover of unspecified person	205 (2.9)	3.9	2.6	3.3
Runover of operator who fell from machine	123 (1.7)	0.6	1.5	2.8
Runover of passenger who fell from machine	108 (1.5)	8.6	0.8	0.2
Runover of unspecified person who fell from machine	47 (0.7)	2.2	0.5	0.4
Struck by object falling from or propelled by machine	390 (5.5)	2.2	6.3	5.3
Rollover of machine	351 (5.0)	2.9	4.8	6.7
Collision	60 (0.9)	2.3	0.7	0.6
Overexertion	109 (1.5)	0.1	1.7	1.7
Jump from machine to another level	61 (0.9)	0.5	1.1	0.6
Struck against machine	161 (2.3)	1.7	2.1	3.0
Other	222 (3.2)	1.6	3.5	2.9
Unknown	150 (2.1)	2.3	2.0	2.3
%	**100.0**	**100.0**	**100.0**	**100.0**
Total number of cases	**7,043**	**827**	**4,405**	**1,811**

In all three age groups, the most common cause of hospitalized machine-related injury was being entangled/caught in machinery, followed by being pinned or struck by a machine. In children aged 14 and under, extra rider injuries (falls from machines with or without a subsequent runover) and bystander runovers were also important causes of injury. In persons aged 15 and over, falls from machines, being struck by an object falling from or propelled by a machine, and being involved in a rollover were the most frequent causes of injury. Rollovers, which are the leading cause of fatal farm injuries in Canada, are much less prevalent as a cause of hospitalized injuries. Tractor and other types of rollovers result in very severe injuries, so a far greater proportion of these events cause death compared with other causes of injury. There are only 1.3 hospitalized rollover injuries for every fatal rollover whereas there are 21.1 hospitalized entanglements for every fatal entanglement.

10.9 LENGTH OF STAY IN HOSPITAL

TABLE 10.5 Hospitalized machinery related agricultural injuries, by primary diagnosis and total length of hospital stay, April 1990-March 2000 (7,043 cases)

Diagnostic Code*	Description of Diagnostic Code	Length of Stay (days)		
		Median	Mean	Standard Deviation
805-809	Fracture: spine and trunk	7	11.6	15.4
860-869	Internal injury of chest, pelvis, and abdomen	6	8.9	10.4
820-829	Fracture: lower limb	5	8.4	11.7
890-897	Open wound: lower limb	5	10.4	17.2
900-904	Injury to blood vessels	4	7.0	10.3
800-804	Fracture: skull	3	6.7	11.3
925-929	Crushing injury	3	7.3	11.5
940-949	Burns	3	12.9	26.0
958-959	Certain traumatic complications and unspecified injuries	3	8.6	19.9
840-848	Sprains / strains of joints and adjacent muscles	3	3.9	5.2
810-819	Fracture: upper limb	2	4.3	6.6
830-839	Dislocation	2	5.1	9.0
870-879	Open wound: head, neck, and trunk	2	3.9	6.2
880-887	Open wound: upper limb	2	4.7	7.2
910-919	Superficial injury	2	4.6	7.2
920-924	Contusion with intact skin surface	2	3.6	4.4
950-957	Injury to nerves and spinal cord	2	6.5	12.6
850-854	Intracranial injury, excl. those with skull fracture	1	2.9	5.7
	Other / missing	4	10.6	22.3
	Overall	**3**	**6.9**	**12.6**

* Based on the nature of injury code from: World Health Organization. Manual of the International Classification of Diseases, Injuries, and Causes of Death [9th Revision]. Geneva, Switzerland, 1977.
** Length of stay includes subsequent admissions for the treatment of the incident injury.

Median lengths of stay in hospital for the treatment of farm machinery injuries ranged from one to seven days. For these data, the median is a better indicator of central tendency than the mean, because the mean is weighted by a small number of very long hospital stays.

10.10 LENGTH OF STAY IN HOSPITAL

TABLE 10.6 **Hospitalized machinery related agricultural injuries, by cause of injury and total length of hospital stay, April 1990-March 2000 (7,043 cases)**

Description of Cause of Injury	Length of Stay (days)		
	Median	Mean	Standard Deviation
Runover	5	10.6	15.1
Fall from machine, runover	4	9.3	13.8
Rollover	4	8.9	15.3
Entanglement	3	7.4	13.5
Pinned or struck by machine	3	5.9	11.8
Fall from machine, not runover	3	5.5	9.9
Struck by object propelled or falling machine	3	5.8	8.0
Collision	1	3.9	6.5
Other	2	5.5	11.8
Unknown	3	7.0	11.9
Overall	**3**	**6.9**	**12.6**

* Based on the nature of injury code from: World Health Organization. Manual of the International Classification of Diseases, Injuries, and Causes of Death [9th Revision]. Geneva, Switzerland, 1977.
** Length of stay includes subsequent admissions for the treatment of the incident injury.

Runovers and rollovers resulted in longer hospital stays. This indicates the greater severity of injuries sustained in these types of events, relative to other causes of injury.

10.11 CAUSE AND NATURE OF INJURY

TABLE 10.7 **Hospitalized agricultural machinery injuries, by cause and nature of injury, April 1990-March 2000 (7,043 cases)**

	Nature of Injury								
	Fracture	**Open wound**	**Soft tissue injury**	**Crushing injury**	**Intracranial injury**	**Internal Injury**	**Dislocation**	**Other**	**Total**
Cause of Injury									
Entangled / caught in machine	801	1,016	47	152	<5	22	31	210	2,282
Pinned or struck by machine	603	322	87	81	45	41	15	182	1,376
Fall from machine, not runover	596	53	112	<5	103	46	31	131	1,075
Runover	301	21	36	24	9	46	9	82	528
Fall from machine, then runover	141	9	31	9	12	24	7	45	278
Rollover	146	22	37	10	23	37	8	68	351
Struck by falling or projected object	171	69	35	9	26	19	<5	59	390
Collision	14	11	13	<5	14	<5	<5	6	60
Other	124	90	91	3	28	8	26	183	553
Unknown	44	62	<5	5	<5	6	5	22	150
Total	**2,941**	**1,675**	**493**	**296**	**265**	**250**	**135**	**988**	**7,043**

Fractures and open wounds (lacerations and amputations) were the primary injuries experienced by most victims of machine-related injury events, irrespective of the cause of injury. Other leading types of primary injury were soft tissue injuries, crushing injuries and intracranial injuries. Entanglements were most likely to result in open wounds, whereas the other causes of injury, apart from collisions, were most likely to result in fractures.

10.12 MACHINERY TYPE

TABLE 10.8 **Hospitalized agricultural machinery injuries, by machinery type and gender, April 1990-March 2000 (7,043 cases)**

Machine type	Total		Gender			
			Males		Females	
	No.	Percent	No.	Percent	No.	Percent
Tractor	2,002	28.4	1,814	28.5	188	28.0
Combine	537	7.6	511	8.0	26	3.9
Auger	602	8.6	561	8.8	41	6.1
Power Take-Off	371	5.3	344	5.4	27	4.0
Motor Vehicle	358	5.1	310	4.9	48	7.1
Baler	261	3.7	246	3.9	15	2.2
Plough / Disk	196	2.8	177	2.8	19	2.8
Farm Wagon	248	3.5	205	3.2	43	6.4
Harvester	180	2.6	153	2.4	27	4.0
Recreational Vehicle	165	2.3	130	2.0	35	5.2
Swather	167	2.4	160	2.5	7	1.0
Power Tool	139	2.0	134	2.1	5	0.7
Fencing Equipment	121	1.7	113	1.8	8	1.2
Hay Elevator	146	2.1	122	1.9	24	3.6
Manure Spreader	74	1.1	70	1.1	<5	-
Mower	59	0.8	52	0.8	7	1.0
Planting Equipment	64	0.9	50	0.8	14	2.1
Chainsaw	59	0.8	57	0.9	<5	-
Lawn Mower	54	0.8	44	0.7	10	1.5
Garden Equipment	41	0.6	32	0.5	9	1.3
Spraying Equipment	24	0.3	19	0.3	5	0.7
Other	733	10.4	664	10.4	69	10.3
Unknown	439	6.2	400	6.3	39	5.8
Total	**7,040**	**100.0**	**6,368**	**100.0**	**672**	**100.0**

More than fifty different classes of machinery were associated with hospitalized injuries. Tractors were involved in over three times as many injuries as any other type of machine. Tractors, augers and combines were associated with 44.6% of hospitalized machine-related injuries. All other machine types accounted for less than 6% of the total number of injuries. Females suffered fewer injuries than males, but the distribution of injuries by machinery type was fairly consistent between the two sexes.

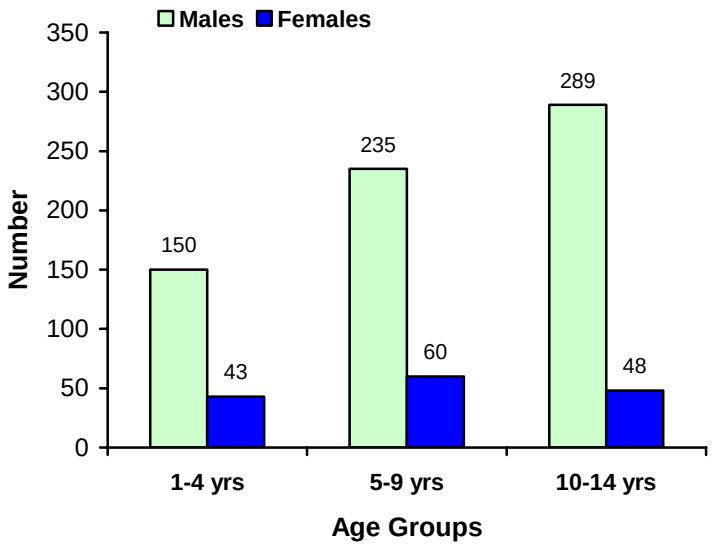
11 HOSPITALIZED AGRICULTURAL MACHINE-RELATED INJURIES: AGES 1-14

11.1 AGE AND GENDER

Canadian children of all ages are hospitalized as a result of agricultural machinery injuries. The number of injuries increased with increasing age among boys, but not among girls. This was likely due to the greater involvement of older boys in mechanized farm work.

Note: due to the small number of cases, infants under the age of one year were excluded from this analysis.

FIGURE 11.1 **Hospitalized agricultural machinery injuries among children (1-14), by age and gender, April 1990-March 2000 (825 cases)**

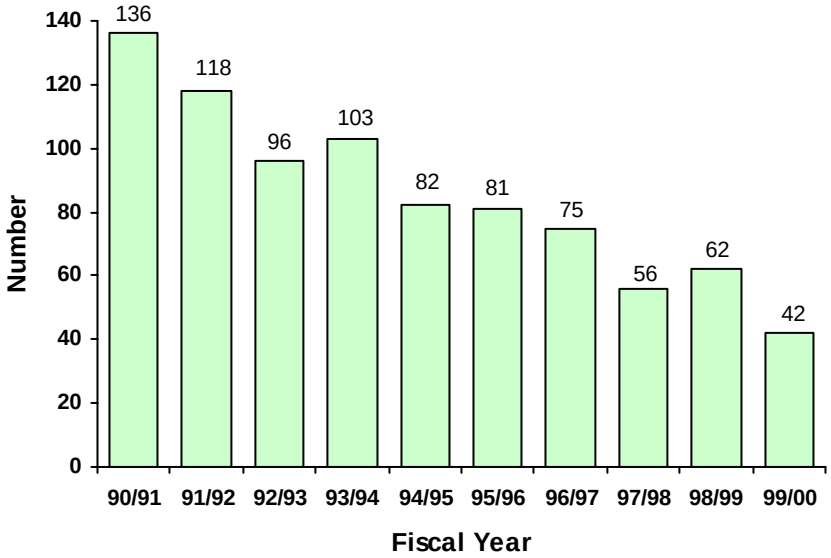


11.2 YEAR

The number of hospitalized farm machinery injuries among children decreased over the surveillance period. (This decrease was more pronounced for children under age 15 than for the adult age groups.) The decrease could be attributed, in part, to changes in hospital admission practices. Patients who would have been admitted for observation in 1990, are now more likely to be treated and released.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 13). Imputed values are not included in the total number of cases.

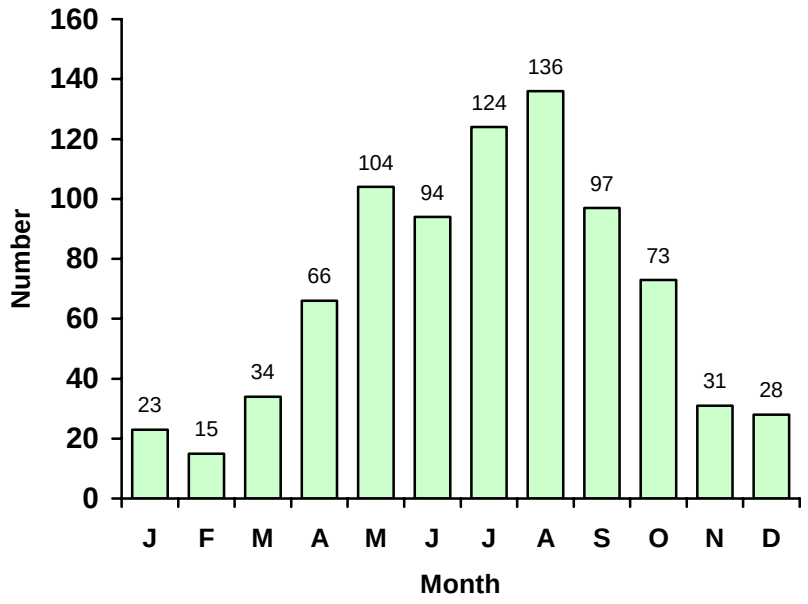
FIGURE 11.2 **Hospitalized agricultural machinery injuries among children (1-14), by fiscal year, Canada, April 1990-March 2000 (825 cases)**



11.3 MONTH

FIGURE 11.3 **Hospitalized agricultural machinery injuries among children (1-14), by month, April 1990-March 2000 (825 cases)**

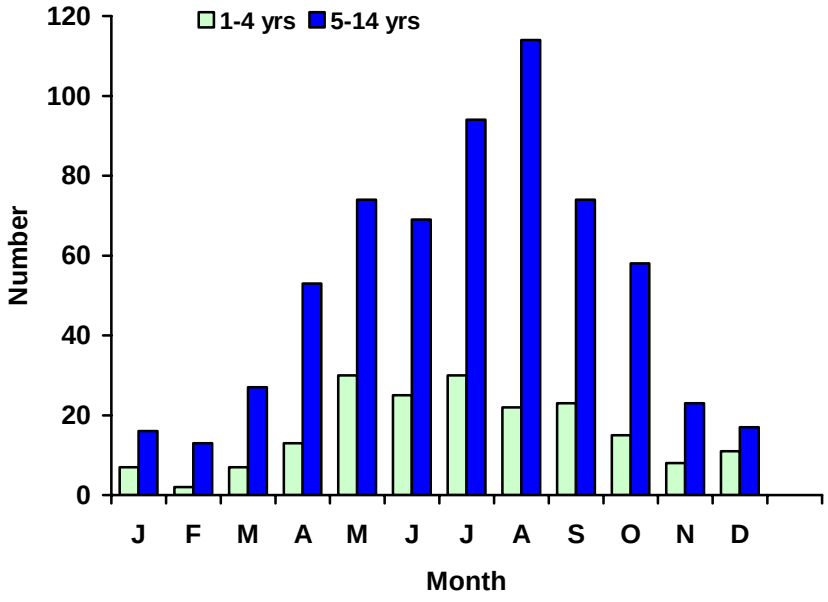
More children were injured during the months of May to August, when they were most likely to be exposed to farm machinery hazards.



11.4 MONTH AND AGE

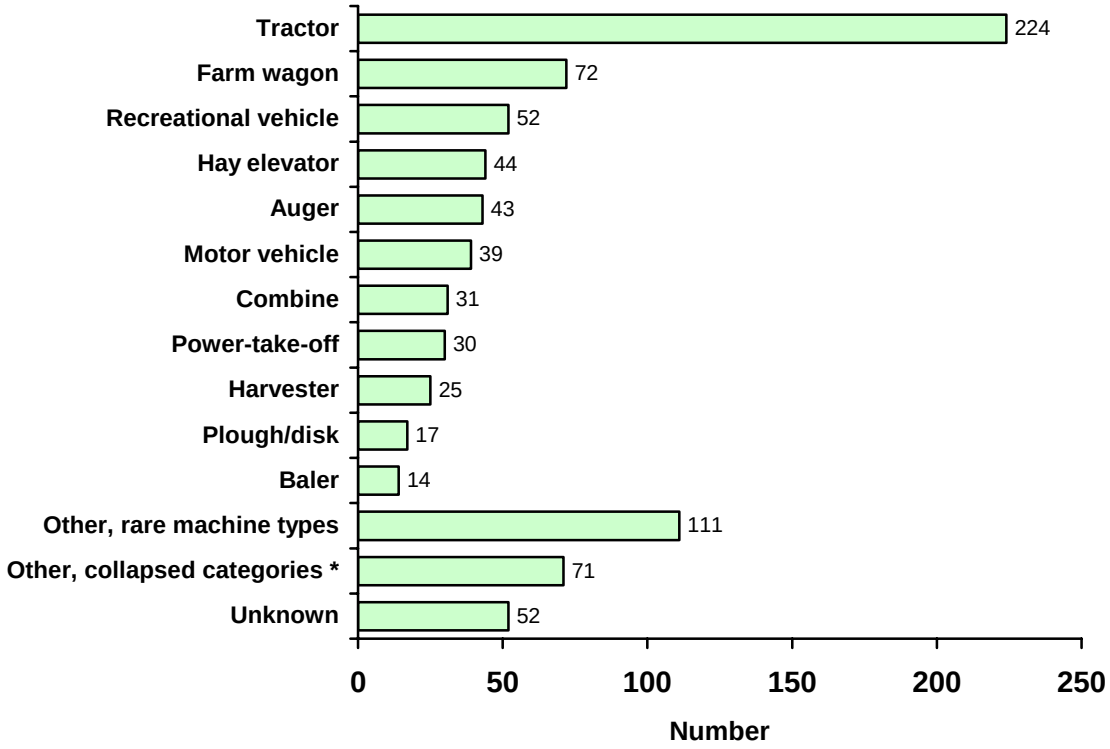
FIGURE 11.4 **Hospitalized agricultural machinery injuries among children (1-14), by age group and month, April 1990-March 2000 (825 cases)**

Older children had a much more pronounced peak in injury occurrence during the summer months, when they were not in school.



11.5 MACHINERY TYPE

FIGURE 11.5 **Hospitalized agricultural machinery injuries among children (1-14), by machinery type, April 1990-March 2000 (825 cases)**

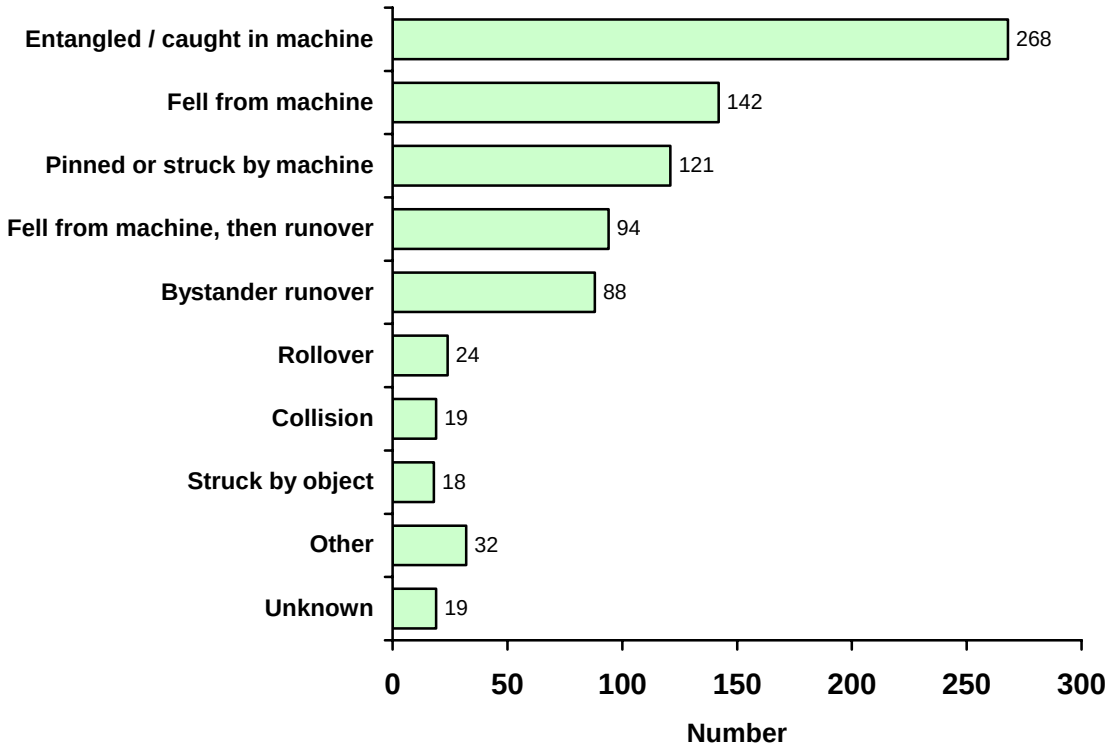


* Includes mower, chainsaw, welder, swather, power tools, hay elevator, manure spreader, fencing equipment, spraying equipment, gardening equipment and planting equipment

Tractors were associated with more than three times as many injuries as any other type of machine. The machine types most commonly associated with injuries to children were tractors, farm wagons, recreational vehicles, hay elevators, augers and motor vehicles.

11.6 CAUSE OF INJURY

FIGURE 11.6 **Hospitalized agricultural machinery injuries among children (1-14), by cause of injury, Canada, April 1990-March 2000 (825 cases)**



Among children, the most common machine-related cause of injury was being entangled or caught in operating, and often unguarded, farm machinery. Other leading causes of injury were falls from machinery (moving or stationary), being struck or pinned by a moving piece of machinery and being runover by farm equipment.

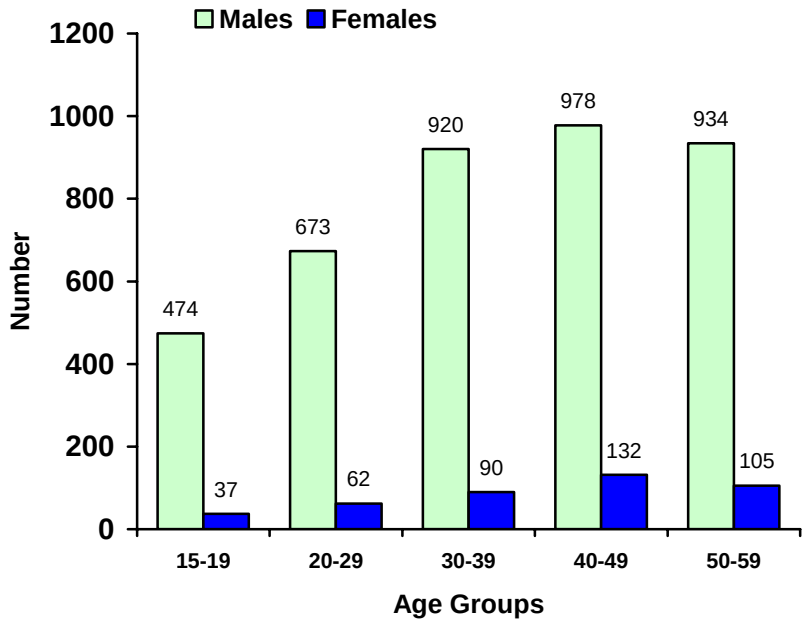
There are two major types of runover injuries. The first is “extra-rider runover”, where a child is riding on farm equipment, falls from it, and is subsequently runover. The second is “bystander runover”, where a child bystander is inadvertently runover by a machine or vehicle.

12 HOSPITALIZED AGRICULTURAL MACHINE-RELATED INJURIES: AGES 15-59

12.1 AGE AND GENDER

FIGURE 12.1 **Hospitalized agricultural machinery injuries among adults (15-59), by age and gender, April 1990-March 2000 (4,405 cases)**

The number of hospitalized injuries to males greatly exceeded the number of hospitalized injuries to females in all age groups.

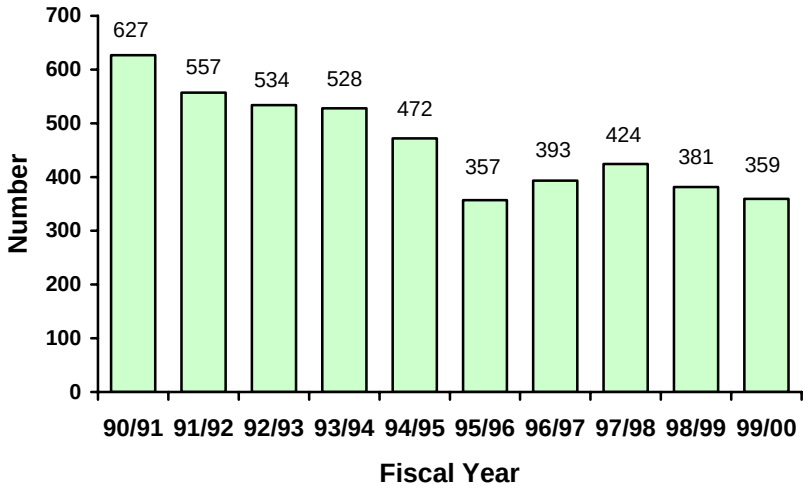


12.2 YEAR

FIGURE 12.2 **Hospitalized agricultural machinery injuries among adults (15-59), by fiscal year, April 1990-March 2000 (4,405 cases)**

The annual number of hospitalized farm machinery injuries among persons 15-59 years appeared to decline slightly during the surveillance period. This trend may have been due, in part, to a reduction in the number of patients admitted to hospital relative to the number of patients treated and then released.

