

Work-related mortality among older farmers in Canada

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ABSTRACT

OBJECTIVE To describe the frequency and circumstances of work-related, fatal injuries among older farmers in Canada (1991 to 1995).

DESIGN Descriptive, epidemiologic analysis of data from the Canadian Agricultural Injury Surveillance Program.

SETTING Canada.

PARTICIPANTS Farmers aged 60 and older who died from work-related injuries from 1991 through 1995.

METHOD Age-adjusted mortality rates were calculated using the Canadian farm population as a standard for people involved, mechanism of injury, and place and time of injury.

MAIN FINDINGS The 183 work-related fatalities observed produced an overall mortality rate of 32.8 per 100 000 population per year. Higher fatality rates were observed in Quebec and the Atlantic Provinces. Almost all of those who died (98%) were men. Farm owner-operators accounted for 82.8% of the deaths (where the relationship of the person to the farm owner was reported). Leading mechanisms of fatal injury included tractor rollovers, being struck or crushed by objects, and being run over by machinery. Many older farmers appeared to be working alone at the time of injury.

CONCLUSIONS The data suggest that older farmers died while performing tasks common to general farm work, that most were owner-operators, and that many were working alone at the time of death. Innovative ways to reduce work-related injuries in this population must be found.

RÉSUMÉ

OBJECTIF Décrire la fréquence et les circonstances d'accidents de travail mortels chez les agriculteurs plus âgés au Canada (de 1991 à 1995).

CONCEPTION Une analyse épidémiologique descriptive des données du Programme canadien de surveillance des accidents agricoles.

CONTEXTE Le Canada.

PARTICIPANTS Des agriculteurs âgés de 60 ans et plus qui sont décédés des suites d'un accident de travail, de 1991 à 1995.

MÉTHODE Les taux de mortalité ajustés en fonction de l'âge ont été calculés en se fondant sur la population agricole canadienne à titre de norme pour les personnes en cause, les mécanismes de blessure, le lieu et le moment de l'accident.

PRINCIPAUX RÉSULTATS Les 183 accidents de travail mortels se sont traduits par un taux de mortalité global annuel de 32,8 par 100 000 de population. Des taux de mortalité plus élevés ont été observés au Québec et dans les provinces de l'Atlantique. Dans la presque totalité des cas, le décès est survenu chez des hommes (98%). Les agriculteurs propriétaires exploitants étaient en cause dans 82,8% des décès (lorsque la relation de la personne avec le propriétaire de la ferme était indiquée). Au nombre des principaux mécanismes de blessure mortelle figuraient un tonneau du tracteur, être frappé ou écrasé par un objet, ou encore passer sous une pièce d'équipement. Plusieurs agriculteurs plus âgés semblaient travailler seuls au moment de l'accident.

CONCLUSIONS Les données font ressortir que les agriculteurs plus âgés sont décédés en exécutant des tâches courantes dans le travail agricole général, que la plupart étaient des propriétaires exploitants et qu'ils travaillaient seuls au moment de leur décès. Il faut trouver des moyens innovateurs pour réduire le nombre d'accidents de travail au sein de cette population.

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Studies from other developed countries (eg, the United States,¹ Australia,² and Finland³) show that agricultural work is one of the most dangerous occupations. While this belief is also widely held in Canada,⁴ it has only recently been confirmed in a national study.⁵

Previous work examining fatalities among agricultural workers has identified older people as a high-risk group.^{6,8} Because farming is one of the very few occupations with no mandatory or customary retirement age, an examination of occupational injury to older farmers is warranted. We are unaware of any interventions designed to address the health and safety of farmers. Detailed analysis of injury-related fatalities in this population could lead to design of preventive measures specifically targeted at older farmers.

The Canadian Agricultural Injury Surveillance Program (CAISP) was established in 1996 as a national initiative. Its mandate is to collect and interpret comprehensive information on Canadian agricultural injuries on an ongoing basis. As CAISP data are highly detailed about the circumstances of fatal injuries, we hope that ongoing surveillance will assist in planning and evaluating interventions to reduce fatal injuries on farms.

Organizations in all 10 provinces contribute data to CAISP. These include government (provincial ministries of health, agriculture, and labour), agricultural organizations (provincial federations of agriculture), and five Canadian universities. The program is in the process of expanding its data to include information on hospitalizations of Canadian farmers for work-related injuries.

This paper's objective is to describe the frequency and nature (circumstances) of work-related, fatal farm injuries among older people in Canada from 1991 to 1995. Because family physicians are likely the primary health care providers for most older farmers, it is important that they are aware of the risks these older farmers face.

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Inclusion criteria

Unintentional injuries resulting in the death of older Canadian farmers were included if they occurred during work-related activities associated with operating Canadian farms between 1991 and 1995. Deaths that occurred off-site at farm-related work locations and deaths that involved motor vehicles that were being used for farm work were included. All deaths where it was not obvious or stated that farm work was involved were excluded, regardless of the circumstances. For the purpose of this analysis, older farmers are defined as members of the farm population aged 60 years or older as defined by the 1991 Canada Census of Agriculture⁹ (ie, all members of a farm operator's household living on a farm in a rural or urban area).

Data collection

Provincial agencies that were known sources of case reports were identified (eg, occupational health agencies, offices of the chief provincial coroner or medical examiner, departments of vital statistics, farm safety associations, and police). A list of farm-related fatalities was then compiled from each available source, and these lists were combined into comprehensive, provincial registries. In most instances these registries and data sources existed before the CAISP, so we were able to retrieve mortality data retrospectively. Detailed case reports were sought for review and to standardize data abstraction. Data were then sent to the national CAISP office for further checking and analysis. A group of CAISP collaborators reviewed each case according to standardized inclusion and exclusion criteria for work-related farm injuries (these criteria are available upon request from the authors).

Data analysis

Data available to describe the injuries included characteristics of victims (age, sex, relationship to farm owner-operator); location of injury (province); temporal patterns of injury (year, month, day of week); and mechanism and circumstances of injury. Statistics used in these descriptions included age-standardized rates of death per 100 000 farm population, frequencies, and cross-tabulations. All death rates were calculated using farm population denominator data from the 1991 Canada Census of Agriculture⁹; age standardization was conducted using the age distribution of the same census. Data management and analysis were carried out using Microsoft Access Version 2.0 and Microsoft Excel Version 5.0 (Microsoft, 1994).

Findings

For the period 1991 through 1995, 183 older farmers died from work-related injuries in Canada. Deaths of those aged 60 and older accounted for 36.5% of all work-related farm deaths during the study period.⁵ Almost all (179, 98%) of those who died were men. The aggregate fatality rate for farmers aged 60 and older was 32.8 per 100 000 population per year. The age-specific fatality rate per 100 000 population per year for farmers aged 60 to 69 was 23.2, for those aged 70 to 79 was 50.8, and for 80 and older was 65.1.

Distribution of work-related farm fatalities is provided, by province, in **Table 1**⁹. For comparative purposes, provincial distributions of population recorded in the *1991 Canada Census of Agriculture*⁹ are also provided. In relation to the distribution of the farm population, Quebec and the Atlantic Provinces had somewhat higher mortality rates, while British Columbia, Alberta, Saskatchewan, and Manitoba had fewer deaths than might be expected (proportion of deaths compared with proportion of total farm population).

For 151 of the 183 fatalities, the victim's relationship to the farm owner-operator was reported: 125 (82.8%) victims were owner-operators, 10 (6.6%) were relatives of owner-operators (eg, brothers, fathers), and six (4.4%) were hired workers. **Figure 1** shows that machinery, primarily tractors, was involved in most fatal injuries.

Figure 2 shows the number of work-related farm fatalities in Canada by year, month, and day of the week. The annual number of work-related deaths fluctuated between 31 in 1992 and 41 in 1994, with a slight trend toward an increase over time. After the cold winter months, fatalities begin to increase in April, peaking in the harvest months of August and September. Most deaths occurred early in the work week (Tuesdays and Wednesdays).

Circumstances associated with the occurrence of work-related farm fatalities are described in **Table 2**. Circumstances were similar for all age groups studied. The three leading circumstances of death were machinery rollovers, being struck or crushed by objects, and being run over by machinery. In 64 cases, the time between death and discovery of the person was reported: 31 cases were reported as 30 minutes or less; the other 33 cases reported times ranging from 45 minutes to 3 days, with the mean time being about 6 hours.

Discussion

This paper presents an analysis of 5 years of data (1991 to 1995) from the national registry of fatal farm injuries developed by CAISP. Our objective in performing this analysis was to describe how, when,

Table 1. Work-related fatalities of older Canadian farmers, 1991 to 1995, by province

PROVINCE	DEATHS N (%)	FARM POPULATION ≥60Y* N (%)	AGE-STANDARDIZED ANNUAL RATE/100 000 POPULATION
British Columbia	12 (6.6)	8565 (7.7)	27.8
Alberta	29 (15.9)	21 790 (19.5)	27.8
Saskatchewan	33 (18.0)	22 780 (20.4)	29.6
Manitoba	16 (8.7)	10 235 (9.2)	31.4
Ontario	52 (28.4)	32 220 (28.9)	38.6
Quebec	28 (15.3)	11 240 (10.1)	49.4
Atlantic Provinces	13 (7.1)	4800 (4.3)	55.7
CANADA	183 (100)	111 630 (100)	32.8

*1991 Canada Census of Agriculture.⁹

where, and why older farmers in Canada suffered work-related, fatal injuries. The main finding in this study is that older farmers who died of work-related injuries were primarily owner-operators who were doing common farm work. Also, many appeared to be working alone at the time of injury.