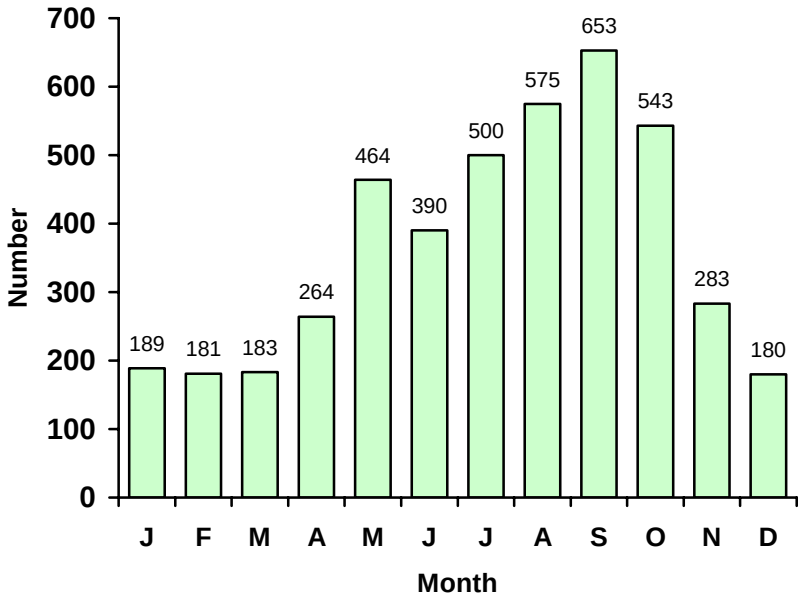
Note: data are imputed for Alberta in 98/99 and 99/00 (n=100) and Nova Scotia in 97/98, 98/99 and 99/00 (n=9). Imputed values are not included in the total number of cases.



12.3 MONTH

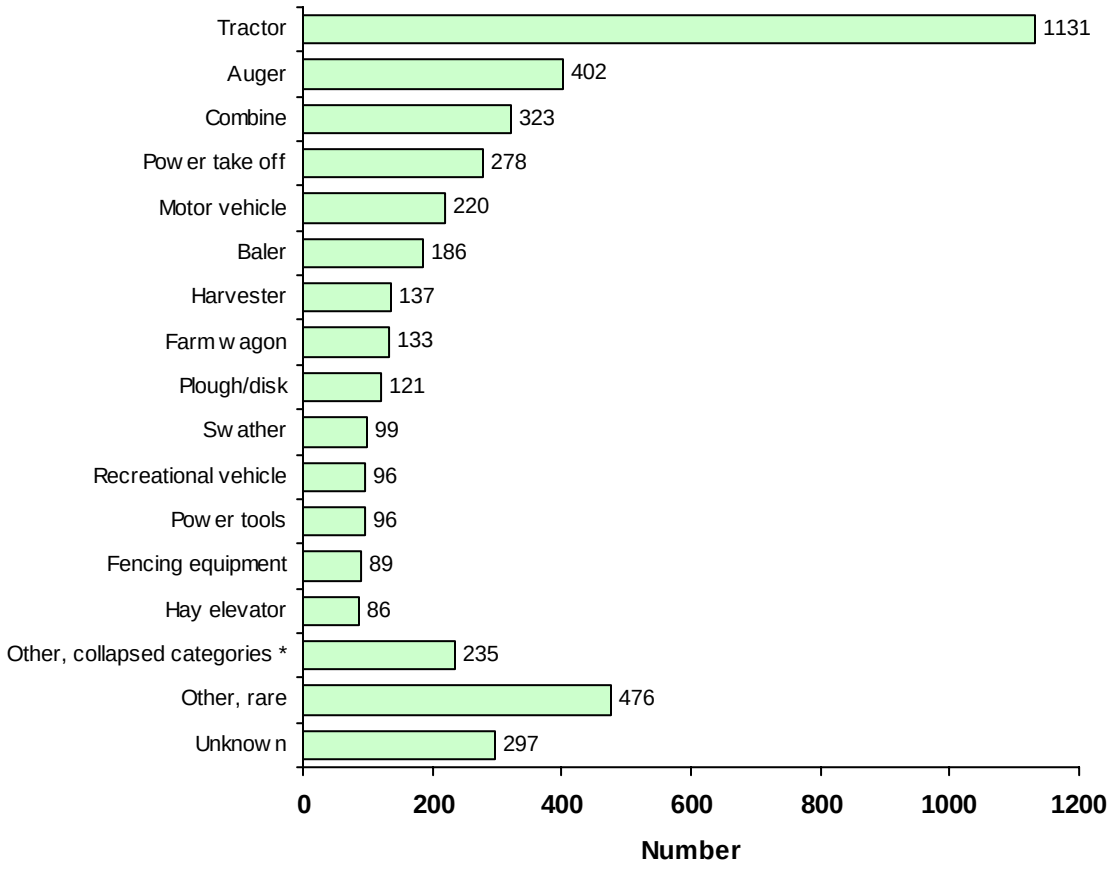
FIGURE 12.3 **Hospitalized agricultural machinery injuries among adults (15-59), by month, April 1990-March 2000 (4,405 cases)**

The monthly distribution of farm machinery injuries among persons aged 15-59 is indicative of increased exposure to agricultural machinery hazards during the warmer months of May to October.



12.4 MACHINERY TYPE

FIGURE 12.4 **Hospitalized agricultural machinery injuries among adults (15-59), by machinery type, April 1990-March 2000 (4,405 cases)**

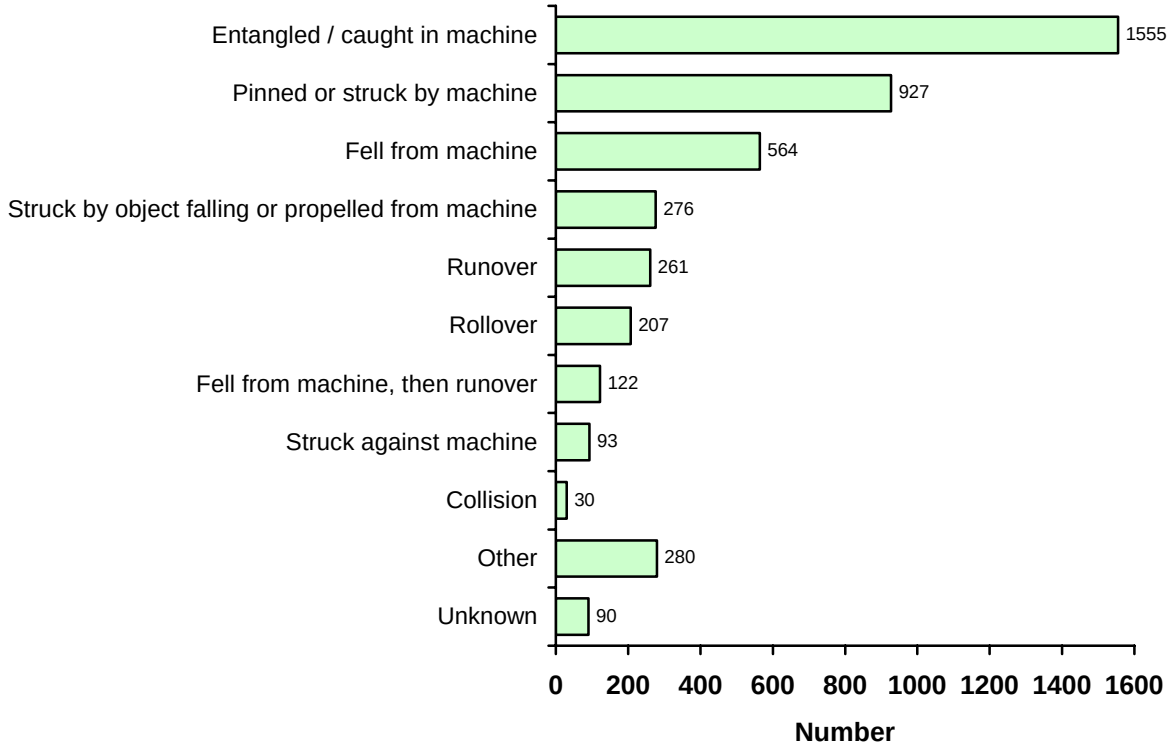


* Includes mower, chainsaw, welder, manure spreader, spraying equipment, gardening equipment, and planting equipment.

Tractors were by far the leading type of machinery associated with injuries to persons aged 15-59. Augers, combines, power take off devices and motor vehicles were also frequently involved in injuries to people in this age group.

12.5 CAUSE OF INJURY

FIGURE 12.5 **Hospitalized agricultural machinery injuries among adults (15-59), by cause of injury, April 1990-March 2000 (4,405 cases)**



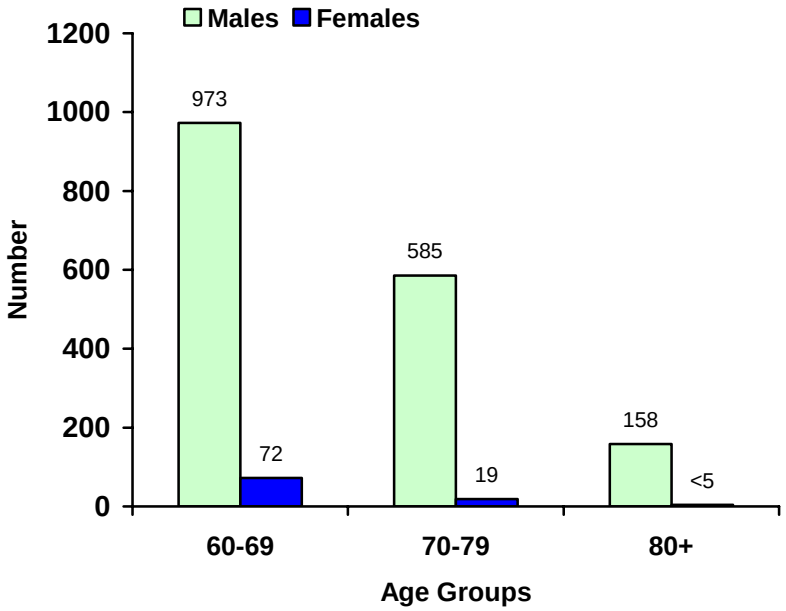
As observed among children under fifteen, the leading causes of injury for persons aged 15-59 were being entangled or caught in operating machinery, being struck or pinned by a moving machine, falls from machines (moving or stationary), and runovers. Rollover injuries occurred more frequently among adults that they did among children.

13 HOSPITALIZED AGRICULTURAL MACHINE-RELATED INJURIES: AGES 60+

13.1 AGE AND GENDER

There were fewer numbers of hospitalized injuries in the older age groups. This is probably because there were fewer people exposed to farm machinery hazards in those age groups. Hospitalizations among older females were very rare.

FIGURE 13.1 **Hospitalized agricultural machinery injuries among older adults (60+), by age and gender, April 1990-March 2000 (1,811 cases)**

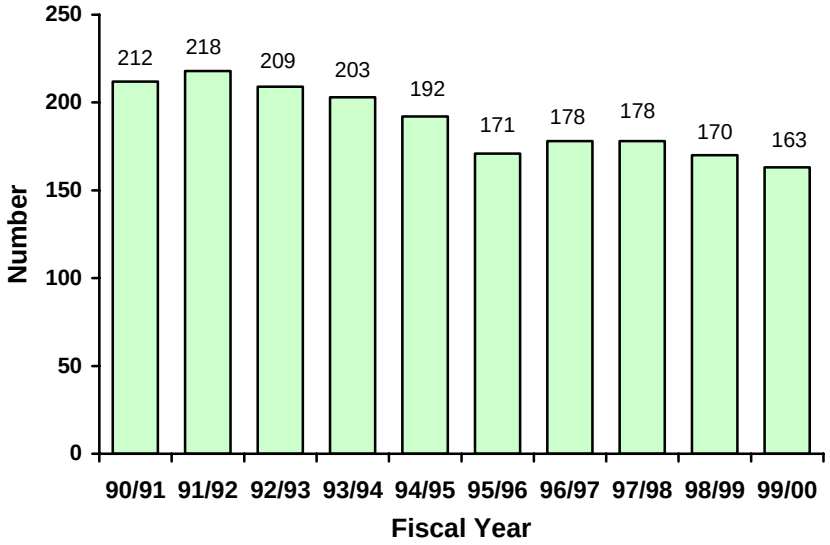


13.2 YEAR

There was a slight decrease in the annual number of hospitalized farm machinery injuries in older adults over the surveillance period. This may simply reflect an increase in the number of patients treated and released relative to the number of patients admitted to hospital.

Note: data are imputed for Alberta in 98/99 and 99/00 (n=37) and Nova Scotia in 97/98, 98/99 and 99/00 (n=3). Imputed values are not included in the total number of cases.

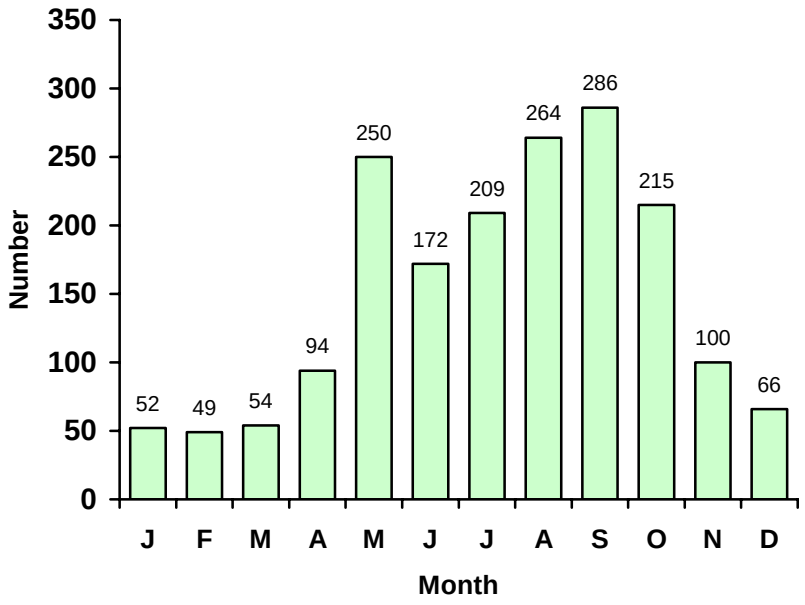
FIGURE 13.2 **Hospitalized agricultural machinery injuries among older adults (60+), by fiscal year, April 1990-March 2000 (1,811 cases)**



13.3 MONTH

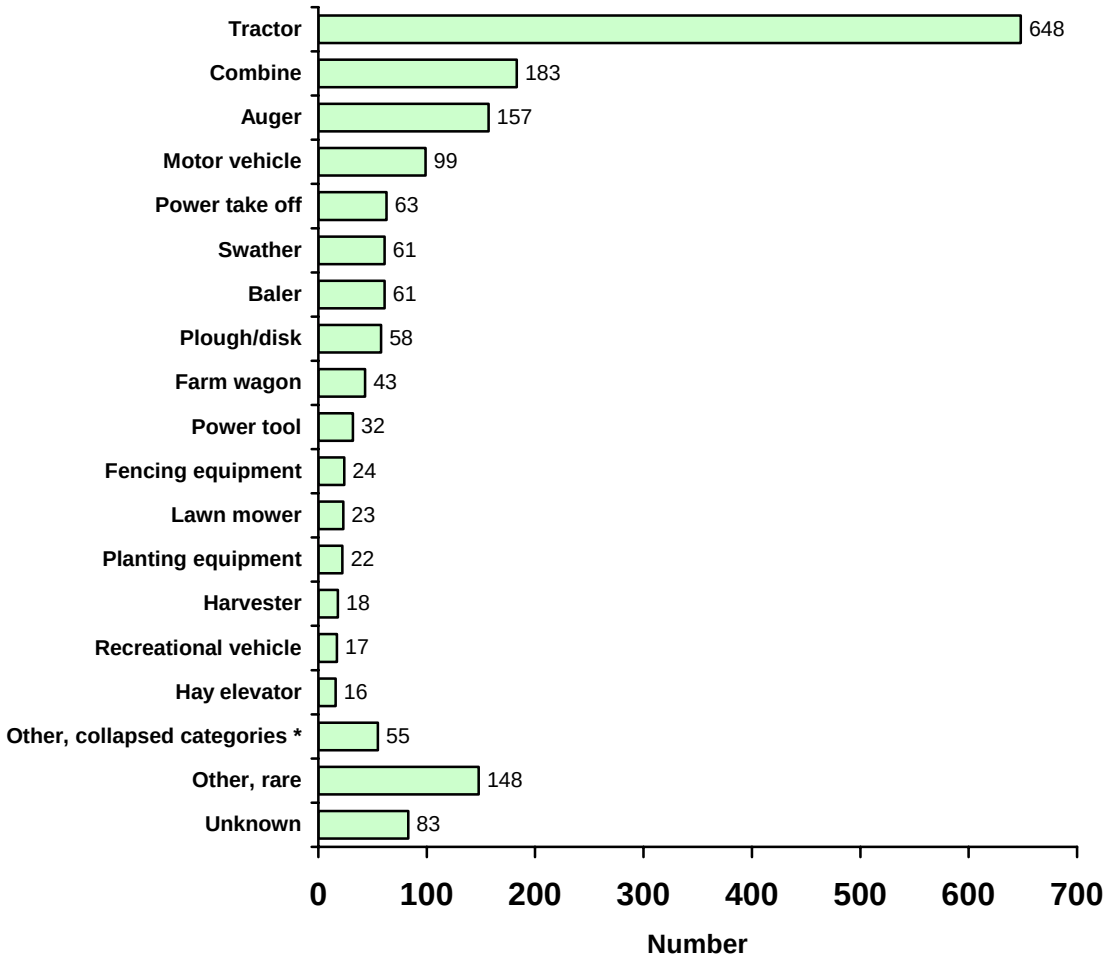
As was the case with persons aged 15-59, there were more farm machinery injuries to adults aged 60 and over during active periods of field crop production (Spring through early Fall).

FIGURE 13.3 **Hospitalized agricultural machinery injuries among older adults (60+), by month, April 1990-March 2000 (1,811 cases)**



13.4 MACHINERY TYPE

FIGURE 13.4 **Hospitalized agricultural machinery injuries among older adults (60+), by machinery type, April 1990-March 2000 (1,811 cases)**

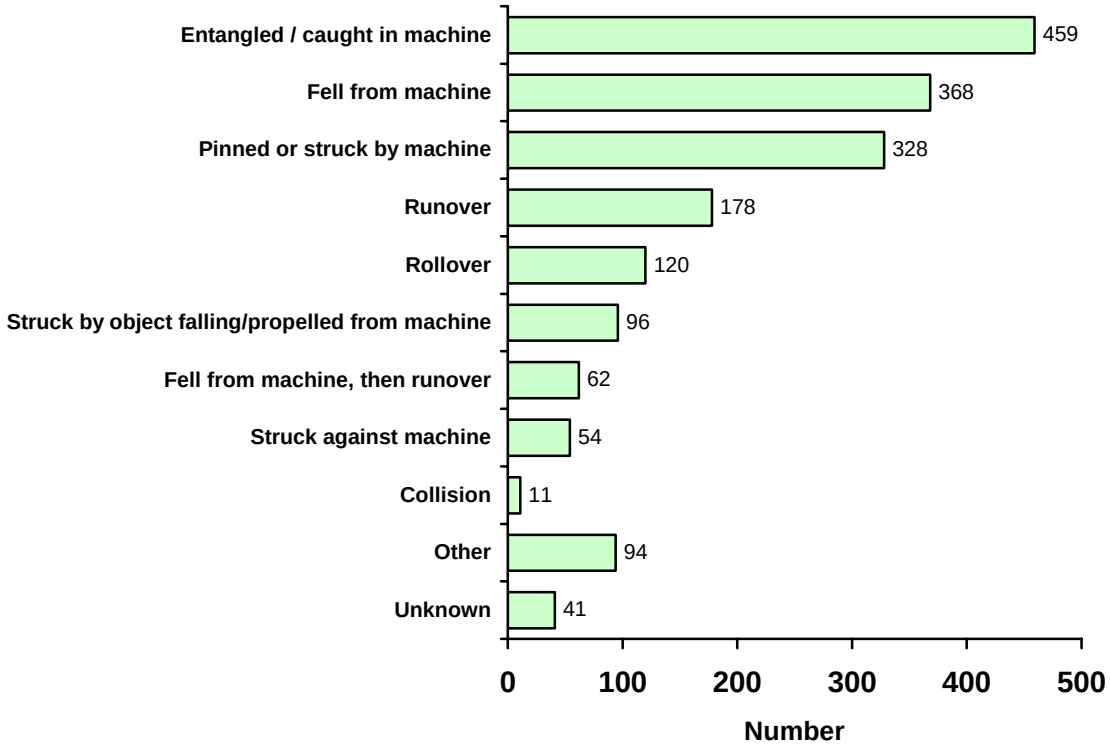


* Includes mower, chainsaw, welder, manure spreader, spraying equipment and gardening equipment.

Tractors were involved in 34% of the hospitalized injuries to persons aged 60 and over. The machine types most commonly associated with injuries to older adults were tractors, augers, combines, motor vehicles, power take off devices, swathers, balers and ploughs.

13.5 CAUSE OF INJURY

FIGURE 13.5 **Hospitalized agricultural machinery injuries among older adults (60+), by cause of injury, April 1990-March 2000 (1,811 cases)**



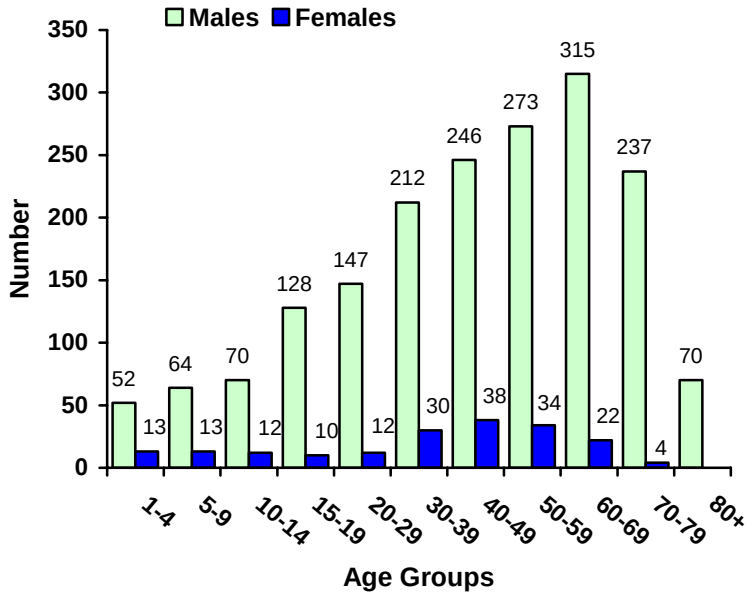
As observed among younger age groups, being entangled or caught in operating farm machinery was the leading cause of hospitalization in adults 60 and over. Falls from machinery were a much more important cause of hospitalized injury in this age group than in the younger age groups.

14 HOSPITALIZED AGRICULTURAL MACHINE-RELATED INJURIES: TRACTORS

14.1 AGE AND GENDER

Most tractor-related injuries involved males. In persons under age 70, there were increased numbers of tractor-related hospitalizations with increasing age. There were fewer numbers of tractor-related hospitalizations in the older age groups because there were fewer people aged 70 and over living on farms and probably fewer people aged 70 and over operating tractors. The rates of injuries among older farmers were actually very high (Figure 14.3).

FIGURE 14.1 **Hospitalized agricultural machinery injuries involving tractors, by age and gender, April 1990-March 2000 (2,003 cases)**

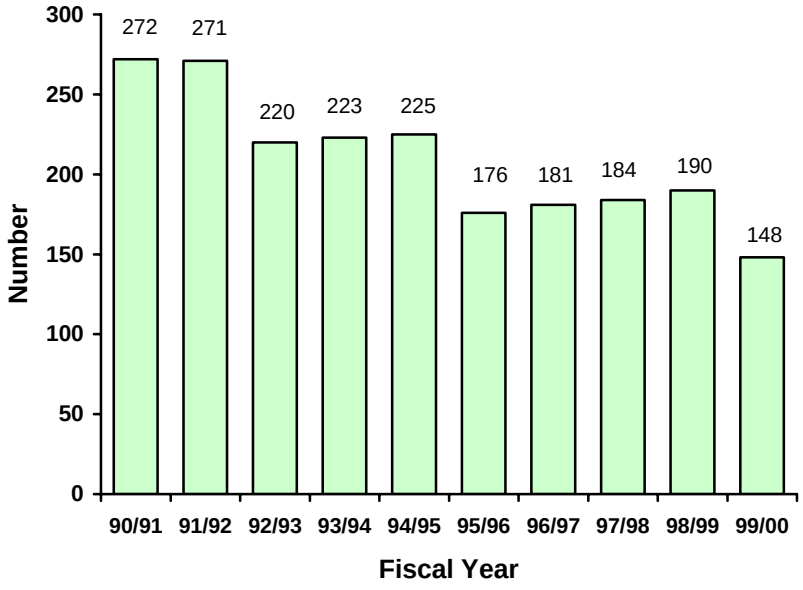


14.2 YEAR

There was a decrease in the annual number of tractor-related hospitalizations over the surveillance period. This trend could be attributed, in part, to a decreased likelihood of hospital admission for injuries of similar severity at the end of the surveillance period compared with at the beginning of the surveillance period.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 36) and for Nova Scotia from April 1, 1997 to March 31, 2000 (n = 5). Imputed values are not included in the total number of cases.

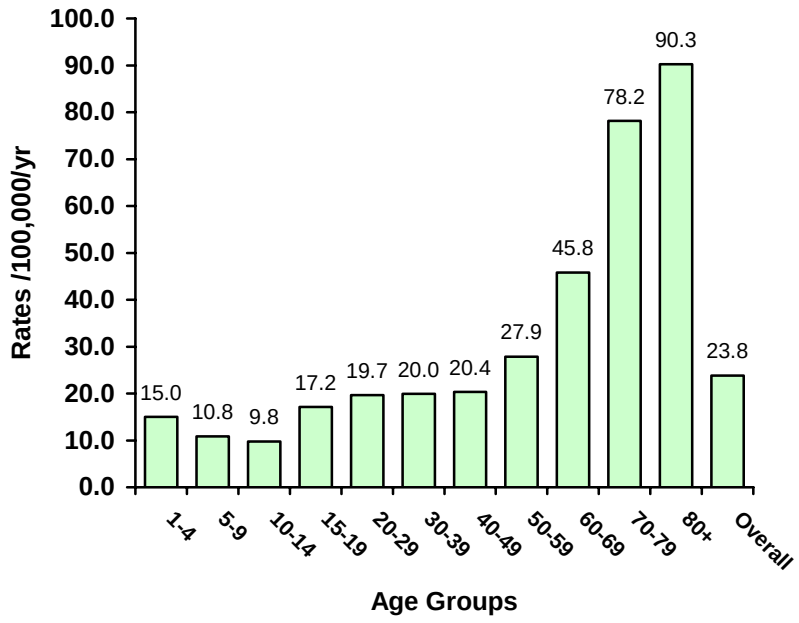
FIGURE 14.2 **Hospitalized agricultural machinery injuries involving tractors, by fiscal year, April 1990-March 2000 (2,003 cases)**



14.3 RATES

FIGURE 14.3 **Rates (per 100,000 farm population per year) of hospitalized agricultural injuries involving tractors, by age group, April 1990-March 2000 (2,003 cases)**

Estimated rates of tractor-related injuries were especially high in males aged 70 and over. The same pattern was seen with tractor fatalities (section 5.2). The higher rates may be due, in part, to the operation of older equipment with fewer safety features.

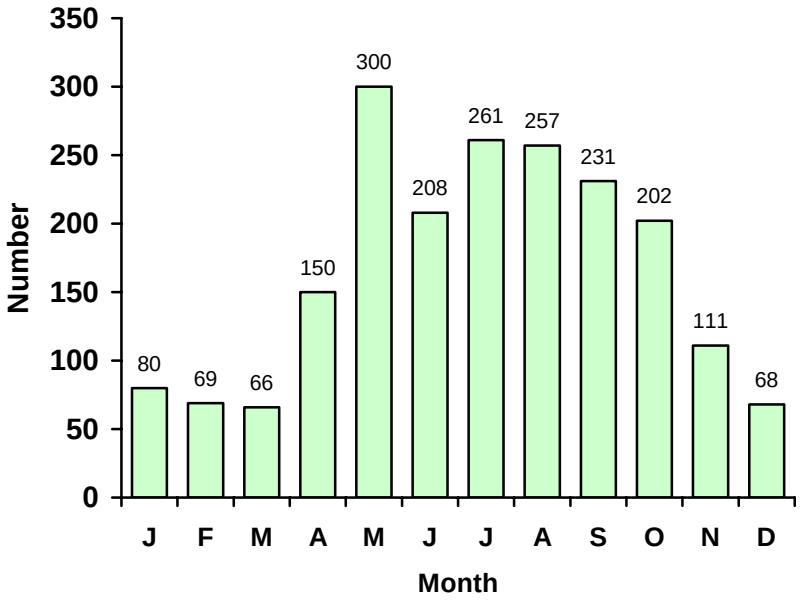


14.4 MONTH

FIGURE 14.4 **Hospitalized agricultural machinery injuries involving tractors, by month, April 1990-March 2000 (2,003 cases)**

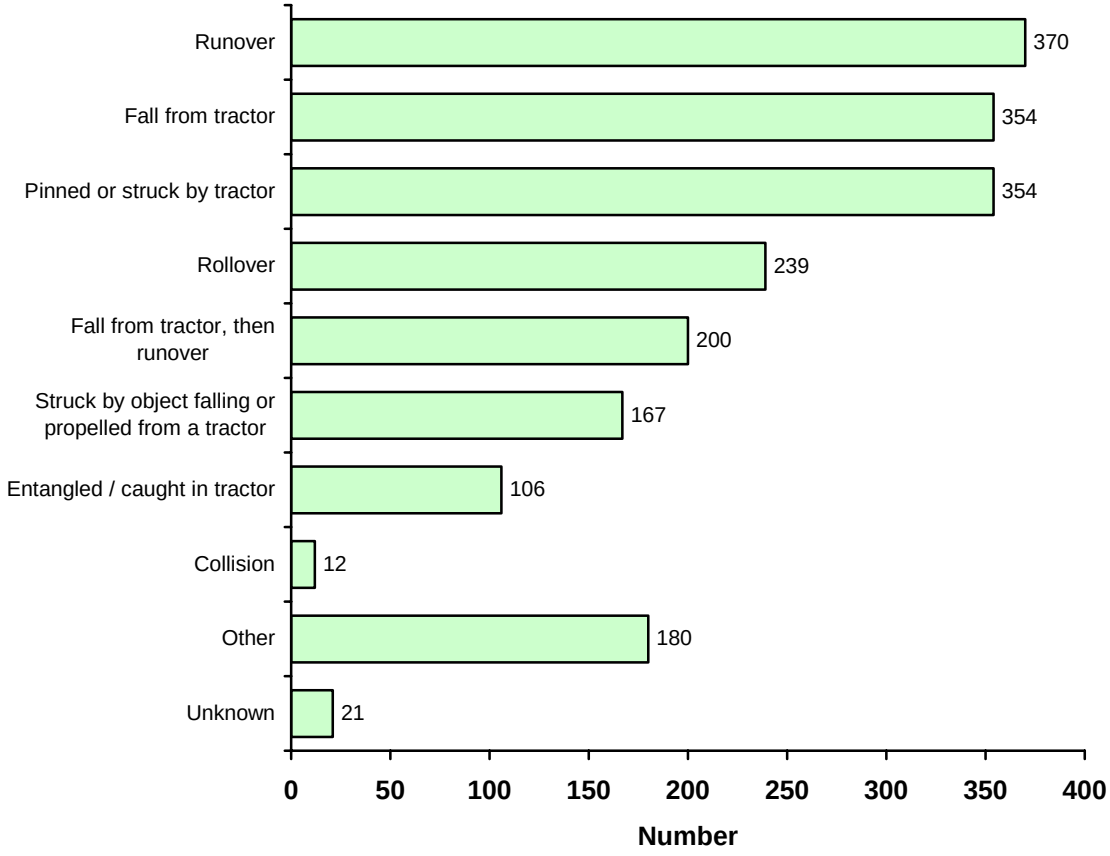
There was a pronounced peak in tractor-related hospitalizations during the month of May. This is associated with intensive tilling and crop planting activities.

The higher numbers of tractor-related hospitalizations during the warm weather months of April to October are associated with field crop production activities that require the use of tractors.



14.5 CAUSE OF INJURY

FIGURE 14.5 **Hospitalized agricultural machinery injuries involving tractors, by cause of injury, April 1990-March 2000 (2,003 cases)**



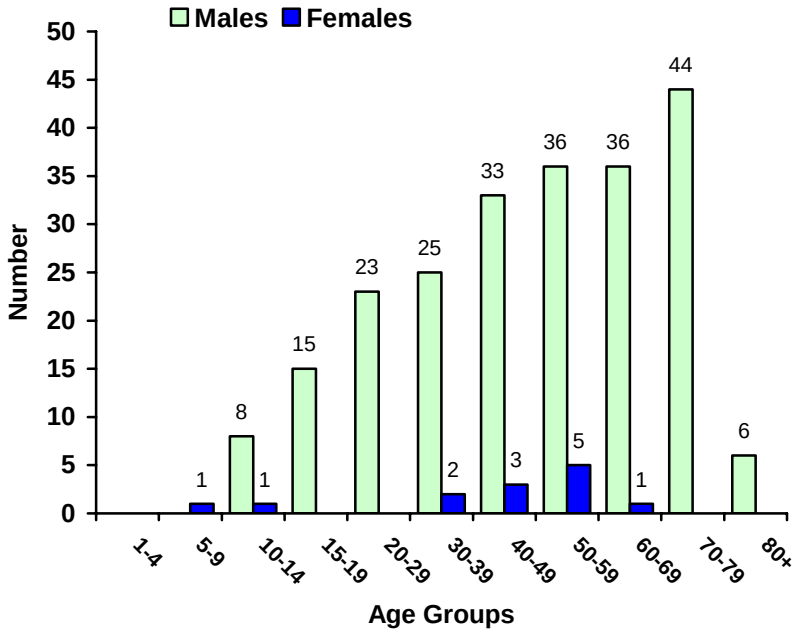
The leading causes of tractor-related hospitalized agricultural injuries were runovers, falls from tractors (not followed by runovers), being pinned or struck by a tractor and rollovers.

14.6 TRACTOR ROLLOVERS

Hospitalized injuries due to tractor rollovers were most common in adult males.

Only ten children under age 15 sustained hospitalized injuries in tractor rollovers during the surveillance period, but during the past decade there were ten fatal tractor rollover injuries to children in that age group. The injuries sustained by children involved in tractor rollovers often prove to be fatal.

FIGURE 14.6 **Hospitalized agricultural machinery injuries involving tractors rollovers, by age group, April 1990-March 2000 (239 cases)**

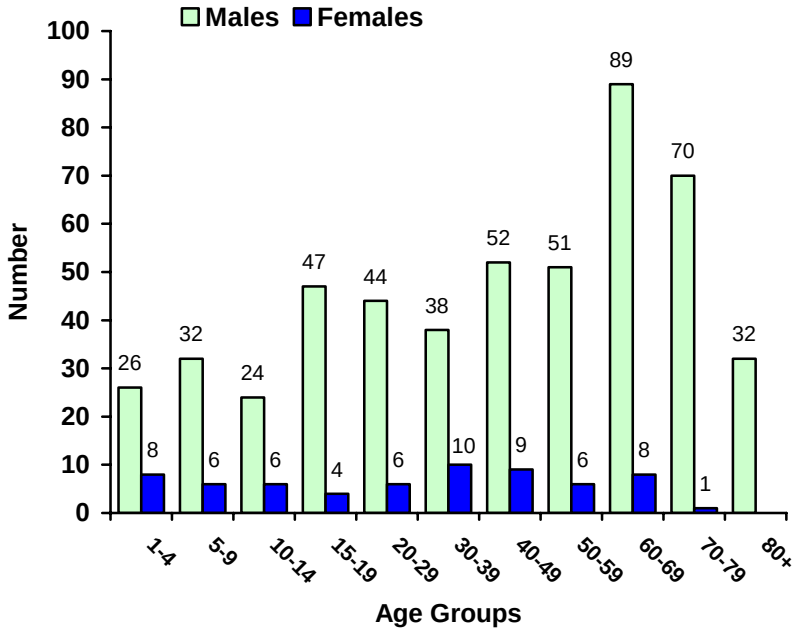


14.7 TRACTOR RUNOVERS

There was a peak in tractor runovers among males aged 60-79. Many of these runovers were "unmanned machine runovers". In this type of injury event, the operator is runover by his/her tractor while trying to complete a task in front of the tractor or while jumpstarting the tractor.

The tractor runovers involving children were mainly extra-rider runovers and bystander runovers.

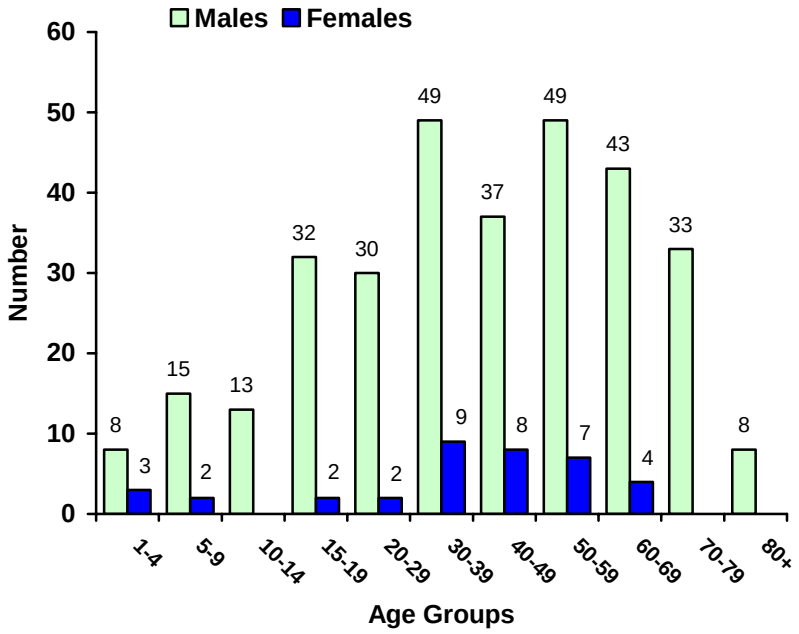
FIGURE 14.7 **Hospitalized agricultural machinery injuries involving tractor runovers, by age group, April 1990-March 2000 (570 cases)**



14.8 PINNED OR STRUCK BY TRACTOR

Being pinned or struck by a tractor was a common cause of injury among males in most age groups. These injuries were especially prevalent in males aged 15-79. In cases where it was the operator who was pinned or struck, it is likely that he/she was trying to complete a task in front of the tractor or to jumpstart the tractor.

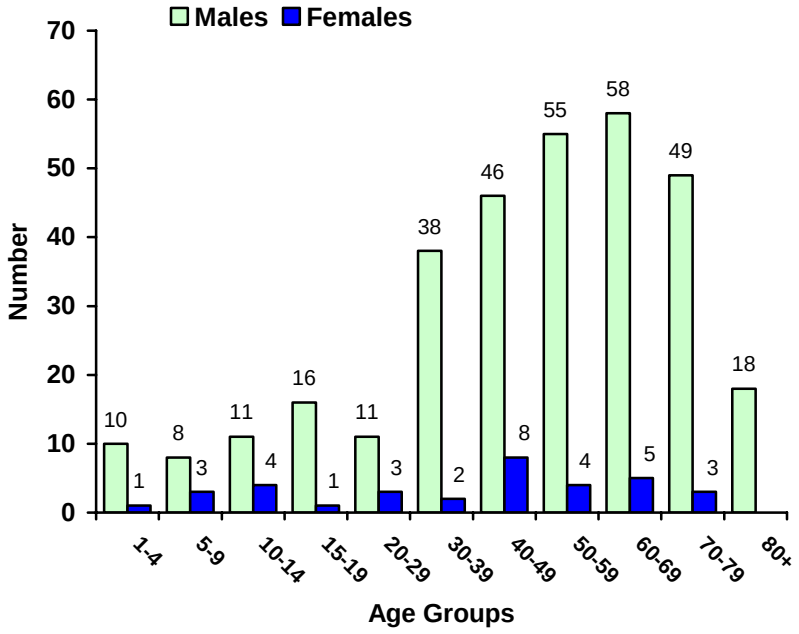
FIGURE 14.8 **Hospitalized agricultural machinery injuries involving being pinned or struck by a tractor, by age and gender, April 1990-March 2000 (354 cases)**



14.9 FALL FROM TRACTOR, NOT RUNOVER

Falls from tractors, not involving a runover, were most frequent among males aged 30-79.

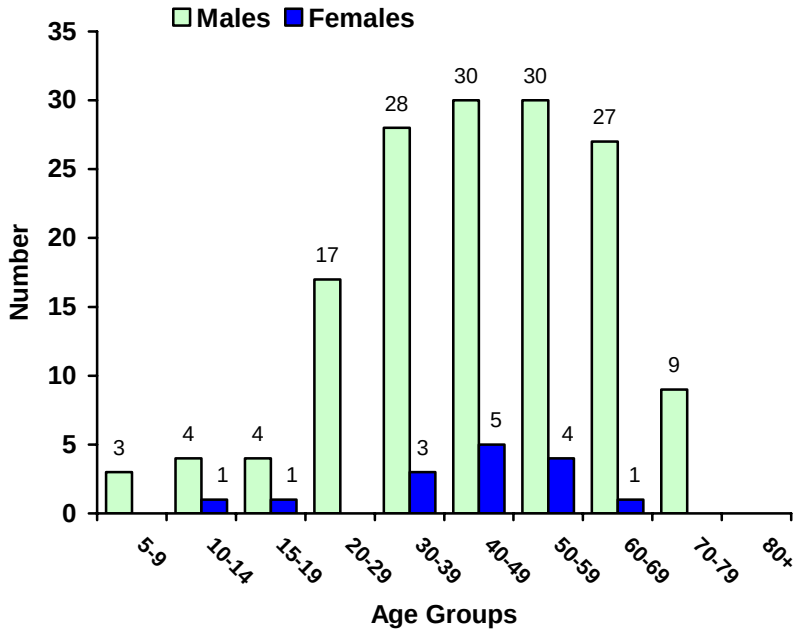
FIGURE 14.9 **Hospitalized agricultural machinery injuries involving falls from tractors (without runover), by age group, April 1990-March 2000 (354 cases)**



14.10 STRUCK BY OBJECT FALLING FROM TRACTOR

This type of injury was especially common among males aged 30-69.

FIGURE 14.10 **Hospitalized agricultural machinery injuries involving being struck by object falling from a tractor, by age group, April 1990-March 2000 (167 cases)**

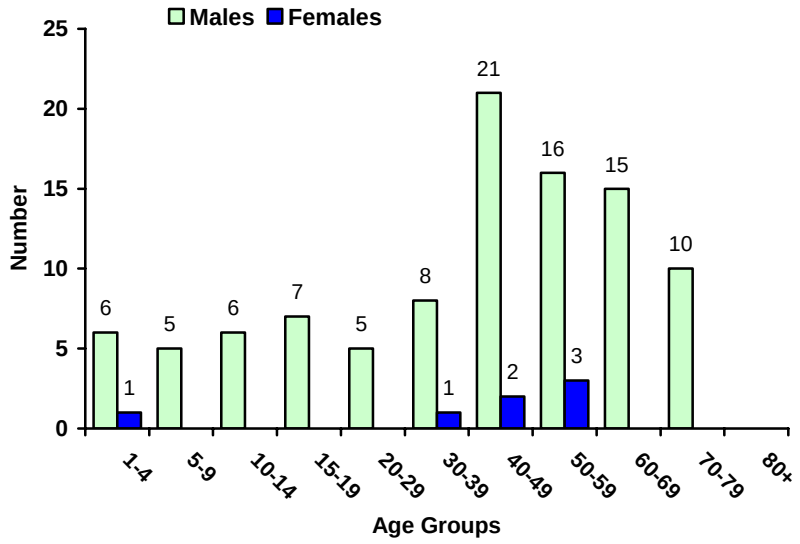


14.11 ENTANGLED OR CAUGHT IN TRACTOR

Tractor entanglements most often occurred in male farmers aged 40 and over; however they are an important cause of lost time injuries and long-term disabilities among males in most age groups.

Of the 106 tractor entanglements, 15.1% resulted in amputations and 35.8% caused fractures.

FIGURE 14.11 **Hospitalized agricultural machinery injuries involving being entangled or caught in a tractor part, by age group, April 1990-March 2000 (106 cases)**



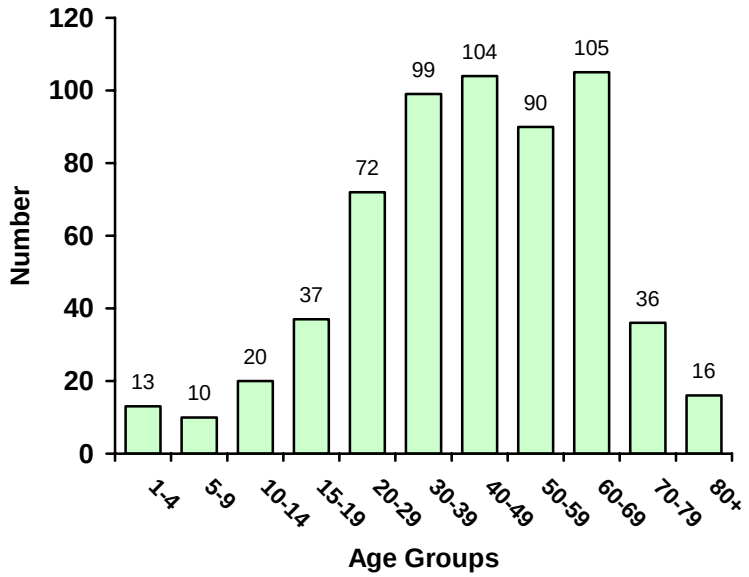
15 HOSPITALIZED AGRICULTURAL MACHINE-RELATED INJURIES: AUGERS, COMBINES, PTOS, MOTOR VEHICLES, BALERS

15.1 AUGERS

15.1.1 AGE

Injuries caused by grain and other augers occurred most frequently among males aged 20-69.

FIGURE 15.1 **Hospitalized agricultural machinery injuries involving augers, by age group, April 1990-March 2000 (602 cases)**

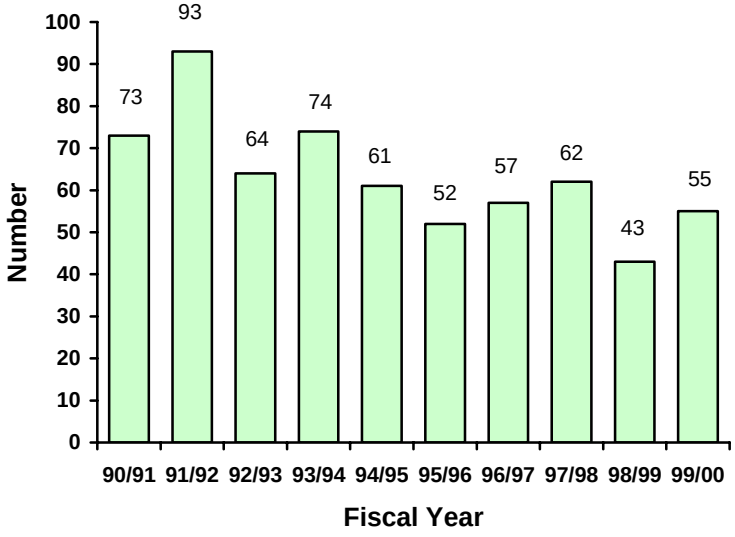


15.1.2 YEAR

There was no clear trend in the annual occurrence of auger-related injuries over the surveillance period.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 16). Imputed values are not included in the total number of cases.

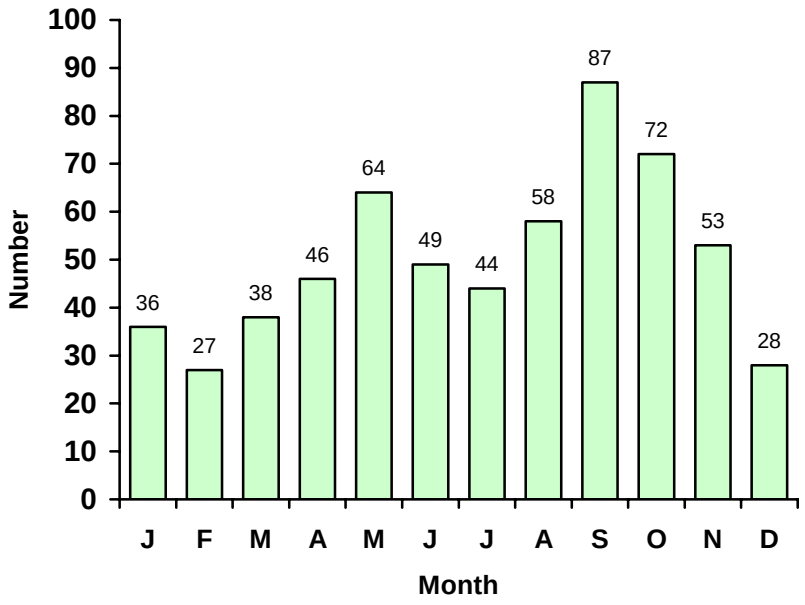
FIGURE 15.2 **Hospitalized agricultural machinery injuries involving augers, by fiscal year, April 1990-March 2000 (602 cases)**



15.1.3 MONTH

There were significant numbers of auger-related hospitalized injuries throughout the year, with a strong peak at harvest time.