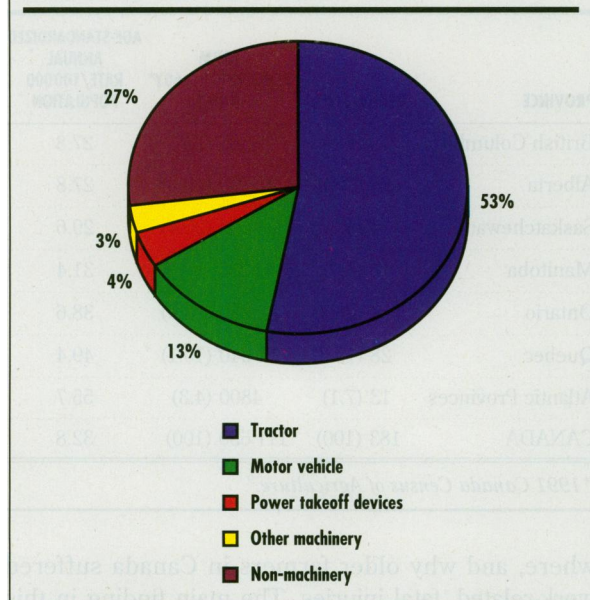
Mortality rates. Older farmers' rate of death from work-related injuries appears to remain relatively uniform in Canada from 1991 to 1995, with an overall rate of 32.8 per 100 000 population per year, and an annual number of deaths ranging from 35 to 41. Aggregate death rates for working farmers (male and female) aged 20 and older reported by CAISP was 14.9 per 100 000 population per year.⁵ Some variation in rates was noted between provinces, with higher rates being observed as one moved from west to east. It is not clear from these data why this trend exists; circumstances of fatal injury for older farmers were relatively uniform across Canada.

Aggregate rates of fatal farm injuries per 100 000 population per year reported in other population-based studies range from 18.4 to 46 in the United States^{10,11} to 19.4 in Australia.¹² Recent data reported by the US Bureau of Labour Statistics indicate that the 1996 fatality rate for people employed in agricultural production and services was 19.2 per 100 000.¹³ The differences in these estimated rates are likely due to different methods of collecting data and to different definitions of the farm population at risk. While the Canadian rates presented here are also subject to critique, it is important to note that they are comparable in magnitude to rates reported for other Western industrialized nations.

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Figure 1. Machinery involved in work-related farm fatalities



Other researchers have identified an escalation in death rates for farmers who continue to work past customary retirement age.^{7,12} Zwerling et al¹⁴ reported that male farmers older than 65 years have significantly higher proportional mortality ratios (PMR) for motor vehicle injuries (PMR=4.30), injuries due to falls (PMR=3.24), machinery-related injuries (PMR=30.44), and being injured by falling objects (PMR=8.15) than nonfarmers. A similar pattern has been reported for hospitalizations.¹⁵⁻¹⁷ Little research, however, has focused on the causes of older farmers' fatal injuries.

Circumstances. The circumstances of injury observed in this study reflect those described in studies of general farm injury mortality and morbidity.^{6,8,15-17} Also, weekday and monthly trends show patterns concomitant with expected seasonal and weekly patterns of injury.^{8,16}

This might indicate that older farmers, when fatally injured, were engaged in work that younger farmers usually do. Further, they were generally farm owner-operators, and appeared, in many cases, to be working alone. Research has shown that older farmers often work long hours, ranging from 50% to 100% of the time worked by younger farmers.^{18,19}

We have also long suspected that older farmers are especially at risk from the hazards of older machinery with fewer safety features, although this has not been proven through definitive, etiologic study.²⁰ Our data

show that 11 deaths occurred as a result of manually starting tractors and other machinery. This indicates that older farmers are likely exposed to aged machinery with concomitant mechanical problems. It has been reported that older farmers without family members in line for property succession invest less money in farm improvements.²¹