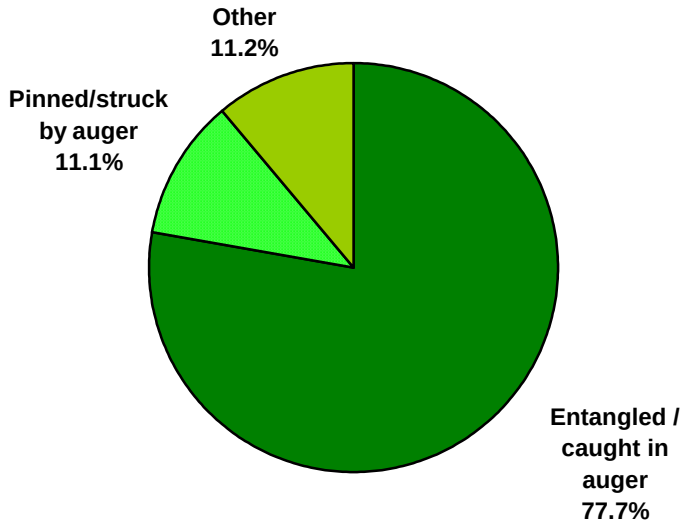
FIGURE 15.3 **Hospitalized agricultural machinery injuries involving augers, by month, April 1990-March 2000 (602 cases)**



15.1.4 CAUSE

The vast majority of hospitalized auger injuries were due to entanglement, but more than 11% of the injuries resulted from being pinned or struck by an auger or part of an auger.

FIGURE 15.4 **Hospitalized agricultural machinery injuries involving augers, by cause of injury, April 1990-March 2000 (602 cases)**

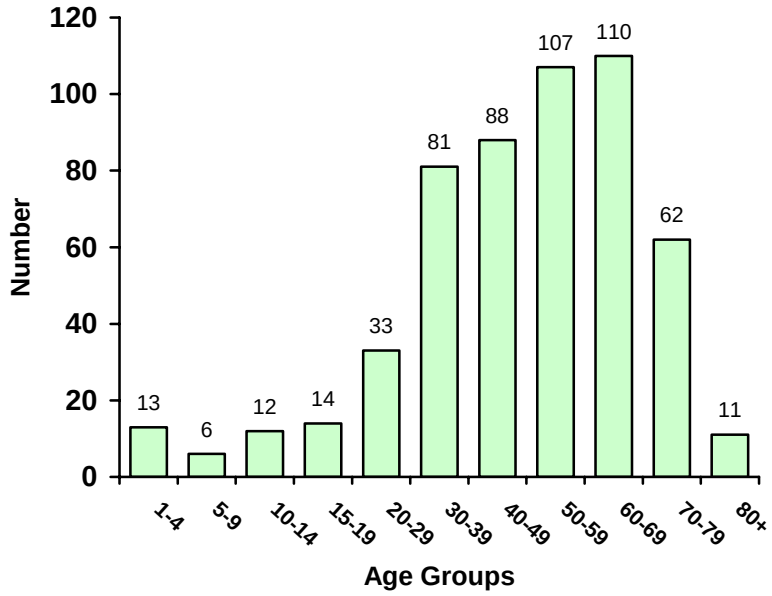


15.2 COMBINES

15.2.1 AGE

Combine-related hospitalized injuries are not common among children and youth. Combines are expensive to purchase and operate. The task of running a combine is therefore generally left to older, experienced farm workers. The majority of those injured were aged 30-69.

FIGURE 15.5 Hospitalized agricultural machinery injuries involving combines, by age group, April 1990-March 2000 (537 cases)

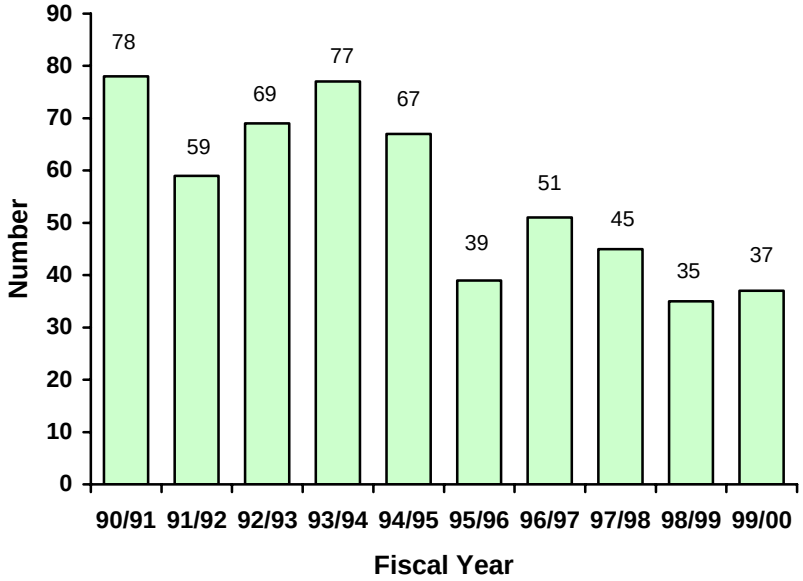


15.2.2 YEAR

There was a slight decline in the annual occurrence of combine-related hospitalizations. This might be due, in part, to a greater proportion of injured persons being treated and released instead of being admitted to hospital.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n =10). Imputed values are not included in the total number of cases.

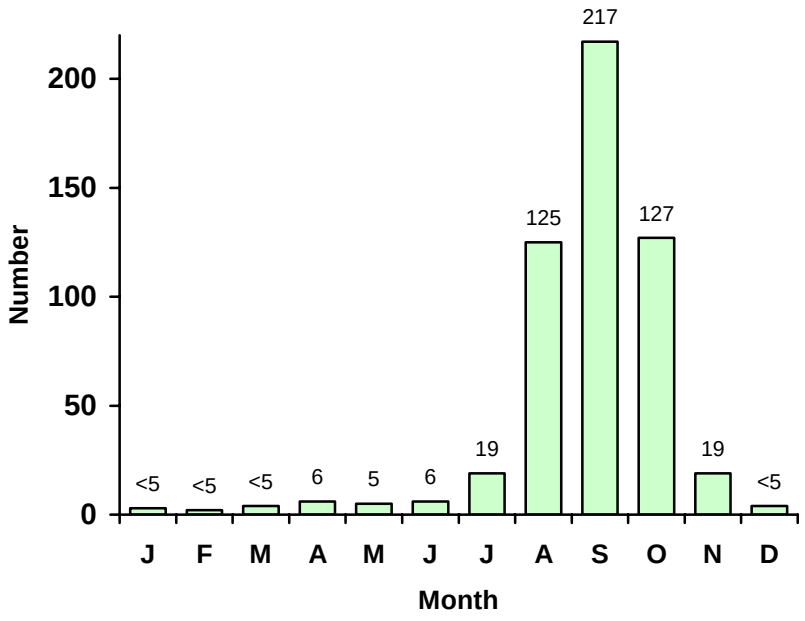
FIGURE 15.6 Hospitalized agricultural machinery injuries involving combines, by fiscal year, April 1990-March 2000 (537 cases)



15.2.3 MONTH

Combine-related hospitalized injuries occurred almost exclusively during harvest season, from August to October.

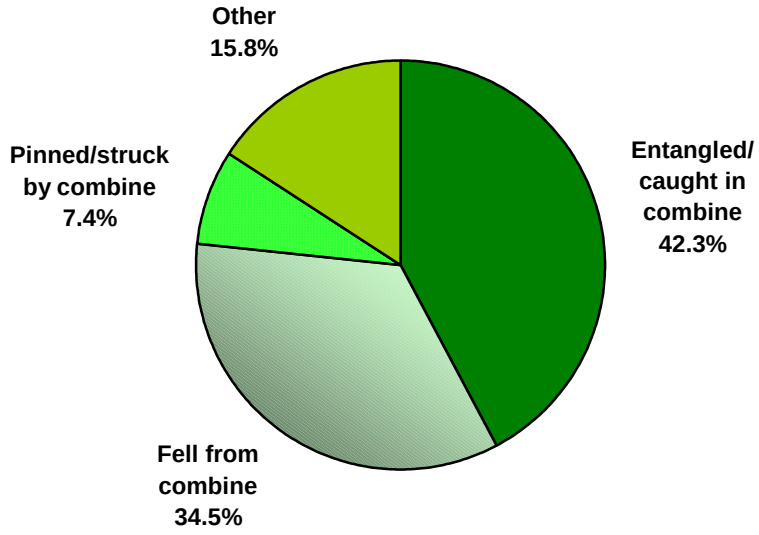
FIGURE 15.7 Hospitalized agricultural machinery injuries involving combines, by month, April 1990-March 2000 (537 cases)



15.2.4 CAUSE

The most common cause of combine-related injury was being entangled or caught in the header mechanism. These injury events often occur when an operator is attempting to clear the mechanism when it has become clogged. A fall from a combine and being struck/pinned by a combine are also common causes of combine-related injury.

FIGURE 15.8 Hospitalized agricultural machinery injuries involving combines, by cause of injury, April 1990-March 2000 (537 cases)



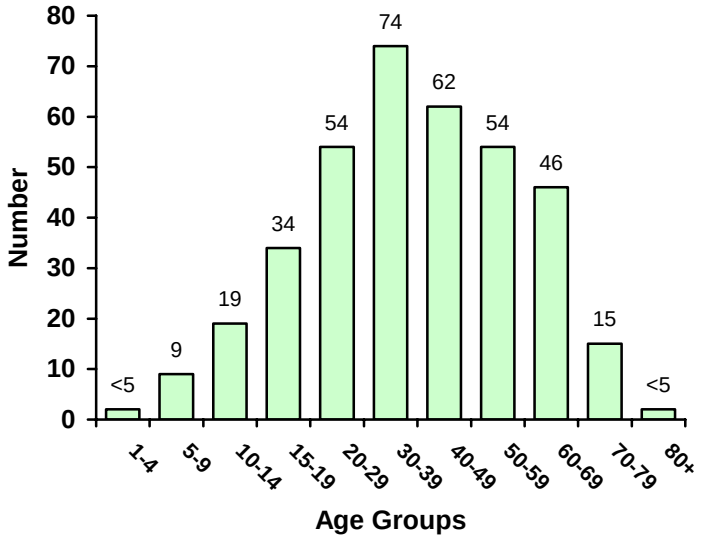
15.3 PTOs

15.3.1 AGE

For the purpose of this report, injuries involving power-take-off devices (PTOs) were considered separately from tractor injuries.

The highest numbers of PTO-related injuries were reported among males aged 20-59.

FIGURE 15.9 **Hospitalized agricultural machine-related injuries involving power-take-off devices, by age group, April 1990-March 2000 (371 cases)**

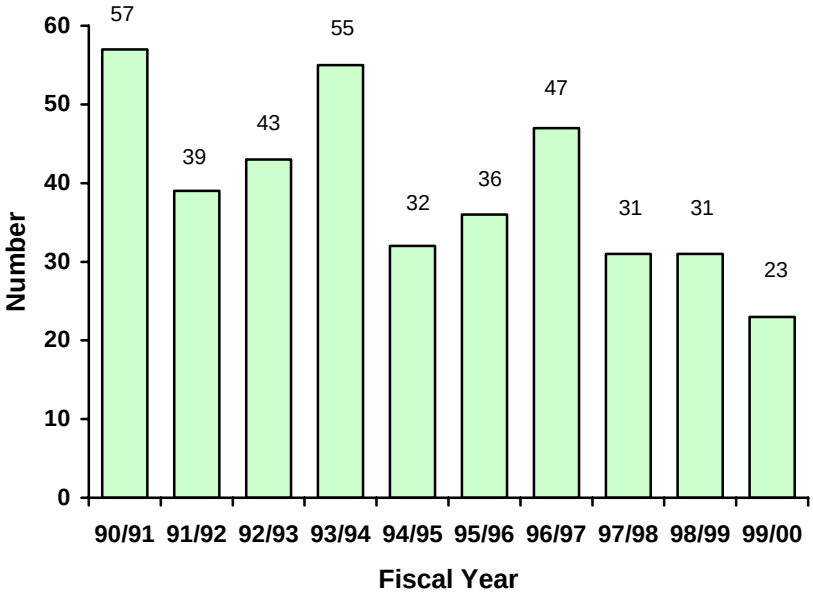


15.3.2 YEAR

There was a wide variation in the annual number of PTO-related injuries reported, but some suggestion of a decrease over time. This trend could be attributed, in part, to a reduction in the proportion of injured persons admitted to hospital relative to the proportion of injured persons who were treated and released.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 10). Imputed values are not included in the total number of cases.

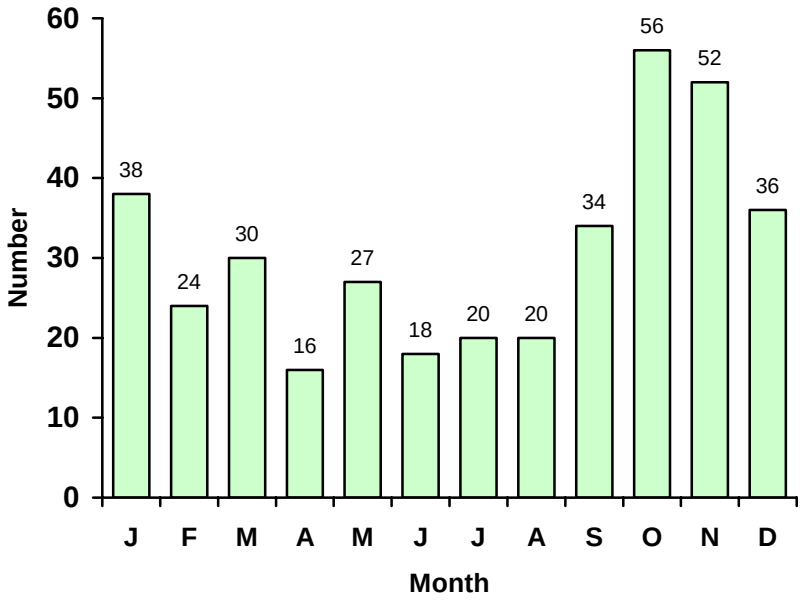
FIGURE 15.10 **Hospitalized agricultural machinery injuries involving power-take-off devices, by fiscal year, April 1990-March 2000 (371 cases)**



15.3.3 MONTH

The monthly distribution of PTO injuries differed from that observed for other types of farm machinery. Peaks in the number of PTO-related hospitalizations were observed in the fall and early winter (October to January).

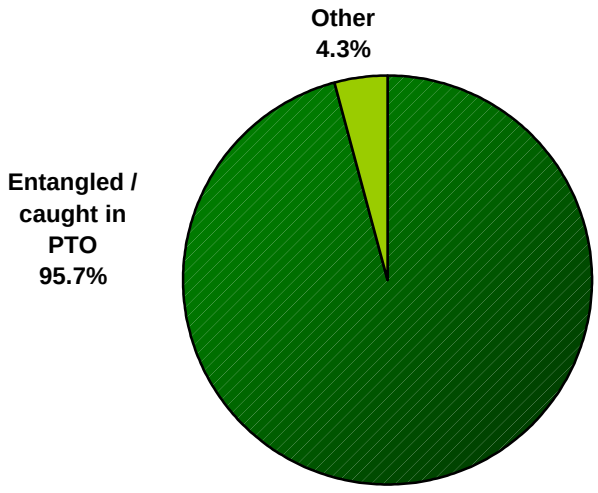
FIGURE 15.11 **Hospitalized agricultural machinery injuries involving power-take-off devices, by month, April 1990-March 2000 (371 cases)**



15.3.4 CAUSE

Almost all PTO-related hospitalized injuries were due to entanglements.

FIGURE 15.12 **Hospitalized agricultural machinery injuries involving power-take-off devices, by cause of injury, April 1990-March 2000 (371 cases)**



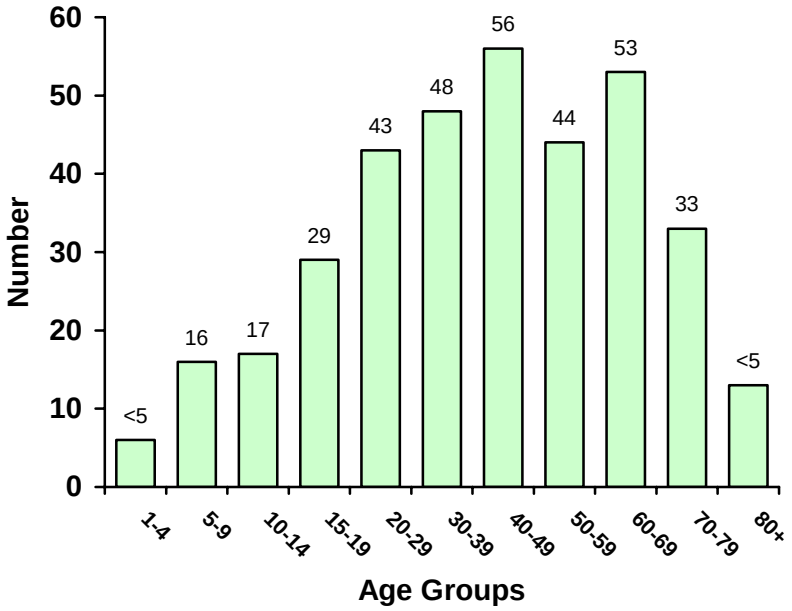
15.4 MOTOR VEHICLES

15.4.1 AGE

Hospitalized motor vehicle injuries mainly occurred among adult males.

These data do not show all motor vehicle injuries, because in most provinces it is difficult to identify farming-related transportation injuries using existing hospital coding.

FIGURE 15.13 Hospitalized agricultural machinery injuries involving motor vehicles, by age group, April 1990-March 2000 (358 cases)

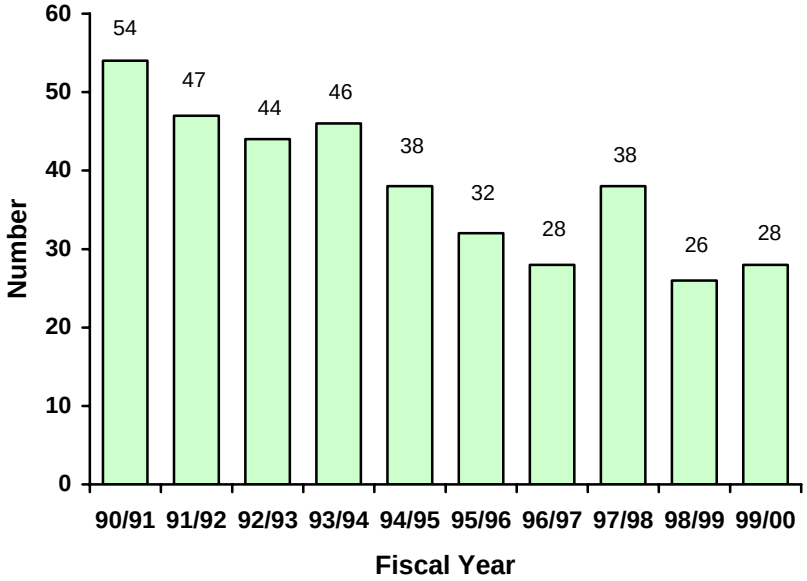


15.4.2 YEAR

There was a moderate decline in the number of hospitalized motor vehicle injuries over the surveillance period. This trend might be due in part to a reduction in the number of patients admitted to hospital relative to the number of patients treated and released.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 10). Imputed values are not included in the total number of cases.

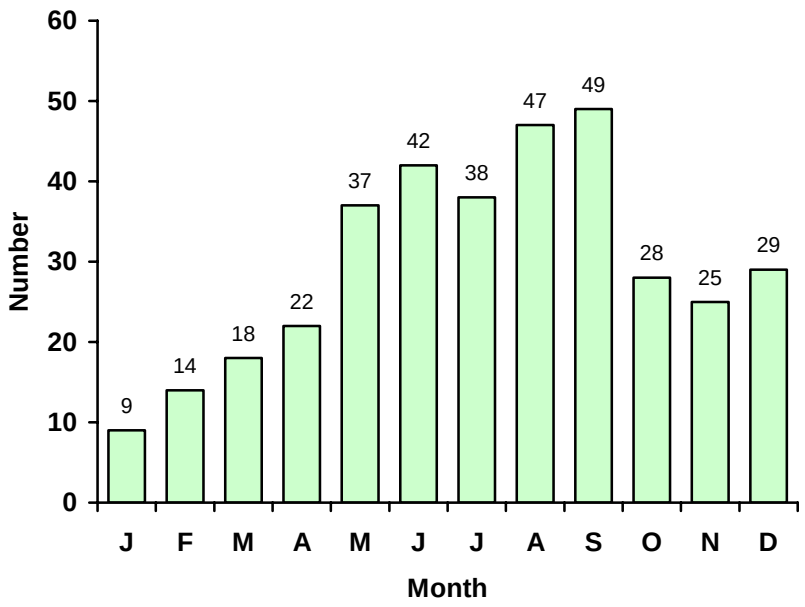
FIGURE 15.14 Hospitalized agricultural machinery injuries involving motor vehicles, by fiscal year, April 1990-March 2000 (358 cases)



15.4.3 MONTH

Motor vehicle injuries were most frequent during the warm weather months of May through September.

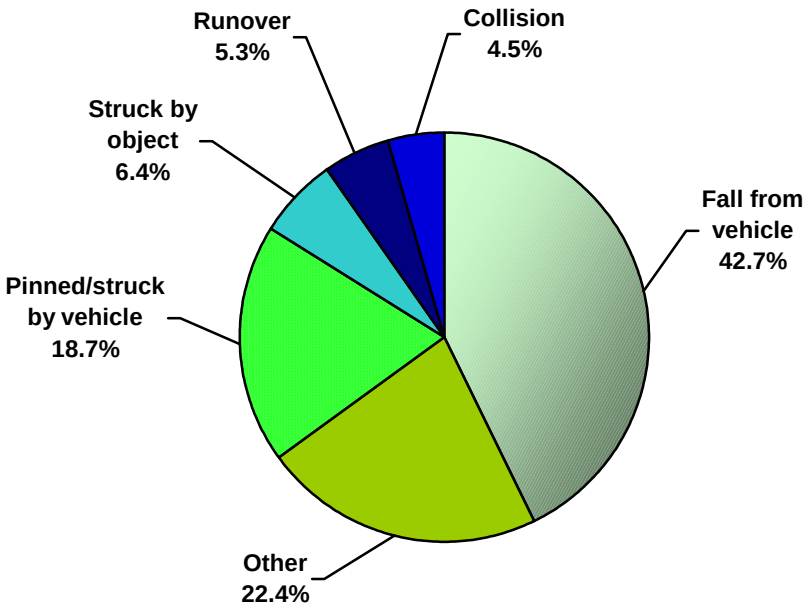
FIGURE 15.15 **Hospitalized agricultural machinery injuries involving motor vehicles, by month, April 1990-March 2000 (358 cases)**



15.4.4 CAUSE

The leading cause of motor vehicle-related hospitalized injuries was a fall (ejection) from a vehicle. These injuries might have been prevented through the use of seat belts and by not permitting people to ride in the back of a pick-up truck.

FIGURE 15.16 **Hospitalized agricultural machinery injuries involving motor vehicles, by cause of injury, April 1990-March 2000 (358 cases)**



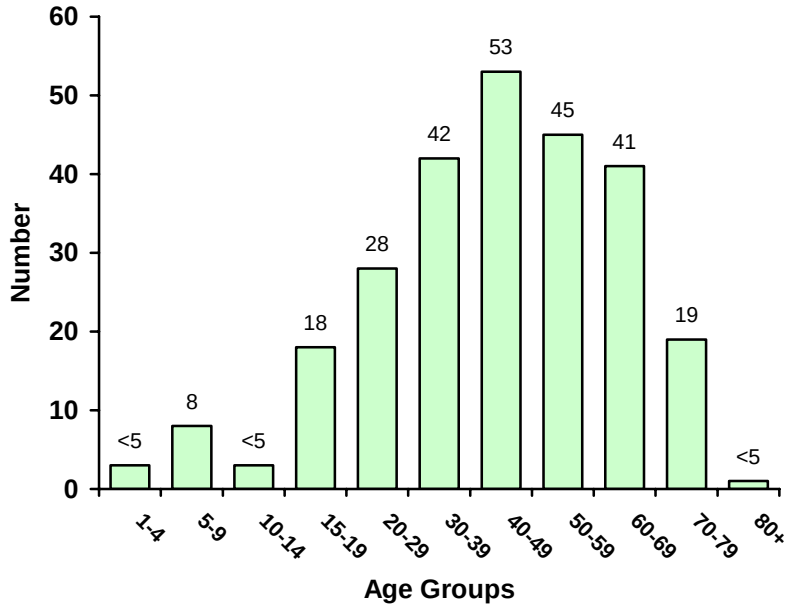
15.5 BALERS

15.5.1 AGE

Baler injuries were most common among adult males.

CAISP is unable to distinguish between injuries caused by round balers and those caused by square balers.

FIGURE 15.17 Hospitalized agricultural machinery injuries involving balers, by age group, April 1990-March 2000 (261 cases)

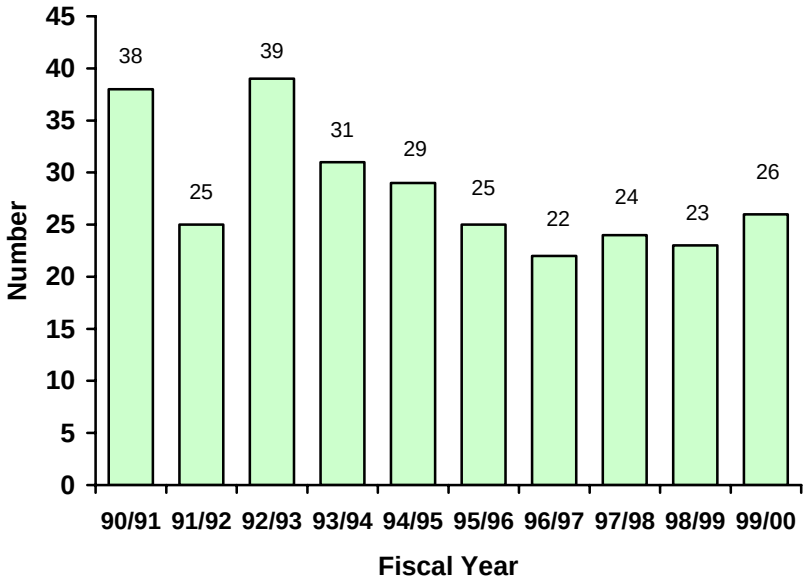


15.5.2 YEAR

There was no clear trend in the annual occurrence of baler-related injuries over the surveillance period.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 9). Imputed values are not included in the total number of cases.

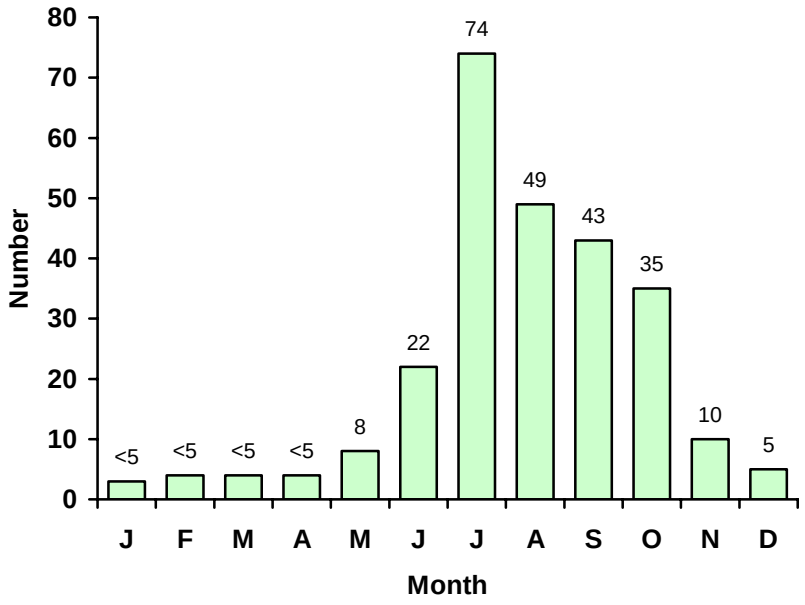
FIGURE 15.18 Hospitalized agricultural machinery injuries involving balers, by fiscal year, April 1990-March 2000 (261 cases)



15.5.3 MONTH

FIGURE 15.19 Hospitalized agricultural machinery injuries involving balers, by month, April 1990-March 2000 (261 cases)

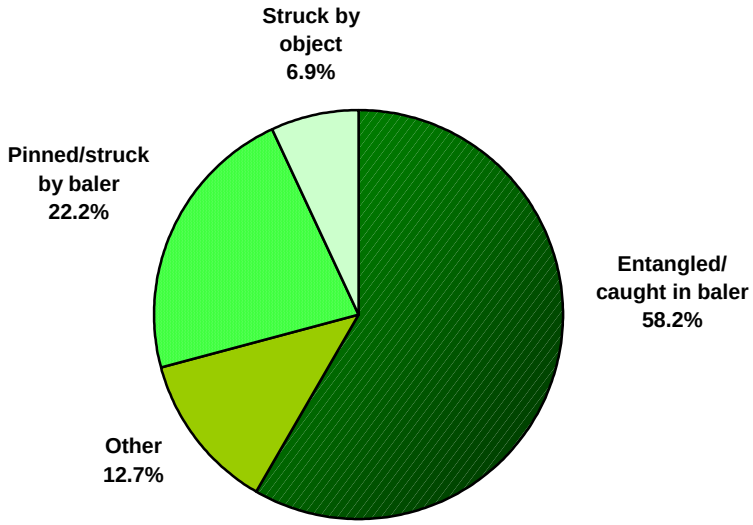
Injuries associated with balers were most common during the months of July through October. This corresponds to haying season activities in Canada, from the first to the last cuts.



15.5.4 CAUSE

FIGURE 15.20 Hospitalized agricultural machinery injuries involving balers, by cause of injury, April 1990-March 2000 (261 cases)

Becoming entangled or caught in an operating mechanism was the most common cause of baler-related injuries. Entanglements involved all forms of baler mechanisms, including large round and conventional square balers. Being pinned or struck by a baler was also an important cause of injury.



16 HOSPITALIZED AGRICULTURAL NON MACHINE-RELATED INJURIES: OVERVIEW

16.1 AGE

In general, the estimated rates of hospitalized, non-machine related injuries increased with increasing age. Persons in the older age groups (20-80+) were over-represented in sustaining hospitalized non machine-related injuries relative to their proportion of the farm population. This was especially true for older adults. The percentage of adults aged 70-79 who were hospitalized was 1.8 times the percentage of adults that age in the farm population. Persons over 79 were most likely to sustain non machine-related injuries. The percentage of adults 80 and over who were hospitalized was 2.6 times the percentage of adults that age in the farm population.

The numbers and rates presented are conservative estimates, due to the incomplete reporting of non machine-related hospitalized injuries in some provinces.

TABLE 16.1 **Hospitalized non machine-related injuries, by age group, April 1990-March 2000 (7,940 cases)**

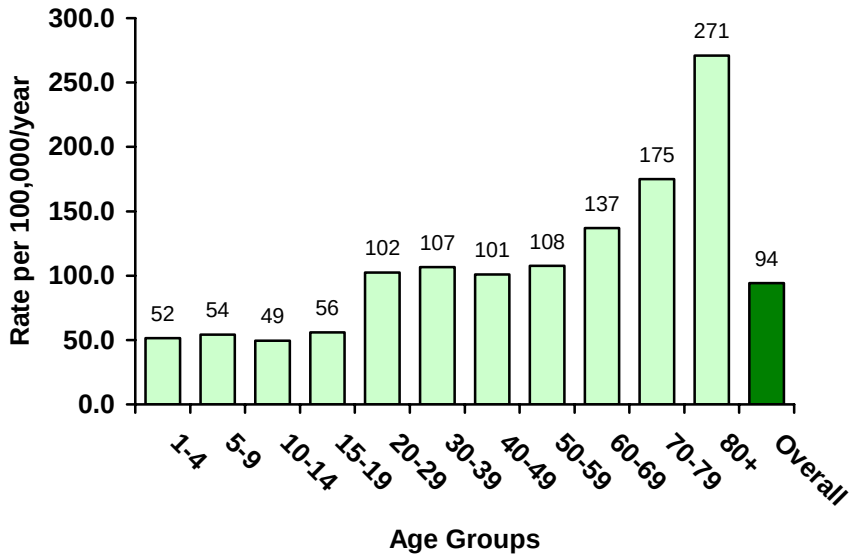
Age Group	Hospitalizations		Farm Population*		Rates per 100,000/year
	No.	%	No.	%	
1-4	223	2.8	43,315	5.1	51.5
5-9	385	4.8	71,035	8.4	54.2
10-14	415	5.2	84,025	10.0	49.4
15-19	450	5.7	80,455	9.6	55.9
20-29	826	10.4	80,775	9.6	102.3
30-39	1,292	16.3	121,230	14.3	106.6
40-49	1,406	17.7	139,425	16.6	100.8
50-59	1,185	14.9	110,135	13.1	107.6
60-69	1,008	12.7	73,620	8.7	136.9
70-79	539	6.8	30,825	3.7	174.9
80+	210	2.6	7,755	0.9	270.8
Total	**7,939**	**100.0**	**842,595**[+]	**100.0**	**94.2**

*Statistics Canada, Census of Agriculture, 1996
[+]Does not include children less than a year old.

16.2 RATES

FIGURE 16.1. Estimated rates (per 100,000 farm population per year) of hospitalized non machine-related injuries, by age group, April 1990-March 2000 (7,940 cases)

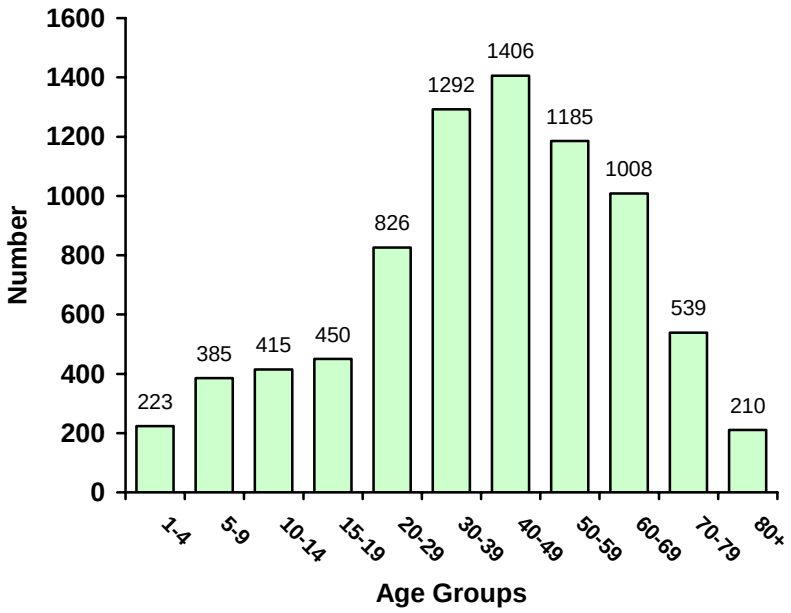
Adults 70 and over clearly experienced the highest frequencies of non machine-related hospitalized injuries.



16.3 COUNTS

FIGURE 16.2 Number of hospitalized non machine-related injuries, by age group, April 1990-March 2000 (7,940 cases)

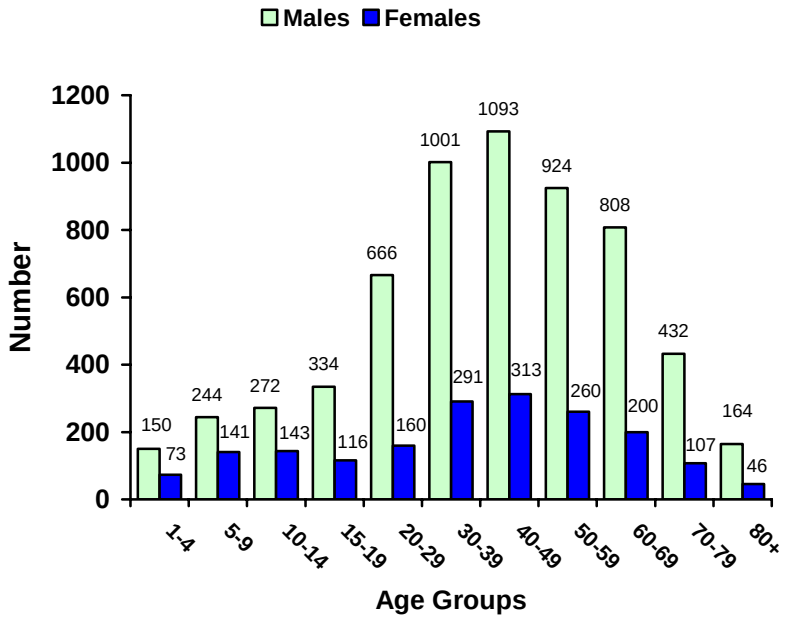
People in all age groups experienced hospitalized non machine-related farm injuries. Most of those injured were adults of working ages.



16.4 AGE AND GENDER

FIGURE 16.3 **Hospitalized non machine-related injuries, by age and gender, April 1990-March 2000 (7,940 cases)**

The number of females injured relative to the number of males injured was higher for non machine-related hospitalizations than it was for machine-related hospitalizations.

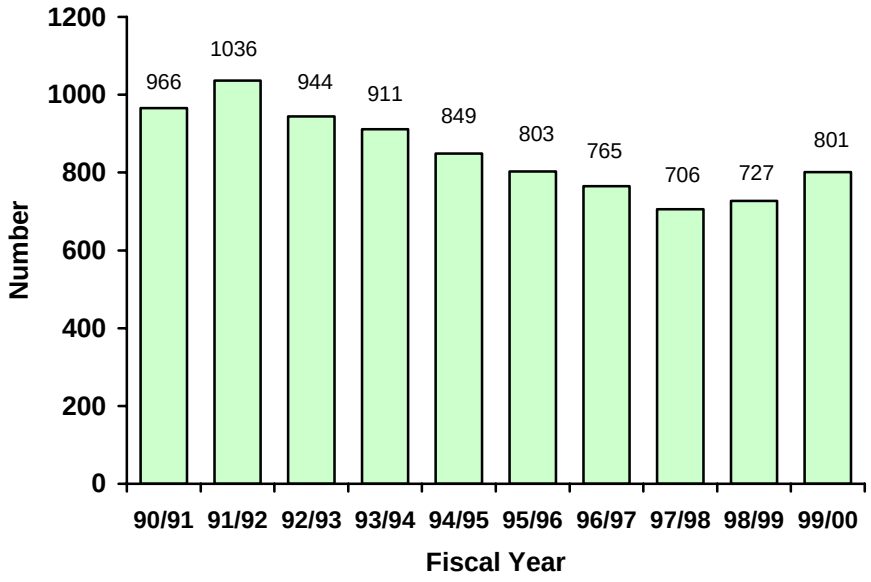


16.5 YEAR

FIGURE 16.4 **Hospitalized non machine-related injuries, by fiscal year, April 1990-March 2000 (7,940 cases)**

There may have been a moderate decline in non machine-related injuries over the surveillance period.

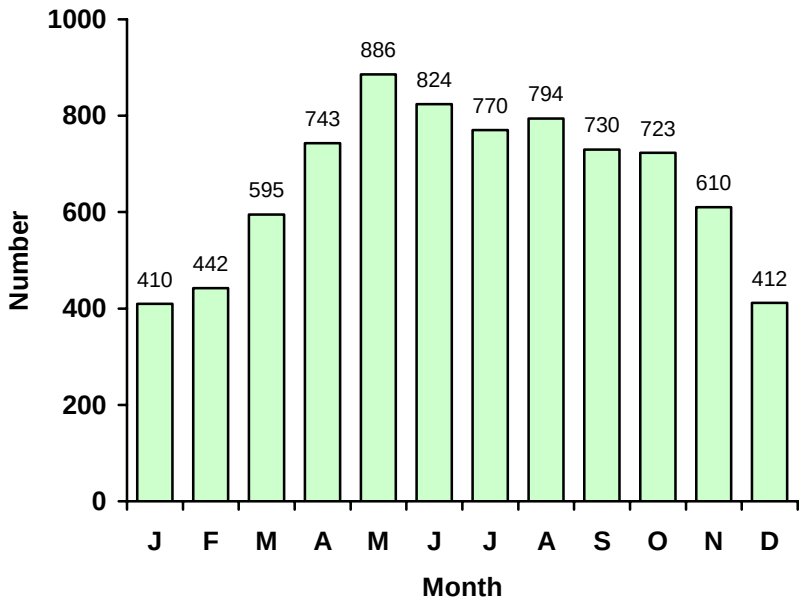
Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 262) and for Nova Scotia from April 1, 1997 to March 31, 2000 (n = 15). Imputed values are not included in the total number of cases.



16.6 MONTH

There were moderate seasonal differences in the frequency of non machine-related injuries, though the seasonal variation was less pronounced than it was for machine-related injuries.

FIGURE 16.5 **Hospitalized non machine-related injuries, by month, April 1990-March 2000 (7,940 cases)**



16.7 PROVINCIAL BREAKDOWN

The majority of non machine-related hospitalized agricultural injuries were identified in provinces west of Ontario. This is likely because "location of injury" is used more widely by hospitals in the Western provinces, so there is more complete identification of non machine-related agricultural injuries in those provinces (sections 2.2.1 and 2.2.3).

TABLE 16.2 Hospitalized non machine-related injuries, by province, April 1990-March 2000 (7,940 cases)

	Hospitalizations		Farms*		Farm Population*	
Province	**No.**	**%**	**No.**	**%**	**No.**	**%**
BC	917	11.5	20,290	8.2	68,100	8.1
AB	2,824	35.6	53,652	21.7	186,260	22.1
SK	1,538	19.4	50,598	20.5	144,265	17.1
MB	760	9.6	21,071	8.5	78,900	9.4
ON	725	9.1	59,728	24.2	219,065	26.0
QC	834	10.5	32,139	13.0	113,385	13.5
NB	246	3.1	3,034	1.3	10,240	1.2
NS	92	1.2	3,923	1.6	12,960	1.5
PE	<5	0.1	1,845	0.7	7,745	0.9
NL	**		643	0.2	1,675	0.2
Canada	**7,940**	**100.0**	**246,923**	**100.0**	**842,595**[+]	**100.0**

*Statistics Canada, Census of Agriculture, 1996.
** Not available.
[+]Does not include children less than a year old.

16.8 PRIMARY DIAGNOSIS

TABLE 16.3 Hospitalized non machine-related injuries, by primary diagnosis and age group, April 1990-March 2000 (7,940 cases)

Diagnostic Code*	Description of Diagnostic Code	Total (%)	Age Group 1-14	15-59	60+
800-804	Fracture: skull	379 (4.8)	7.8	4.8	2.8
805-809	Fracture: spine and trunk	701 (8.8)	1.4	8.6	13.8
810-819	Fracture: upper limb	868 (10.9)	21.1	10.2	7.3
820-829	Fracture: lower limb	1,277 (16.1)	8.9	15.0	23.4
830-839	Dislocation	259 (3.3)	0.8	3.9	2.7
840-848	Sprains and strains of joints and adjacent muscles	456 (5.7)	0.7	6.7	6.0
850-854	Intracranial injury (excludes skull fracture)	630 (7.9)	17.7	6.5	6.4
860-869	Internal injury of chest, pelvis, and abdomen	255 (3.2)	2.4	3.3	3.5
870-879	Open wound: head, neck, and trunk	214 (2.7)	5.4	2.5	1.7
880-887	Open wound: upper limb	280 (3.5)	1.8	4.4	2.1
890-897	Open wound: lower limb	206 (2.6)	3.1	2.8	1.7
900-904	Injury to blood vessels	19 (0.2)	0.0	0.3	0.3
910-919	Superficial injury	64 (0.8)	1.1	0.9	0.6
920-924	Contusion with intact skin surface	418 (5.3)	4.0	5.3	5.9
925-929	Crushing injury	48 (0.6)	0.3	0.7	0.4
940-949	Burns	285 (3.6)	5.9	3.4	2.8
950-957	Injury to nerves and spinal cord	33 (0.4)	0.1	0.5	0.3
958-959	Certain traumatic complications and unspecified injuries	257 (3.2)	2.6	3.4	3.2
	Other	1,206 (15.2)	14.0	15.8	14.3
	Missing	84 (1.1)	1.1	1.1	1.0
	%	**100.0**	**100.0**	**100.0**	**100.0**
	Total number of cases	**7,939**	**1,023**	**5,159**	**1,757**

* Based on the nature of injury code from: World Health Organization. Manual of the International Classification of Diseases, Injuries, and Causes of Death [9th Revision]. Geneva, Switzerland, 1977.

Among children, the leading primary diagnoses were fractures to the upper limbs followed by intracranial injuries, lower limb fractures and skull fractures. In both the 15-59 and 60 and over age groups, fractures to the lower limbs were the most common primary diagnosis. This was followed by fractures to the upper limbs in the younger adults and fractures to the spine and trunk in the older adults.

The percentage of injuries diagnosed as skull and upper limb fractures, intracranial injuries, open wounds to the head, neck and trunk, and burns decreased with increasing age, whereas the percentage of injuries diagnosed as fractures to the spine and trunk, fractures to the lower limb, sprains/strains, and contusions increased with increasing age.

16.9 CAUSE OF INJURY AND AGE GROUP

TABLE 16.4 Hospitalized non machine-related injuries, by cause of injury and age group, April 1990-March 2000 (7,940 cases)

Cause of Injury	Total (%)	Age Group 1-14	15-59	60+
		Percentage of age total		
Animal-related	2,799 (35.3)	29.1	36.5	35.2
Fall from height	1,546 (19.5)	34.8	16.8	18.4
Struck by object	1,000 (12.6)	8.1	14.1	10.8
Struck against object	285 (3.6)	5.7	3.6	2.4
Fall on the same level	649 (8.2)	3.6	6.2	16.6
Overexertion	431 (5.4)	0.2	6.5	5.2
Contact with toxic substances	454 (5.7)	6.5	6.4	3.3
Exposure to fire	210 (2.6)	3.5	2.5	2.6
Caught in/under/between objects	197 (2.5)	2.0	2.7	2.2
Exposure to temperature extremes	66 (0.8)	1.5	0.6	1.0
Exposure to electric current	40 (0.5)	0.1	0.7	0.2
Other	194 (2.4)	4.7	2.3	1.5
Unknown	68 (0.9)	0.2	1.1	0.6
%	**100.0**	**100.0**	**100.0**	**100.0**
Total number of cases	**7,939**	**1,023**	**5,159**	**1,757**

In children, most hospitalized non machine-related injuries were due to falls from height. The next most frequent cause of injury in children was animal-related. In persons aged 15-59, animals were the most common cause of hospitalized injuries, followed by falls from height and being struck by an object. In adults aged 60 and over, animals and falls from height were the leading causes of injury, followed by falls on the same level.

16.10 LENGTH OF STAY IN HOSPITAL BY PRIMARY DIAGNOSIS

TABLE 16.5 Hospitalized non machine-related related agricultural injuries, by primary diagnosis and total length of hospital stay, April 1990-March 2000 (7,940 cases)

Diagnostic Code*	Description of Diagnostic Code	Length of Stay (days)**		
		Median	Mean	Standard Deviation
900-904	Injury to blood vessels	6	5.5	4.8
805-809	Fracture: spine and trunk	5	9.6	22.0
820-829	Fracture: lower limb	4	6.8	10.3
860-869	Internal injury of chest, pelvis, and abdomen	4	6.1	6.2
940-949	Burns	4	9.0	15.2
890-897	Open wound: lower limb	3	4.8	4.6
800-804	Fracture: skull	2	5.2	10.4
840-848	Sprains / strains of joints and adjacent muscles	2	3.4	3.0
870-879	Open wound: head, neck, and trunk	2	3.3	3.0
880-887	Open wound: upper limb	2	2.7	2.9
910-919	Superficial injury	2	3.4	3.7
920-924	Contusion with intact skin surface	2	3.0	3.1
925-929	Crushing injury	2	3.7	3.6
950-957	Injury to nerves and spinal cord	2	3.8	6.0
958-959	Certain traumatic complications and unspecified injuries	2	4.1	5.1
810-819	Fracture: upper limb	1	2.4	3.0
830-839	Dislocation	1	2.9	6.6
850-854	Intracranial injury, excluding skull fracture	1	2.7	6.5
	Other / missing	2	5.2	12.6
	Overall	**2**	**5.0**	**10.7**

* Based on the nature of injury code from: World Health Organization. Manual of the International Classification of Diseases, Injuries, and Causes of Death [9th Revision]. Geneva, Switzerland, 1977.
** Length of stay includes subsequent admissions for the treatment of the incident injury.

Median lengths of stay in hospital for the treatment of non machine-related injuries varied from 1 to 6 days for a typical hospitalized case. Injuries to blood vessels, fractures to the spine and trunk, burns, fractures to the lower limb and internal injuries of the chest, pelvis and abdomen required the longest hospital stays.

16.11 LENGTH OF STAY IN HOSPITAL BY CAUSE OF INJURY

TABLE 16.6 **Hospitalized non machine-related related agricultural injuries, by cause of injury and total length of hospital stay, April 1990-March 2000 (7,940 cases)**

Cause of Injury	Length of Stay (days)*		
	Median	Mean	Standard Deviation
Exposure to fire	4	10.8	18.2
Fall from height	3	6.3	17.0
Struck against object	3	4.1	4.2
Fall on the same level	3	6.4	11.7
Exposure to temperature extremes	3	5.7	6.1
Animal-related	2	4.3	7.0
Struck by object	2	4.7	8.5
Overexertion	2	4.0	5.7
Caught in/under/between objects	2	6.0	12.8
Other	2	4.3	7.7
Unknown	2	4.1	7.6
Contact with toxic substances	1	2.2	3.6
Exposure to electric current	1	5.2	7.7
Overall	2	5.0	10.7

* Length of stay includes subsequent admissions for the treatment of the incident injury.

The relative severities of the different causes of non machine-related injuries can be inferred from the median and mean lengths of hospital stay. Exposure to fire, falls from height and falls on the same level appeared to result in the most serious injuries.

For these data, the median is a better indicator of central tendency than the mean, because the mean is weighted by a small number of very long hospital stays.

16.12 CAUSE OF INJURY AND GENDER

FIGURE 16.7 **Hospitalized non machine-related injuries, by cause of injury and gender, April 1990-March 2000 (7,940 cases)**

	Total		Gender			
			Males		Females	
Cause of Injury	**No.**	**Percent**	**No.**	**Percent**	**No.**	**Percent**
Animal-related	2,799	35.3	1,980	32.5	819	44.3
Fall from height	1,546	19.5	1,258	20.7	288	15.6
Fall on the same level	648	8.2	377	6.2	271	14.6
Struck by object	1,000	12.6	863	14.2	137	7.4
Overexertion	431	5.4	353	5.8	78	4.2
Contact with toxic substances	454	5.7	374	6.1	80	4.3
Struck against object	285	3.6	231	3.8	54	2.9
Exposure to fire	210	2.6	187	3.1	23	1.2
Caught in/under/between objects	197	2.5	169	2.8	28	1.5
Exposure to temperature extremes	66	0.8	52	0.9	14	0.8
Exposure to electric current	40	0.5	34	0.6	6	0.3
Other	194	2.4	154	2.5	40	2.2
Unknown	68	0.9	56	0.9	12	0.6
Total	**7,938**	**100**	**6,088**	**100**	**1,850**	**100**

For males, the leading causes of non machine-related hospitalized injuries were animals, falls from height and being struck by an object. For females, animals were the leading cause of injury, followed by falls from height and falls on the same level.

16.13 NATURE AND CAUSE OF INJURY

TABLE 16.8 **Hospitalized non machine-related injuries, by cause and nature of injury, April 1990-March 2000 (7,170 cases)**

	Nature of Injury								
Cause of Injury	**Fracture**	**Open wound**	**Soft tissue injury**	**Crushing injury**	**Intracranial injury**	**Internal Injury**	**Dislocation**	**Other**	**Total**
Animal-related	1,211	214	400	20	284	163	106	402	2,800
Fall from height	996	31	95	1	179	50	33	161	1,546
Struck by /against object	382	337	75	9	119	29	20	314	1,285
Fall on the same level	409	27	56	0	33	5	30	89	649
Overexertion	36	1	215	1	0	1	52	125	431
Caught in/under or between objects	95	42	11	17	2	3	3	24	197
Other	73	31	9	0	4	4	10	63	194
Unknown	18	11	6	0	8	0	5	20	68
Total number of cases	**3,220**	**694**	**867**	**48**	**629**	**255**	**259**	**1,198**	**7,170***

Animals were the leading cause of all of the types of injuries listed except for open wounds, which were largely due to being struck by or struck against an object. For fractures, other important causes of injury were falls from height and falls on the same level. Overexertion was an important cause of soft tissue injuries and crush injuries were due almost equally to animals and being caught in, under and between objects.

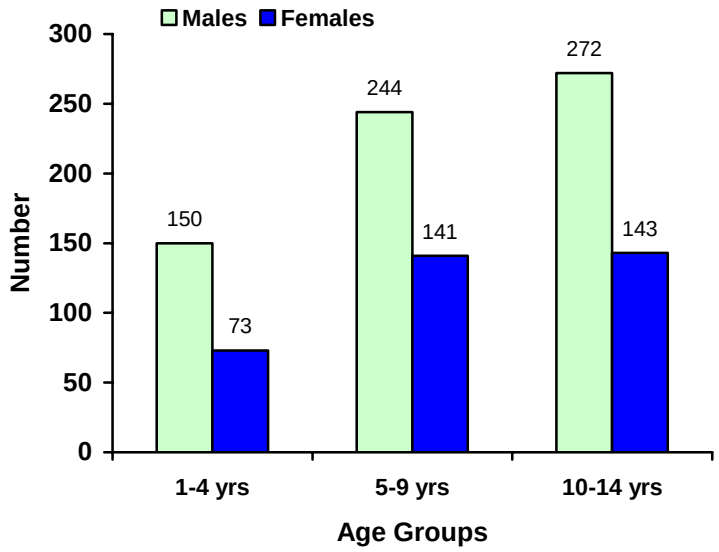
* Some non machine-related injuries are not shown in this table. These include exposure to: toxic substances (454), fire (210), extreme temperatures (66), and electric current (40). The “nature of injury” values listed for cases of exposure to toxic substances included poisoning, allergic reactions, tightness and swelling and reaction to inhalants. The nature of injury listed for almost all injuries caused by fire was “burns”. The nature of injury values listed for cases of exposure to extreme temperatures included frostbite, hypothermia, burns, heat exhaustion and heat stroke. For exposure to electric current, the nature of injury values listed included burns, electric shock and electrocution.

17 HOSPITALIZED AGRICULTURAL NON MACHINE-RELATED INJURIES: AGES 1-14

17.1 AGE AND GENDER

In children aged 1-14, the ratio of males injured to females injured ranged from 1.7:1 to 2:1. In the older age groups, the number of males injured far exceeded the number of females injured.

FIGURE 17.1 **Hospitalized non machine-related injuries among children (1-14), by age and gender, April 1990-March 2000 (1,023 cases)**

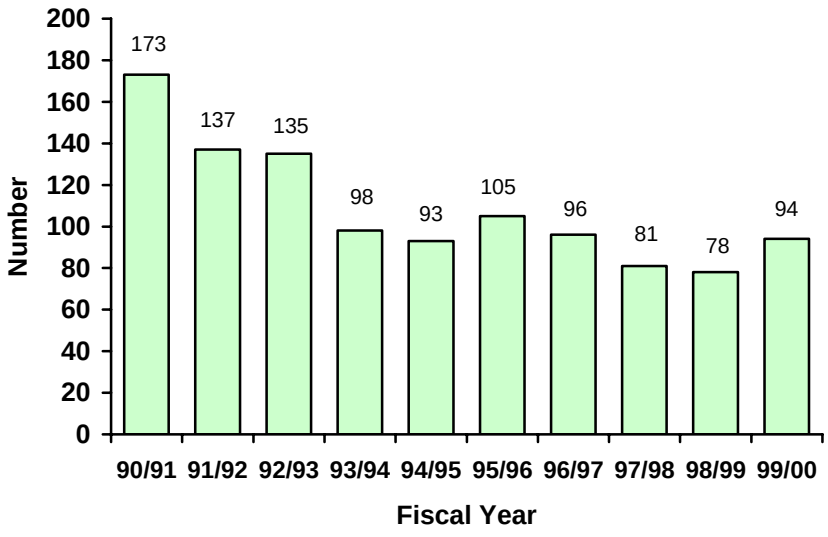


17.2 YEAR

The annual number of non machine-related hospitalizations appeared to decrease over the surveillance period. A peak of 173 hospitalized injuries was observed in the first year of surveillance. The decrease in the number of hospitalized injuries could be attributed, in part, to a reduction in the number of injured persons admitted to hospital relative to the number who are treated and released.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 32). Imputed values are not included in the total number of cases.

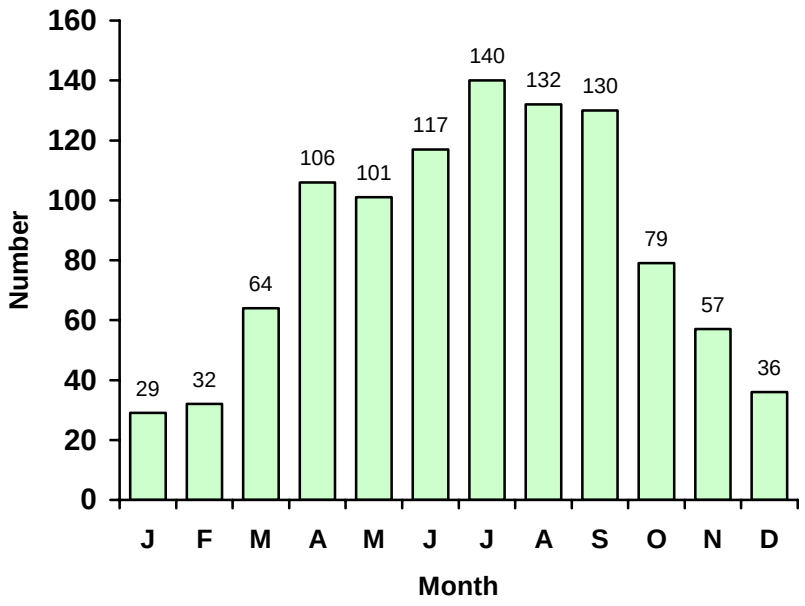
FIGURE 17.2 **Hospitalized non machine-related injuries among children (1-14), by fiscal year, April 1990-March 2000 (1,023 cases)**



17.3 MONTH

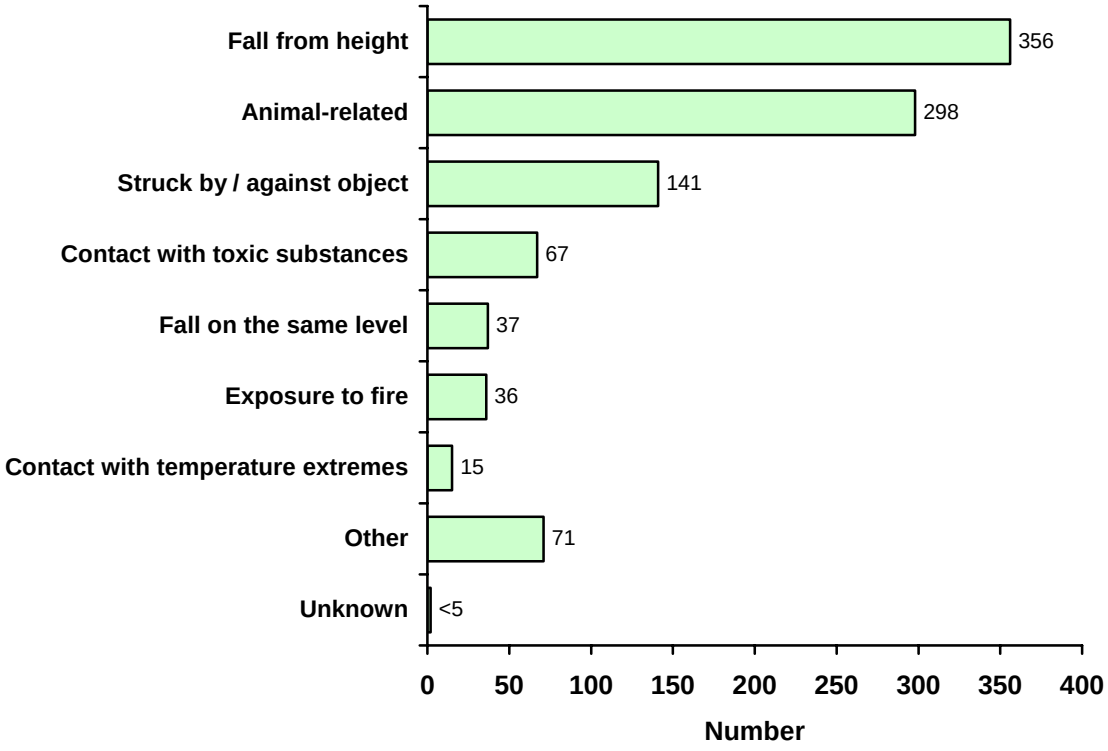
There were greater numbers of hospitalized non machine-related injuries during the warm weather months of April to September. The highest numbers of injuries occurred in July and August, when older children are out of school.

FIGURE 17.3 **Hospitalized non machine-related injuries among children (1-14), by month, April 1990-March 2000 (1,023 cases)**



17.4 CAUSE OF INJURY

FIGURE 17.4 **Hospitalized non machine-related injuries among children (1-14), by cause of injury, April 1990-March 2000 (1,023 cases)**



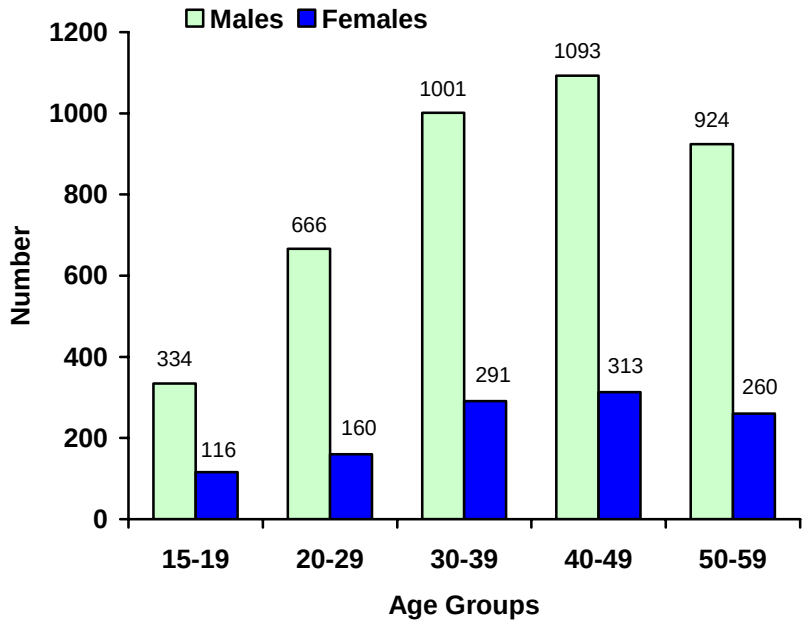
Falls from height and animal-related injuries were the most common causes of non machine-related hospitalized injuries in children.

18 HOSPITALIZED AGRICULTURAL NON-MACHINE-RELATED INJURIES: AGES 15-59

18.1 AGE AND GENDER

For this age group, the number of hospitalized agricultural non-machine related injuries to males far exceeded the number of injuries to females, especially in persons aged 20-29, where the ratio was 4.2:1.

FIGURE 18.1 **Hospitalized non-machinery injuries among adults (15-59), by age and gender, April 1990-March 2000 (5,159 cases)**

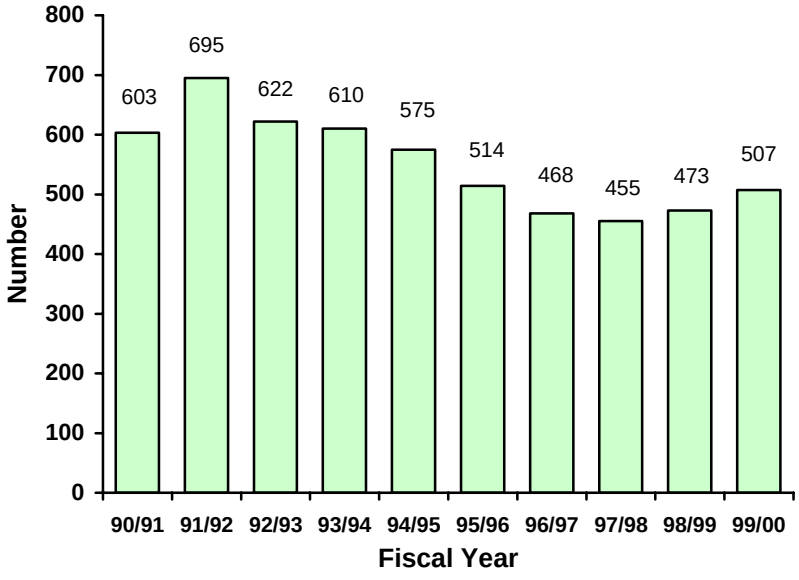


18.2 YEAR

In persons aged 15-59, there was no consistent trend in the occurrence hospitalized agricultural non machine-related injuries over the surveillance period.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 167) and for Nova Scotia from April 1, 1997 to March 31, 2000 (n = 10). Imputed values are not included in the total number of cases.

FIGURE 18.2 **Hospitalized non-machinery injuries among adults (15-59), by fiscal year, April 1990-March 2000 (5,159 cases)**

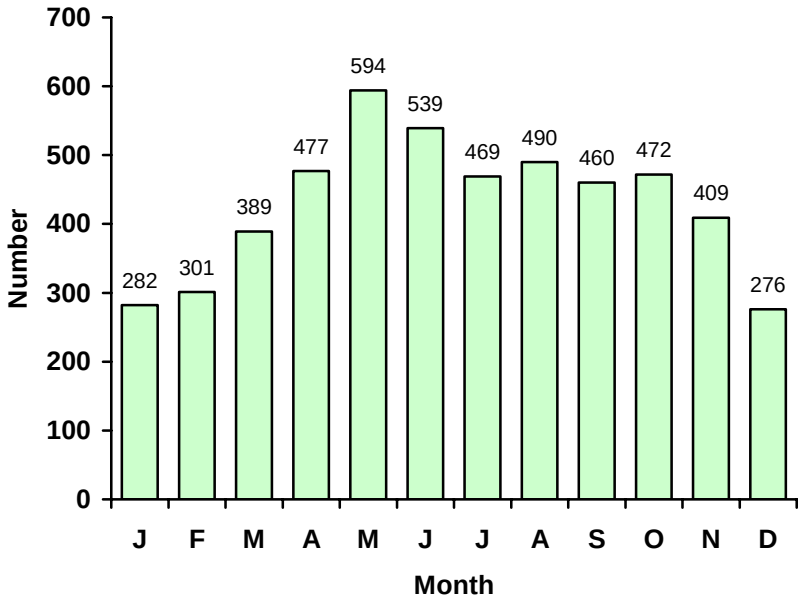


18.3 MONTH

In persons aged 15-59, greater numbers of hospitalized non machine-related injuries occurred during the warmer months of April to November, but this seasonal increase in injuries was far less pronounced than it was for machine-related injuries.

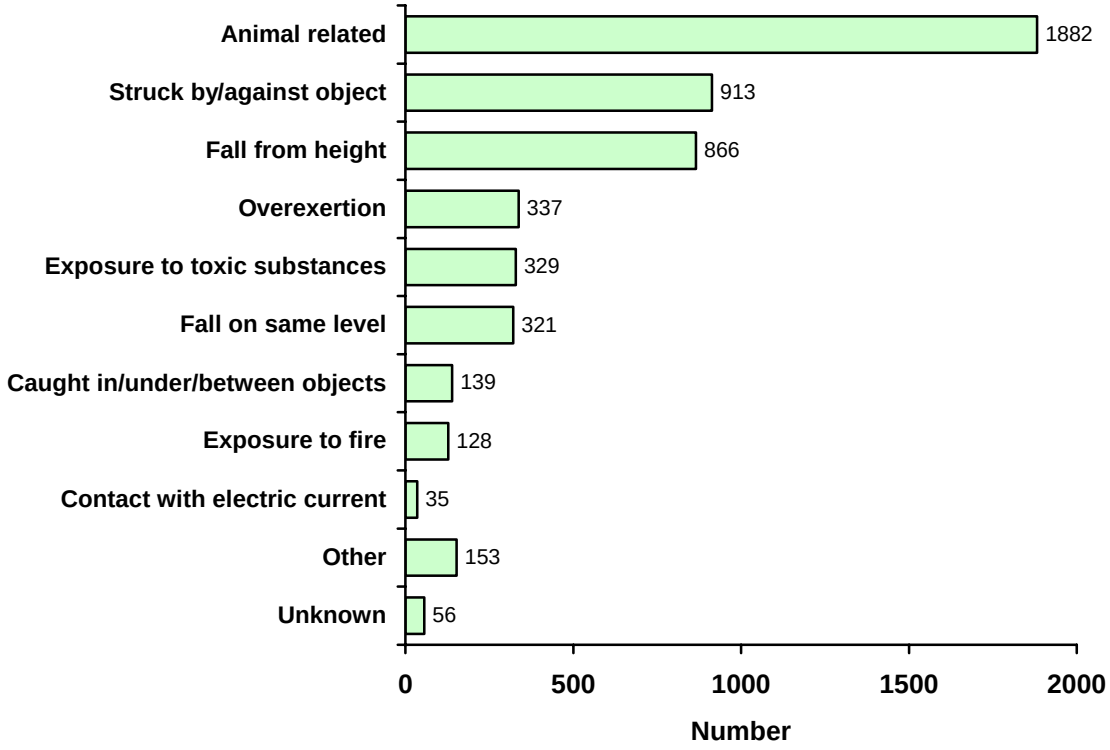
Seasonal changes in the number of injuries were less pronounced in this age group than they were in children. This is likely due to the greater exposure of school-aged children to agricultural hazards during the summer months.

FIGURE 18.3 **Hospitalized non-machinery injuries among adults (15-59), by month, April 1990-March 2000 (5,159 cases)**



18.4 CAUSE OF INJURY

FIGURE 18.4 **Hospitalized non-machinery injuries among adults (15-59), by cause of injury, April 1990-March 2000 (5,159 cases)**



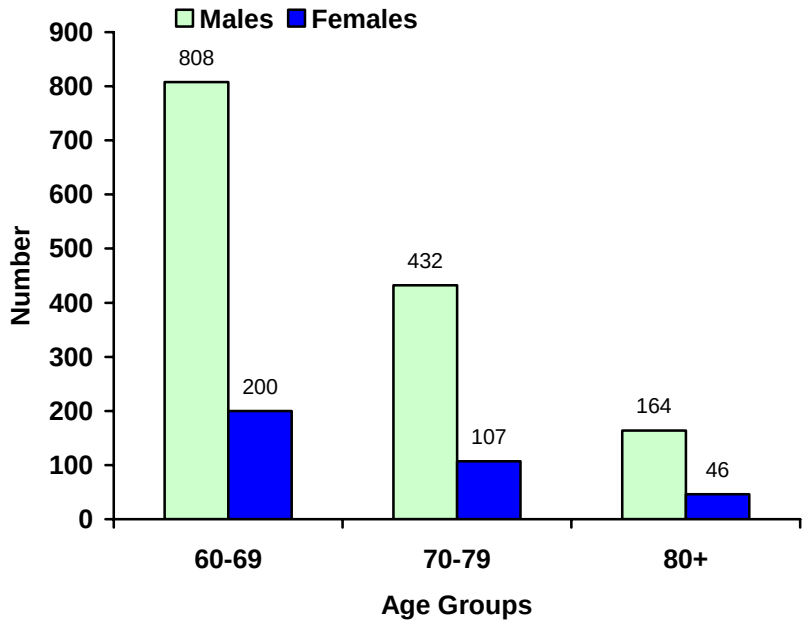
The leading causes of non machine-related hospitalized injuries among persons aged 15-59 were animal-related trauma, being struck by or struck against an object, and falls from height.

19 HOSPITALIZED AGRICULTURAL NON MACHINE-RELATED INJURIES: AGES 60+

19.1 AGE AND GENDER

In adults aged 60 and over, the number of hospitalized non machine-related injuries to males exceeded the number of injuries to females by a ratio of about 4:1.

FIGURE 19.1 **Hospitalized non-machinery injuries among older adults (60+), by age and gender, April 1990-March 2000 (1,757 cases)**

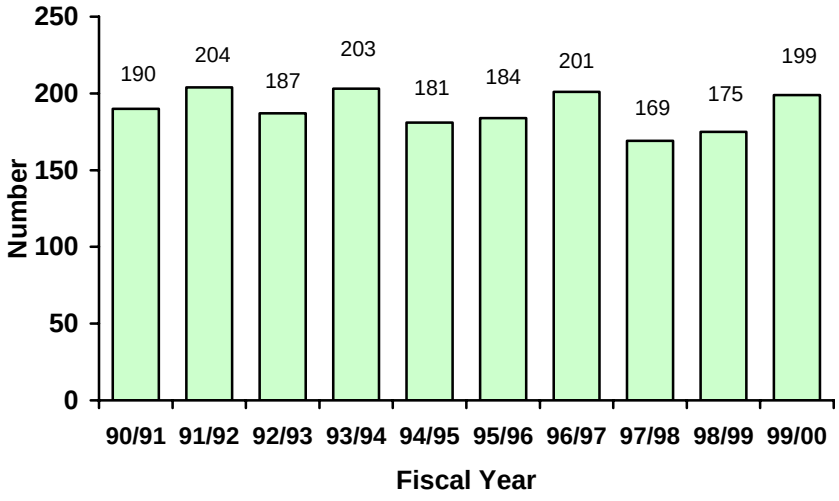


19.2 YEAR

In persons aged 60 and over, there was no consistent trend in the occurrence of hospitalized agricultural non machine-related injuries over the surveillance period.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 62). Imputed values are not included in the total number of cases.

FIGURE 19.2 **Hospitalized non-machinery injuries among older adults (60+), by fiscal year, April 1990-March 2000 (1,757 cases)**

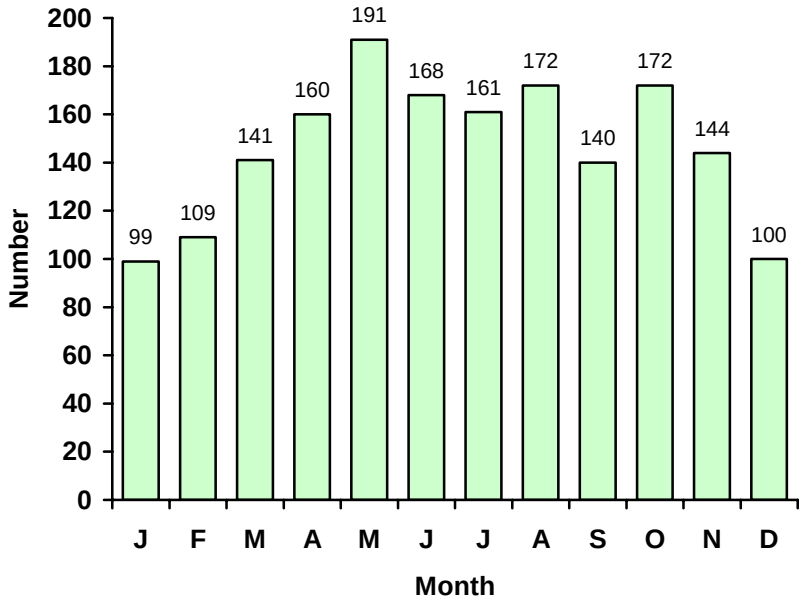


19.3 MONTH

In persons 60 and over, greater numbers of hospitalized non machine-related injuries occurred from March to November, but seasonal changes in the numbers of injuries were less pronounced than they were for machine-related hospitalized injuries.

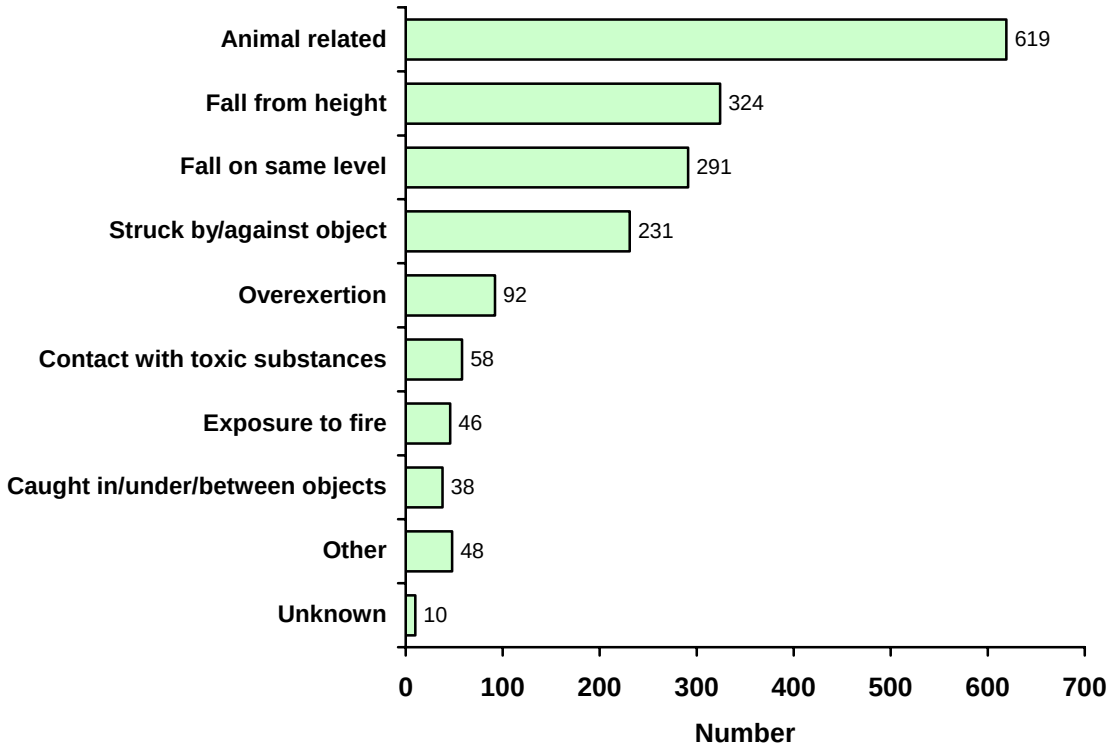
Seasonal variation in the numbers of injuries was again less apparent in this age group than it was in children 14 and under.

FIGURE 19.3 **Hospitalized non-machinery injuries among older adults (60+), by month, April 1990-March 2000 (1,757 cases)**



19.4 CAUSE OF INJURY

FIGURE 19.4 **Hospitalized non-machinery injuries among older adults (60+) by cause of injury, April 1990-March 2000 (1,757 cases)**



For persons aged 60 and over, the leading two causes of hospitalized non machine-related injuries were animal-related trauma and falls from height, as they were for the 15-59 year age group. Unlike younger adults and children, falls on the same level became a major cause of hospitalized injury for persons 60 and over. The number of injuries resulting from falls on the same level even exceeded the number of injuries due to being struck by or against an object.

20 HOSPITALIZED AGRICULTURAL NON MACHINE-RELATED INJURIES: ANIMALS

20.1 AGE

Animal-related injuries were relatively uncommon among children. Persons in the older age groups (20-80+) sustained more hospitalized animal-related injuries than would be expected given their representation in the farm population. This was especially true for adults 70 and over. Many of the injuries to older adults involved cows and bulls.

TABLE 20.1 Hospitalized non-machinery Injuries involving animals, by age, April 1990-March 2000 (2,800 cases)

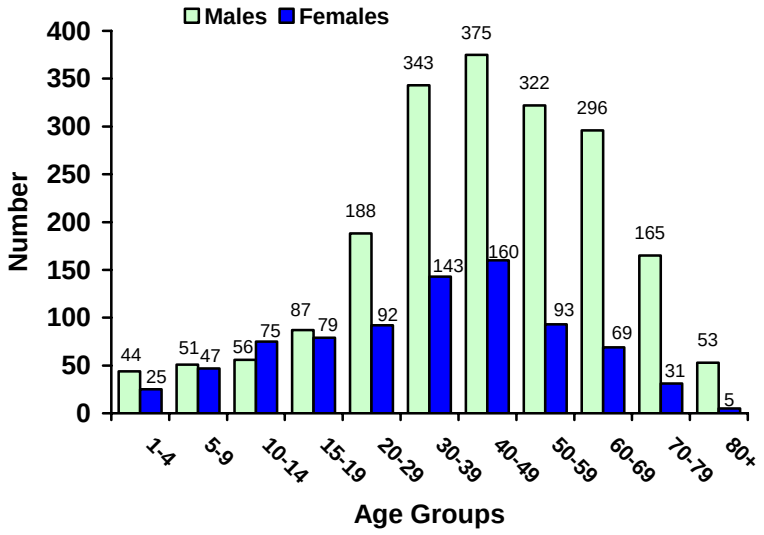
Age Group	Hospitalizations No.	Hospitalizations %	Farm Population* No.	Farm Population* %
1-4	69	2.5	43,315	5.1
5-9	98	3.5	71,035	8.4
10-14	131	4.7	84,025	10.0
15-19	166	5.9	80,455	9.6
20-29	280	10.0	80,775	9.6
30-39	486	17.3	121,230	14.3
40-49	535	19.1	139,425	16.6
50-59	415	14.8	110,135	13.1
60-69	365	13.0	73,620	8.7
70-79	196	7.0	30,825	3.7
80+	58	2.1	7,755	0.9
Total	**2,799****	**100.0**	**842,595+**	**100.0**

* Statistics Canada, Census of Agriculture, 1996.
** Age is missing for one case.
+ Does not include children less than a year old.

20.2 AGE AND GENDER

Among children and youth, animal-related injuries were unique in that almost equal numbers of injuries were reported for males and females. In the 10-14 age group, the number of injuries to females actually exceeded the number of injuries to males. 68% of the injuries to females in that age group involved horses.

FIGURE 20.1 Hospitalized non-machinery injuries involving animals, by age and gender, April 1990-March 2000 (2,800 cases)

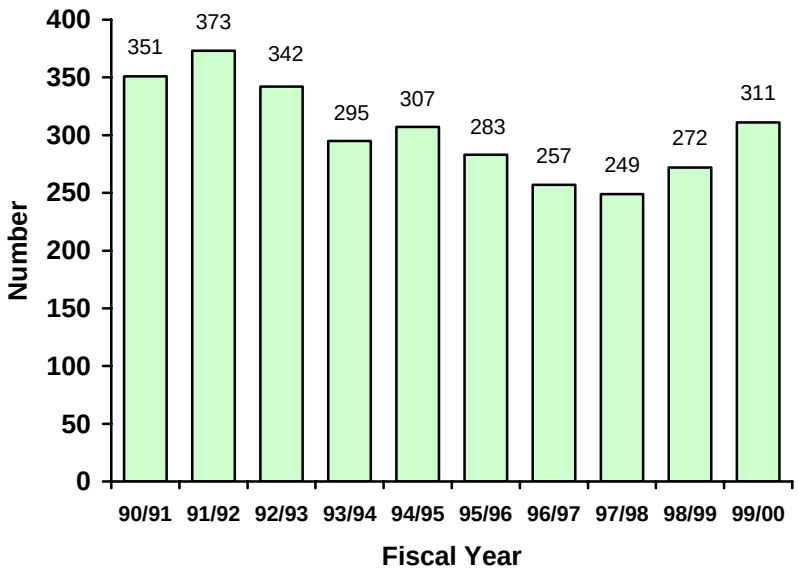


20.3 YEAR

There was no clear trend in the annual occurrence of animal-related injuries over the surveillance period.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 116). Imputed values are not included in the total number of cases.

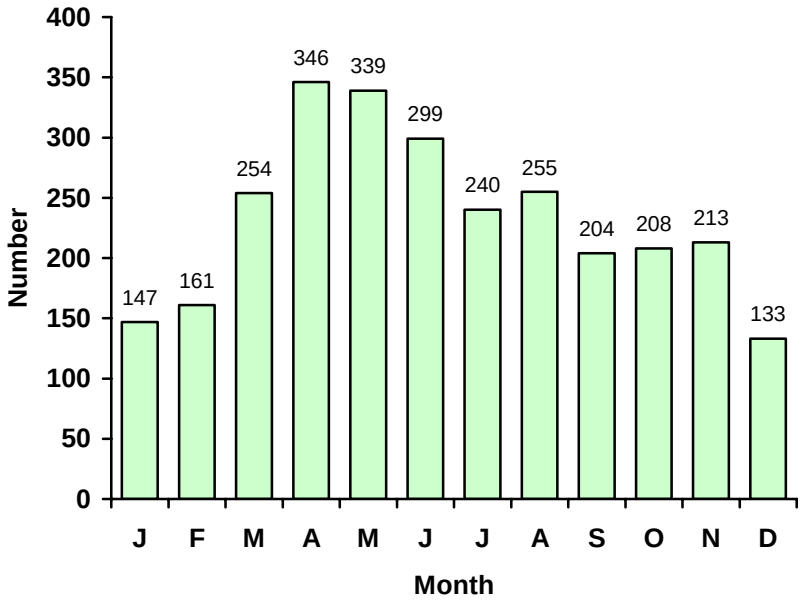
FIGURE 20.2 Hospitalized non-machinery injuries involving animals, by year, April 1990-March 2000 (2,800 cases)



20.4 MONTH

Animal-related injuries were more frequent during the months of March to August, with the highest numbers of injuries occurring in April and May.

FIGURE 20.3 Hospitalized non-machinery injuries involving animals, by month, April 1990-March 2000 (2,800 cases)



20.5 TYPE OF ANIMAL

Cattle and horses caused 92% of the animal-related hospitalized injuries.

66.1% of the injuries to children involved horses. 67.2% of the injuries to older adults were from cows, bulls, calves and other cattle.

TABLE 20.2 Agricultural hospitalizations involving animals, 1990-2000, by type of animal and age group (2,799 cases*)

Type of Animal	Age group 1-14 years	15-59 years	60+ years	Total
Cow, heifer, steer, other cattle	45	759	332	1,136*
Bull	<5	132	51	186
Calf	11	99	33	143
Horse**	197	751	163	1,111
Pig***	<5	54	5	63
Dog	23	9	7	39
Other[+]	15	63	26	104
Unknown	-	15	<5	17
Total	**298**	**1,882**	**619**	**2,799**

* Age was not available for one case.
** Includes horse, mare, stallion, gelding, pony, colt, filly, foal.
***Includes pig, hog, sow, boar, gilt.
[+]Includes sheep, goat, ostrich, elk, buffalo, llama, mink, chicken, rooster, deer, cat, rat, snake, wolf, mule, ox, lion.

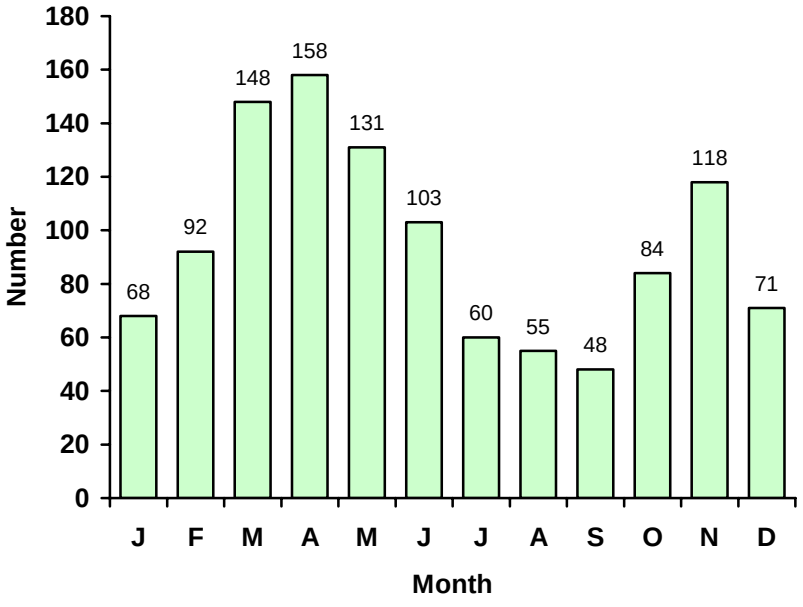
20.5.1 CATTLE*

20.5.1.1 MONTH

Injuries relating to cattle were most frequent in March, April and May. Many injuries were associated with calving or with cows that had recently calved. There was another peak in hospitalized injuries in the late fall. These injuries were likely associated with transportation activities.

* Includes, cows, steers, heifers, "cattle". Does not include bulls or calves.

FIGURE 20.4 Hospitalized injuries involving cattle*, by month, April 1990-March 2000 (1,136cases)**



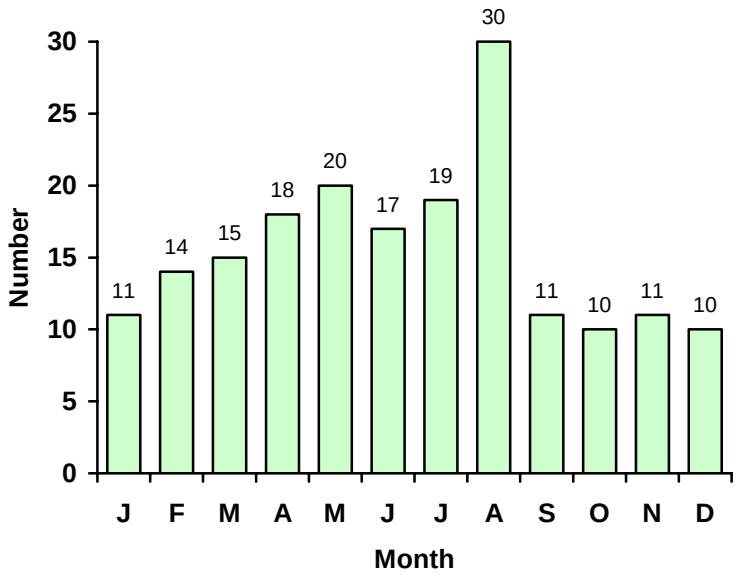
**Month was not available for one case.

20.5.2 BULLS

20.5.2.1 MONTH

Bull-related injuries were most frequent from April to August, with a strong peak in August.

FIGURE 20.5 **Hospitalized injuries involving bulls, by month, April 1990-March 2000 (186 cases)**

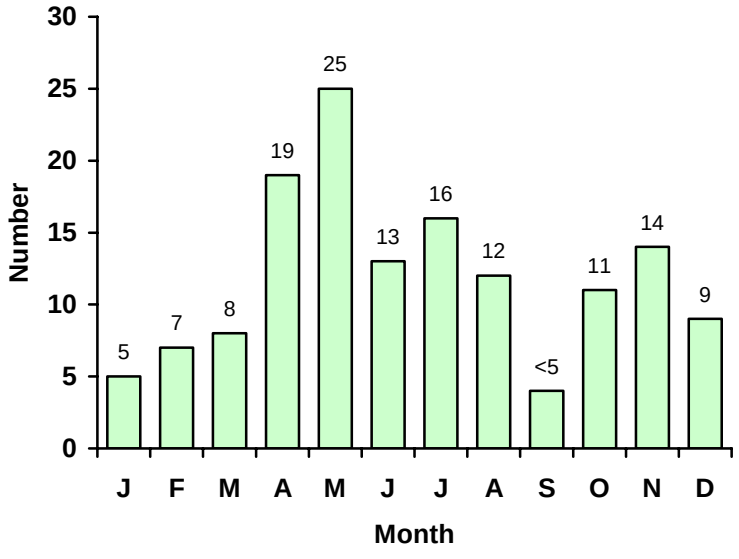


20.5.3 CALVES

20.5.3.1 MONTH

Calf-related injuries occurred most often during April and May.

FIGURE 20.6 **Hospitalized injuries involving calves, by month, April 1990-March 2000 (143 cases)**



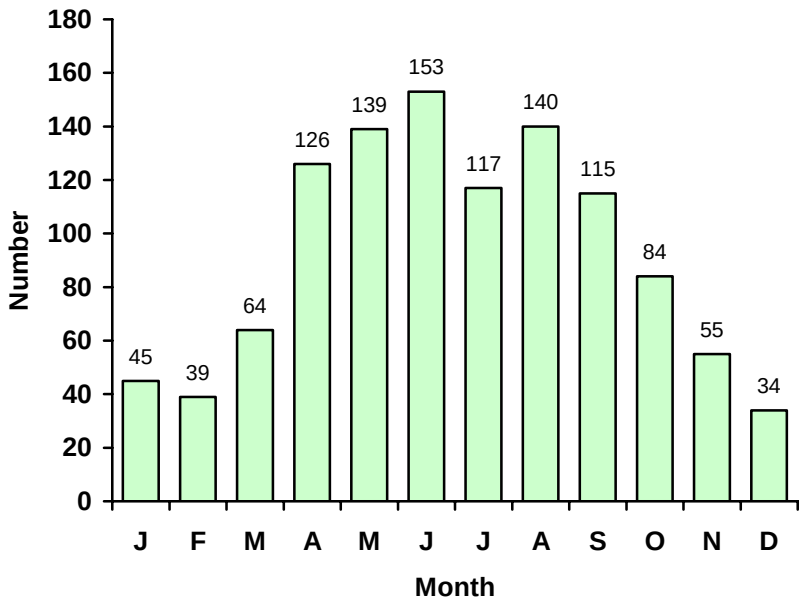
20.5.4 HORSES

20.5.4.1 MONTH

FIGURE 20.7 **Hospitalized injuries involving horses*, by month, April 1990-March 2000 (1,111 cases)**

Horse-related* injuries occurred more frequently during the warm weather months of April to September.

*Includes horse, mare, stallion, gelding, pony, colt, filly, foal.



21 HOSPITALIZED AGRICULTURAL NON MACHINE-RELATED INJURIES: FALLS, STRUCK BY OBJECT

21.1 FALLS

21.1.1 AGE

Persons in the older age groups (50-80+) sustained more hospitalized fall-related injuries than would be expected given their representation in the farm population. Falls were a major problem for adults 80 and over.

For most causes of injury, children and young adults were under represented in injury events relative to their proportion of the population. This was not the case with falls among 5-9 year old children, where the proportion of those injured was almost equal to the proportion of children aged 5-9 in the farm population.

TABLE 21.1 Hospitalized non-machinery injuries involving falls, by age, April 1990-March 2000 (2,195 cases)

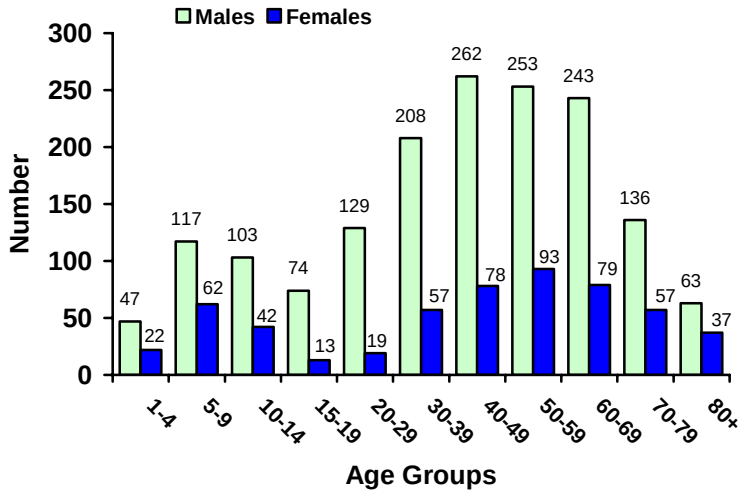
Age Group	Hospitalizations		Farm Population*	
	No.	%	No.	%
1-4	69	3.1	43,315	5.1
5-9	179	8.2	71,035	8.4
10-14	145	6.6	84,025	10.0
15-19	87	4.0	80,455	9.6
20-29	148	6.7	80,775	9.6
30-39	265	12.1	121,230	14.3
40-49	340	15.5	139,425	16.6
50-59	347	15.8	110,135	13.1
60-69	322	14.7	73,620	8.7
70-79	193	8.8	30,825	3.7
80+	100	4.6	7,755	0.9
Total	**2,195**	**100.0**	**842,595**[+]	**100**

*Source: Statistics Canada, Census of Agriculture, 1996
[+] Does not include children less than a year old.

21.1.2 AGE AND GENDER

In all age groups, males were involved in more hospitalized fall-related injuries than females were. The ratio of males injured to females injured was lowest for the very young and the very old.

FIGURE 21.1 Hospitalized non-machinery injuries involving falls, by age and gender, April 1990-March 2000 (2,195 cases)

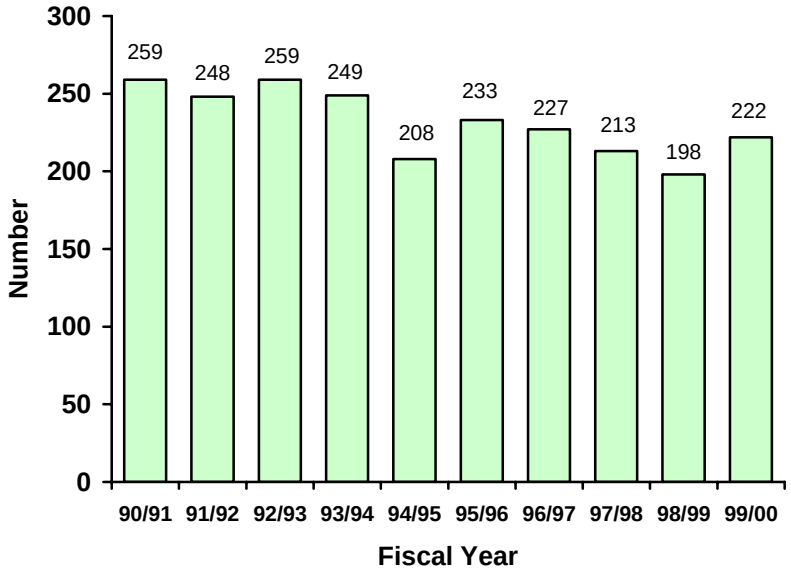


21.1.3 YEAR

There was no clear trend in the annual occurrence of fall-related injuries over the surveillance period.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 53) and for Nova Scotia from April 1, 1997 to March 31, 2000 (n = 5). Imputed values are not included in the total number of cases.

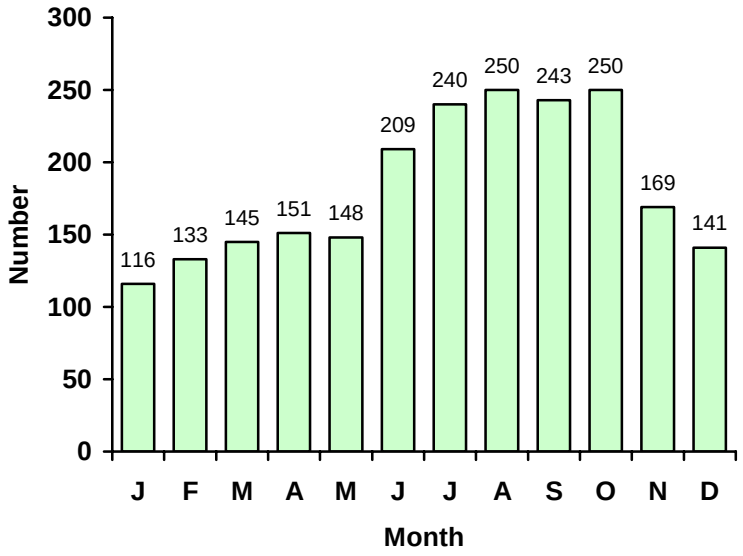
FIGURE 21.2 Hospitalized non-machinery injuries involving falls, by year, April 1990-March 2000 (2,195 cases)



21.1.4 MONTH

Falls leading to hospitalization were most common during the months of June to October.

FIGURE 21.3 **Hospitalized non-machinery injuries involving falls, by month, April 1990-March 2000 (2,195 cases)**



21.1.5 CAUSE OF INJURY

TABLE 21.2 **Hospitalized non-machinery injuries involving falls, by external cause of injury, April 1990-March 2000 (2,195 cases)**

			Age Group		
			1-14	15-59	60+
	Cases per age group:		393	1,187	615
External Cause of Injury*	**Cases per category**	**%**	**Percentage of Age Group Total**		
Fall from one level to another	56	25.9	52.7	22.5	15.3
Fall on or from ladders or scaffolding	411	18.8	5.3	23.4	18.4
Fall on same level from slipping, tripping or stumbling	396	18.1	4.3	16.7	29.4
Fall from or out of building or other structure	367	16.7	21.9	19.3	8.6
Fall into hole or other opening in a surface	44	2.0	1.8	2.1	2.0
Fall on or from stairs or steps	24	1.1	1.0	0.4	2.4
Other and unspecified falls	385	17.5	13.0	15.6	23.9
Total	**2,195**	**100.0**	**100.0**	**100.0**	**100.0**

* Based on the external cause of injury code from: World Health Organization. Manual of the International Classification of Diseases, Injuries, and Causes of Death [9th Revision]. Geneva, Switzerland, 1977.

Of the children aged 1-14 who were injured, 52.7% were involved in falls from height (falls from one level to another). A further 21.9% of children 1-14 were injured in falls from a building. In persons aged 15-59, there were four common causes of falls: falls from ladders and scaffolding, falls from one level to another, falls from a building, and falls from slipping, tripping or stumbling. In persons 60 and over, falls from slipping, tripping or stumbling were most frequent, followed by falls from ladders or scaffolding and falls from one level to another.

21.2 STRUCK BY AN OBJECT

21.2.1 AGE

TABLE 21.3 Hospitalized non-machinery injuries due to being struck by object, by age, April 1990-March 2000 (1,000 cases)

Persons in the older age groups (20-80+) sustained more hospitalized struck by object injuries than would be expected given their representation in the general farm population.

Unfortunately, the types of objects that caused these injuries are not currently recorded in the hospitalization database. This may be a worthwhile topic for future investigation.

Age Group	Hospitalizations		Farm Population*	
	No.	%	No.	%
1-4	16	1.6	43,315	5.1
5-9	27	2.7	71,035	8.4
10-14	40	4.0	84,025	10.0
15-19	65	6.5	80,455	9.6
20-29	141	14.1	80,775	9.6
30-39	182	18.2	121,230	14.3
40-49	194	19.4	139,425	16.6
50-59	146	14.6	110,135	13.1
60-69	115	11.5	73,620	8.7
70-79	56	5.6	30,825	3.7
80+	18	1.8	7,755	0.9
Total	**1,000**	**100.0**	**842,595**	**100.0**

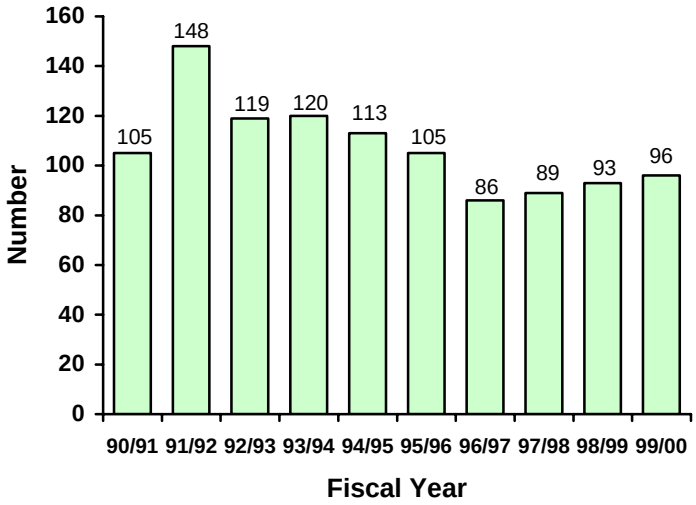
*Statistics Canada, Census of Agriculture, 1996

21.2.2 YEAR

FIGURE 21.4 Hospitalized non-machinery injuries due to being struck by object, by year, April 1990-March 2000 (1,000 cases)

There was no clear trend in the annual occurrence of struck by object injuries over the surveillance period.

Note: data are imputed for Alberta from April 1, 1998 to March 31, 2000 (n = 37). Imputed values are not included in the total number of cases.



Appendix A Decision Rules

Inclusion of deaths and injuries in the fatality and hospitalization databases

Alcohol Involvement

Deaths and injuries where the victim was under the influence of alcohol are included in the databases if they involved agricultural work or an agricultural hazard.

Fires

Deaths and injuries due to fires in farm or ranch residences, where the source of the fire was not an agricultural hazard (e.g., stored gasoline) are excluded from the databases, because these data were not collected consistently for residential farms and ranches in all provinces. All injuries or deaths due to fires in agricultural machinery or in barns and other outbuildings associated with the agricultural operation are included in the databases.

Collisions on Highways

Deaths and injuries due to collisions on public highways that involved agricultural vehicles, agricultural machinery or farm animals were included in the databases; for example, collisions with other vehicles, trains, people, farm animals, objects and bodies of water.

Inclusion of deaths in the fatality database

Pre-existing Medical Conditions

Deaths attributed to pre-existing medical conditions (e.g., seizure, heart attack) are excluded from the fatality database. Deaths where an agricultural injury was immediately preceded by a significant medical event such as a stroke, seizure or heart attack, are also excluded.

Secondary Complications

Deaths that occurred in hospital from secondary complications of agricultural injuries (e.g., embolism, respiratory distress) are included in the fatality database. Note: New Brunswick does not identify these cases as farm-related if the death occurred more than two weeks after the agricultural injury.

Other Deaths in Farm Residences

Deaths in an agricultural residence (farm house) are excluded from the fatality database unless some aspect of agricultural work caused the death.

Suicides

Completed suicides are excluded from the fatality database, as are other deaths where the investigating coroner or medical examiner judged that the cause of death was probably suicide. Deaths where the possibility of suicide was mentioned on the death certificate or coroner's/medical examiner's report, but where the final cause of death was deemed accidental, were included in the fatality database.

Designation as work-related deaths in the fatality database

Vehicle Maintenance

Deaths that occurred during the maintenance of motor vehicles (e.g., cars, pick up trucks and vans) were not designated as work-related in the fatality database because these data were not consistently collected in all provinces. Also, it was not possible to determine whether agricultural work was involved at the time of death. Deaths that occurred during the maintenance of tractors and other farm machinery were designated as work-related.

Exposure

Deaths due to exposure (heat exhaustion or hypothermia) were not designated as work-related in the fatality database unless the victim was injured during the course of agricultural work. Deaths due to exposure were not consistently identified in all provinces.

Firearms

Deaths due to firearm use on farms or ranch holdings were designated work-related if the death was ruled accidental and the gun was being used for agricultural work (shooting pests, sick livestock, etc.).

Aircraft

Deaths due to aircraft crashes during crop spraying and other agricultural activities were designated as work-related fatalities.

Recreational Vehicles

Deaths involving recreational vehicles such as ATVs, dirt bikes and dune buggies were not designated as work-related fatalities unless the RV was being used for agricultural work at the time of the accident.

Children at Play

Deaths of children who were playing in the agricultural work place were designated as work-related if their deaths occurred because someone was engaged in agricultural work. This included cases where a person engaged in agricultural work was unable to supervise a child that he/she had taken to the agricultural work place (e.g. drownings) and cases where a child was killed as a direct result of someone engaged in an agricultural work activity (e.g., extra rider deaths, blind runovers).

Collisions on Highways

Deaths due to collisions on public highways were designated as work-related if an agricultural work activity was involved; e.g., transporting livestock, machinery or harvested crops; herding livestock.

Appendix B Glossary

General Terms

Agricultural Fatalities
CAISP defined an agricultural injury fatality as: 1) Any unintentional injury resulting in death that occurred during activities related to the operation of a farm (as defined below) 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 took place 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. CAISP further sub-divided agricultural injury fatalities into two types: work-related agricultural fatalities and non work-related agricultural fatalities.

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

Farm
Any farm 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. (*Census of Agriculture, Statistics Canada.)*

Non work-related agricultural fatalities
Deaths that, while occurring on a farm or ranch, or caused by some aspect of the agricultural environment, were either not directly related to agricultural work or not collected in a consistent manner across the country. For the purposes of clarity, they are analyzed separately from work-related agricultural fatalities. Examples of these fatalities include deaths on agricultural vehicles being used for recreational purposes.

Numerator data
Data used as numerator values in rate calculations. If presented as a fraction, the top half of an injury or illness rate refers to the number of cases (events).

Rates
In the context of injuries or fatalities, this means the number of cases per time period or per population group over a given time period; for example, the number of persons injured per 100,000 agricultural workers per year.

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

Work-related agricultural fatalities
Work-related agricultural fatalities are deaths that occurred during the course of agricultural work. This includes deaths that took place away from the farm or ranch if agricultural work was being done (e.g., transporting livestock or harvested crops on public highways.) Deaths where the victim(s) were killed while a third party was engaged in agricultural work are also included.

Non Machine-Related Causes of Injury

Crushed by/struck by animal*
Includes being crushed, kicked, gored or butted by an animal. Includes crush injuries sustained after a fall from an animal. Does not include bites.

Other animal injury*
Includes being bitten, mauled or dragged by an animal.

Fall from an animal*
Includes falls from animals that were not followed by a crush injury.

Struck by an object
Includes being struck by a falling, swinging, slipping, propelled, rolling or sliding object, or by a collapsing structure or structural element. Does not include being struck by an object falling or propelled from a machine. Does not include being caught or asphyxiated under an object or structure.

Struck against an object
Includes injuries where the victim was moving and struck against a non-machine object, or stepped on a stationary object. Does not include injuries where the victim struck the object after tripping, falling or stumbling.

Caught-in, under or between objects
Includes being caught in, under, or between non-machine objects; being compressed or pinched by rolling, sliding or shifting objects; being caught in, under or between a moving and a stationary object, or two or more moving objects; being trapped under collapsing structures; being asphyxiated due to being trapped in, under or between non-machine objects. Does not include being caught in grain or soil.

Falls from height
Includes falls from scaffolds, walkways, platforms, roofs, and piled or stacked materials; falls on stairs or steps; falls into shafts, excavations, floor openings, etc.; and falls from ground level to a lower level. Does not include falls from machines or falls on the same level.

Fall on the same level
Includes slipping, tripping or stumbling on to the surface the victim was standing on, or onto or against objects on that surface.

Jumped to a lower level
The abstraction source must include a statement of intent to jump. Includes jumps from scaffolding, platforms, loading docks, structures etc. Does not include jumps from machines.

Overexertion
Includes injuries sustained in lifting, pulling, pushing, holding, wielding or throwing objects. Does not include machine-related overexertion.

Drowning
Includes drowning in any liquid such as water, manure or sewage, in any location. Excludes asphyxiation in grain or soil.

Exposure to fire/explosion
Includes fires in farm buildings or other farm structures, such as bunk houses for hired workers; forest, brush, grass, or other outdoor fires, whether or not they were set deliberately; ignition of clothing; and explosions of any kind. Excludes machine-related fires and fires in the farm residence.

Contact with temperature extremes
Includes exposure to atmospheric or environmental heat, exposure to atmospheric or environmental cold, or contact with hot or cold objects or substances. Excludes contact with hot or cold objects or substances from machines (e.g., radiator fluid, oil).

Contact with electric current
Includes all contact with electric current except for electrocutions while sitting in or working with a machine and electrocutions due to lightening strikes.

Contact with radiation, caustic, toxic or noxious substances
Includes contact with, consumption or inhalation of pesticides, herbicides, fungicides, insecticides, rodenticides, or fertilizers; inhalation of silo gas, methane, hydrogen sulfide, carbon monoxide, mould, organic dust; exposure to venom (e.g, from insect stings or snake bites); accidental vaccinations; allergic reactions, including anaphylaxis, due to contact with any noxious substance. Excludes asphyxiations due to entrapment in grain, silage or soil.

Asphyxiation
Includes asphyxiation due to entrapment in flowing grain, silage, or soil; trench collapse. Excludes traumatic asphyxiations and drownings.

Firearms
Includes unintentional injuries due to being shot by any kind of gun.

Machine-Related Causes of Injury

Sideways rollover
Includes injuries caused when a machine or vehicle rolls over onto its side. Excludes runovers by an upright machine or vehicle.

Backwards rollover
Includes injuries caused when a machine rolls over backwards (i.e., the front tires of the machine rotate around its rear axle causing it to land on its top.) Excludes runovers by an upright machine or vehicle.

Unspecified rollover
Includes injuries caused by a rollover where there is insufficient information to determine whether the rollover was sideways or backwards. Excludes runovers by an upright machine or vehicle.

Entangled or caught in moving parts of machinery
Includes injuries caused by any part of the body becoming trapped, entangled or caught in the continually moving parts of a machine. Does not include being struck or trapped by a machine part that is not continually moving, e.g. a tractor door.

Pinned or struck by a machine
Includes being pinned or struck by a machine or part of a machine; being caught between two machines; or being caught between a machine and a stationary object. Excludes rollovers and machine or motor vehicle collisions with pedestrians on roadways.

Struck against machine
Includes injuries where the victim was moving and struck against a machine or machine part. Does not include injuries where the victim struck the machine after tripping, falling or stumbling.

Collision
Includes collisions on roadways between farm machines/vehicles; between farm machines/vehicles and non-farm vehicles; between farm machines/vehicles and stationary objects; between farm machines/vehicles and

pedestrians; or between farm workers and non-farm vehicles. Does not include off-road collisions. Does not include rollovers unless the rollover occurred because of a collision with another vehicle.

Operator fell from machine, not runover°
Includes cases where a machine operator falls from his/her machine, but is not runover subsequent to the fall.

Operator fell from machine, then runover°
Includes cases where a machine operator falls from a machine and is then runover by the machine and/or by a machine, wagon or implement that is being pulled behind it.

Passenger fell from machine, not runover°
Includes cases where a passenger falls from the machine he/she is riding on, but is not runover subsequent to the fall.

Passenger fell from machine, then runover°
Includes cases where a passenger falls from a machine and is then runover by the machine and/or by a machine, wagon or implement that is being pulled behind it.

Runover of operator by unmanned machine
Includes the runover of an alighted operator by his or her unmanned machine due the machine rolling forwards or backwards, slipping down an incline or hill, or slipping into gear. Does not include instances where the operator has fallen from the machine.

Runover of bystander°
Includes the unintentional runover of a bystander by a machine or vehicle and/or by a machine, wagon or implement that is being pulled behind it. Does not include alighted passenger runovers or runovers subsequent to falls from a machine or vehicle.

Runover of alighted passenger°
Includes the unintentional runover of an alighted passenger by the machine or vehicle he or she was riding on and/or by a machine, wagon or implement that is being pulled behind it.

Jumped to a lower level
The abstraction source must include a statement of intent to jump from the machine. Excludes cases where the victim slipped or tripped while mounting or dismounting.

Overexertion
Includes overexertion injuries sustained in lifting, pulling, pushing or repairing a machine or vehicle.

Being struck by an object propelled or falling from a machine
Includes being struck by any object falling from or being propelled from a machine. Does not include being trapped or asphyxiated under a machine.

Other machine-related injuries
Includes machine-related electrocutions, drownings, fires etc.

*For the purpose of this report, the animal injury categories have been combined.
°Where it was not clear whether the person injured was a passenger, bystander or operator, the case was assigned to an “unspecified person” category.

Pattern of Injury Definitions for Chapter 8

The following definitions describe the types of fatality cases included in each pattern of injury. Patterns are not mutually exclusive, so one case can be part of more than one pattern; e.g., a fatality caused when a tractor rolled over backwards while pulling a log out of a woodlot would be included in the *Backwards Rollover (non-collision, non-RV)* pattern and in the *Woodcutting or Forestry* pattern.

Animal-related
All fatalities that were caused by an animal. This includes cases where the victim was hit by an object (usually a gate) propelled by an animal.

Backwards rollover (non-collision, non-RV)
All fatalities caused by a rollover where the vehicle (usually a tractor) tipped onto its back while it was being used to pull or tow a heavy load.

Blind runover
All fatalities caused when a bystander or alighted passenger of a vehicle was runover. (The term "blind" is used because the driver of the vehicle was not aware of the victim's presence prior to the runover event).

Collisions on public roadways
All fatalities that occurred when an agricultural vehicle or farm animal was involved in a collision on a public roadway. This pattern does not include RV off-road accidents or rollovers that did not involve collisions. It does include collisions with RVs on public roads if the operator of the RV was engaged in agricultural work or collided with an agricultural vehicle or a farm animal.

Contact with overhead power lines
All fatal electrocutions caused when a vehicle or metal object came into contact with an overhead power line. This pattern does not include any other types of electrocution.

Drowning (all causes)
All fatalities where drowning was the cause of death. This includes cases where victims drowned in vehicles that were involved in rollovers or collisions.

Entanglement
All fatalities that occurred because the victim was caught, drawn into or pinned by continually moving operating machinery (usually rotating shafts or conveyor systems).

Exposure to toxic or caustic substances
All fatalities caused by the exposure of a victim to a toxic or caustic substance. Most deaths in this pattern were due to the inhalation of hydrogen sulfide or carbon monoxide. Deaths caused by exposure to venom, mould, anhydrous ammonia, and pesticides are also included.

Extra rider fatalities
All fatalities that occurred when a passenger fell from any type of vehicle, whether or not the passenger was subsequently run over.

Failed hydraulics or improper blocking
All fatal crush, runover, or pinning injuries sustained in any circumstances where hydraulic systems failed or were used improperly, or where blocking failed or was not used during machine or vehicle maintenance.

Falls from height
All fatalities caused when a victim fell from an object, structure or machine above ground level. This pattern includes all falls from machines whether or not they were followed by a runover event. Falls (tripping or stumbling) at the same level are not included.

Fires or explosions (all types)
All fatalities due to fires or explosions, whether or not they involved a vehicle or machine.

Jumpstarting or ground starting
All fatalities that occurred when the victim jump started or ground started a vehicle and was then runover or pinned by it.

Recreational vehicles (off road)
All fatalities that occurred during the off-road operation of a recreational vehicle (either work-related or non work-related). This pattern does not include RV accidents on public roadways.

Runover or pinned by unmanned vehicle
All fatalities caused when a vehicle operator alighted or was thrown from or knocked off a vehicle and subsequently runover or pinned by it. This pattern also includes cases where the operator left a vehicle to complete a task and was runover or pinned when the vehicle slipped into gear and/or rolled down an incline. This pattern was created to isolate all cases where an emergency shut off mechanism linked to a sensor in the driver's seat might have prevented the fatal injury. Jump starting and ground starting cases are not included because in these instances the operator deliberately bypasses all safety mechanisms associated with the starter motor.

Sideways rollovers (non-collision, non-RV)
All fatalities caused when a vehicle (usually a tractor) slipped off a road, ramp or incline and landed on its side or top. This pattern includes cases where the occupant drowned subsequent to the rollover event.

Suffocation or asphyxiation by grain
All fatalities caused by suffocation in any type of grain. Suffocation generally occurred after a victim fell or jumped into a full grain bin or other bulk storage container for grain.

Suffocation or asphyxiation by soil
All suffocations and traumatic asphyxiations due to trench collapse. This pattern also includes suffocations in mud due to a fall head first into a narrow pit.

Struck by falling, collapsing or propelled material
All fatalities caused when an object of any kind strikes a victim, including large bales, logs, falling trees, collapsing structures, and objects propelled from machines.

Woodcutting or forestry
All fatalities that occurred due to cutting or moving trees or logs, or pulling stumps. This pattern includes all backwards rollovers related to woodcutting or forestry and all log rollbacks.

Appendix C Data Abstraction Forms

Fatality data abstraction form

FATAL FARM INJURIES – DATA ABSTRACTION FORM

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

All responses that require additional details are followed by a (specify) in red. All specification fields (for example, SPPOLICE following POLICE) are in blue, for ease of use.

FILE #: _____-_____ **ID: _____-_____-_____**
year no. **prov. year no.**

Agricultural Fatalities: 1) Any unintentional injury resulting in death that occurred during activities related to the operation of a farm (as defined below) 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: _____ Birthdate: ____ / ____ / ____ Birthdate missing (circle)? Yes No
mo dy yr

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

Region: _____ Date of Injury: ____ / ____ / ____ Weekday of Injury (circle): S M T W T F S
mo dy yr

Time of Injury _____ (24:00) Date of Death: ____ / ____ / ____
mo dy yr

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

1 Coroner 2 Medical Examiner 3 Media (specify): _____
4 RCMP / police 5 Registrar General 6 Other (specify): _____

What sources were used during data abstraction from fatality files (circle all that apply):

1 Coroner 2 Medical Examiner 3 Media (specify): _____
4 RCMP / police 5 Registrar General 6 Other (specify): _____

A. DESCRIPTION OF INJURY EVENT

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

If injury was not machinery or vehicle related, complete Section B and then proceed to Section E.
If injury was machinery or vehicle related, begin with Section C and continue.

B. CAUSE OF INJURY NOT MACHINERY OR VEHICLE RELATED
(Circle appropriate number)

1 crushed by animal
(specify type of animal: _____)
2 struck by animal
(specify: _____)
3 fall from animal
(specify: _____)
4 struck by object
5 struck against object
6 caught in, under or between objects
7 fall from height
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 radiations, caustics, toxics or noxious substances: by (circle):
inhalation ingestion absorption
specify agent: _____
18 asphyxiation (specify): _____
19 firearm
77 other (specify): _____
88 unknown

C. CAUSE OF INJURY MACHINERY OR VEHICLE RELATED
(Circle appropriate number)

1 sideways rollover
2 backwards rollover
3 unspecified rollover
4 entangled/caught in machinery
5 pinned or struck by machine
6 collision
7 operator fell from machine, not runover
8 operator fell from machine, then runover
9 passenger fell from machine, not runover
10 passenger fell from machine, then runover
11 runover of operator
12 runover of passenger
13 runover of bystander
77 other (specify):
_____

D. TYPE OF MACHINERY
(Circle all numbers that apply if injury event was machinery or vehicle related)

1 tractor
2 auger (specify): _____
3 mower
4 power take off (specify machinery pto attached to): _____
5 baler
6 farm wagon (specify): _____
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 offroad vehicle (specify): _____
18 swather
77 other farm implement
(specify): _____
88 unknown

E. IMMEDIATE LOCATION OF INJURY

1 Field
2 Barn
3 Silo / grain bin (specify: _____)
4 Shed
5 Farm Yard
6 Road/highway
7 Driveway
8 Farm House
9 Farm Road
11 Water source (e.g. ditch, dugout, pond, etc.)
(specify: _____)
13 Corral/outdoor animal enclosure
77 Other
(specify: _____)
88 Unknown

F. RELATION OF INJURED PERSON TO FARM OWNER
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 child
10 Visitor
77 Other
(specify: _____)
88 Unknown

G. LOCATION OF DEATH

1 Found dead
2 Died en route
3 Died in hospital
7 Other
(specify: _____)
8 Unknown

H. METHOD OF DISCOVERY

Who found deceased (i.e. relationship to deceased? _____ Check if information not available:

Time last seen: _____ (24:00) Time found: _____ (24:00) >24 hrs? Y N

Witnessed? Not witnessed?

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

NATURE OF INJURY: _____BODY PART: _____
NATURE OF INJURY: _____BODY PART: _____
NATURE OF INJURY: _____BODY PART: _____

J. WAS E-CODING USED TO CODE THE EXTERNAL CAUSE OF INJURY?

1 Yes → specify code used: _____
2 No → how was cause of injury coded? _____

K. REVIEW FOR CONSENSUS? (please circle) Yes/No - If yes, please explain points needing consensus opinion.

Hospitalization data abstraction form

HOSPITALIZED FARM INJURIES – DATA ABSTRACTION FORM

ID_____-_____-______
Prov year number

Instructions:

The <respective provincial agency> has provided us with the hospital separation record for the following patient treated in your hospital for a farm-related injury. Would you 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 diagnosis (N-Code):
External cause of injury (E-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 ---> Date of original injury: _____ / _____ / _____ (yy/mm/dd)
2 NO

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

If this was a farm-related injury, please list the injuries associated with this event (from most to least important): e.g., fracture, arm

nature of injury: _____ body part: _____

nature of injury: _____ body part: _____
nature of injury: _____ body part: _____

Please describe (with as much detail as possible) the circumstances surrounding the injury event:

What was the injured person doing at the time of the injury?

Did the injury event involve a machine or vehicle?

No_____ → complete section 1
Yes_____ → complete section 2, part A and B by circling the appropriate number

SECTION 1 – NON-MACHINE	**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, animal 3 fall from animal **Struck / caught by object(s)** Specify object:_____ 4 struck by object 5 struck against object 6 caught in/under/between objects **Fall / Jump** Specify from where:_____ 7 fall from height 8 fall on same level 9 jumped to lower level 10 **Overexertion** 11 **Drowning** 12 **Exposure to fire** **Contact with:** 13 temperature extremes 14 electric current 16 toxic substances Specify substance:_____ Contact by: (circle) Inhalation ingestion absorption 77 **Other cause, specify:** _____ 88 **Unknown** 99 **Does not apply**	**Machine / Vehicle Rollover** 1 sideways rollover 2 backwards rollover 3 unspecified rollover 4 **Entangled in machine** **Struck by / against / pinned by** 5 pinned by or struck by 18 struck by object propelled or falling off machine 23 struck against machine 6 **Collision** **Fall from machine, not run over** 7 operator 9 passenger 15 person unspecified **Fall from machine, then run over** 8 operator 10 passenger 16 person unspecified **Run over by machine (no fall)** 11 operator 12 passenger 13 bystander 17 person unspecified 21 **Overexertion** 22 **Jumped to lower level** 77 **Other cause, specify** _____ 88 **Unknown** 99 **Does not apply**	1 Tractor **Auger** 2 Grain auger 23 Auger, unspecified 3 Mower 4 Power take off Specify machine PTO attached to: _____ 5 Baler 6 Farm wagon Specify type:_____ 7 Combine 8 Power tool (not chainsaw) 9 Chainsaw 10 Welder 11 Harvester 12 Plough / disk 13 Hay elevators / conveyors 14 Manure spreader 16 Motor vehicle Specify type:_____ 17 Recreational 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 99 Does not apply

Review for consensus? (please 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**

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Appendix E Contact Information

National Office/Ontario

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Appendix F References

Canada Census of Agriculture 1996. Statistics Canada, Ottawa.

Canada Census of Agriculture 2001. Statistics Canada, Ottawa.

Leigh, JP, McMurdy SA, Schenker MB. Costs of Occupational Injuries in Agriculture. *Public Health Rep*. 2001; 116:235-248.

Locker, R., Dorland JL and Hartling L. Economic Burden of Agricultural Machinery Injuries in Ontario, 1985 to 1996. *Rural Health Research.* Summer 2003, 285-291.

Pickett W, Hartling L, Brison RJ, Guernsey J. Fatal farm injuries in Canada. *Can. Med Assoc. J*. 1999; 160:1843-1848.