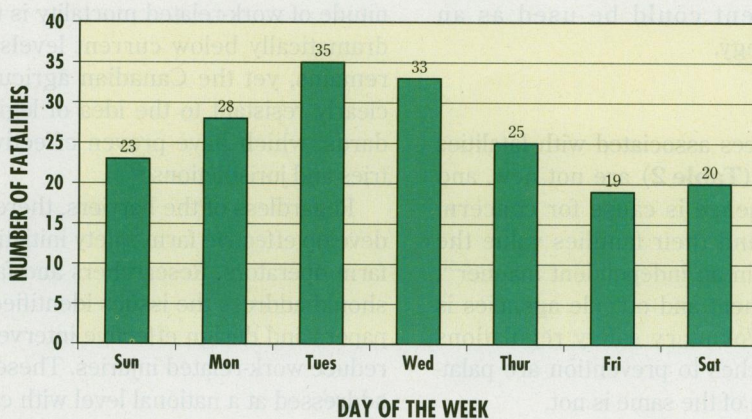
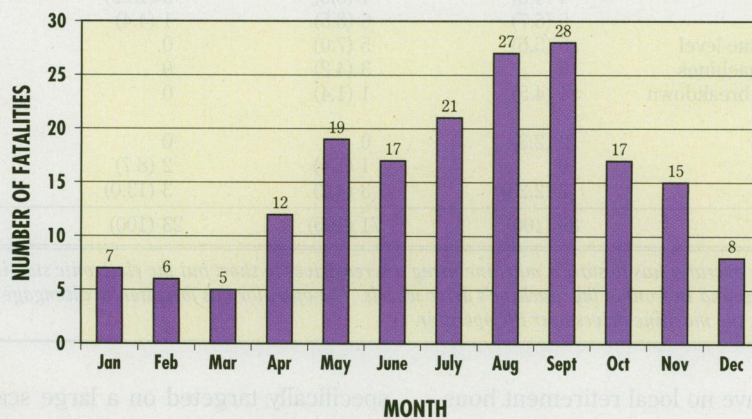
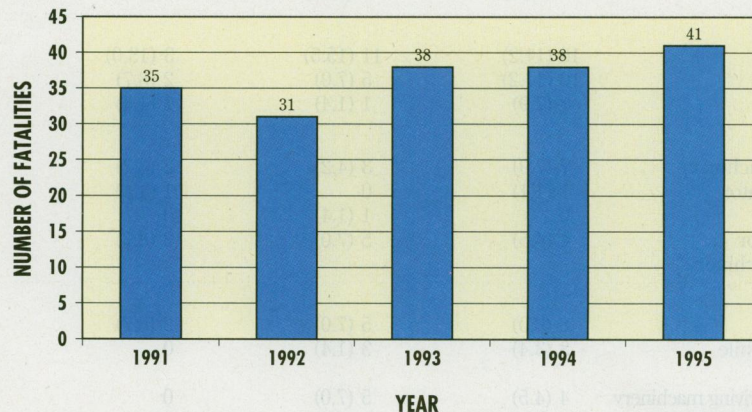
Older farmers might also be at risk of serious injury as a result of natural processes related to aging that affect physical capabilities such as hearing, balance, coordination, and reaction time.²² Medical conditions and concurrent medication use might also be related to chances of suffering serious injury. Pickett et al²³ reported significant relationships between injury and use of heart or circulatory medications in male farmers older than 45.

Older men are also less likely to survive traumatic injury for a variety of reasons. Case descriptions suggest that they work in isolation, which contributes to longer times to discovery of injury, longer transportation times to hospital, and less opportunity for resuscitation and recovery.²⁴ Also, as people age, they are less able to recover physically from traumatic injury, which puts them at higher risk of dying when they do sustain an injury.

Farming is one of the few industries in which there is no mandatory or customary retirement age. Many farmers continue to work long after most of their counterparts in industry have left the work force. There are several reasons older farmers continue to farm.

- Older farmers could be an inexpensive source of labour necessary to make some farms economically viable; 6% to 8% of income on midsized farms in Canada comes directly from pensions or child allowances.²⁵
- There might be no offspring or other relatives willing to take over the family farm.²¹
- Pension incomes might be insufficient for older farmers to maintain the lifestyles to which they are accustomed, and low land prices might not provide enough money for older farmers to move off the farm. Rural retirees report substantially lower pension incomes than their urban counterparts.²⁶
- The pace of farm work is internally controlled; thus, older farmers can structure their workdays according to their capabilities. For example, farmers who have suffered injuries return to work sooner than their counterparts in industry because they can maintain a pace that is consistent with recovery.²⁷
- Farmers like the rural lifestyle and are reluctant to give it up.²⁸ Older people in rural areas report greater satisfaction with their social relationships than their urban counterparts do.²⁹

Figure 2. Work-related fatalities of older Canadian farmers, 1991 to 1995: By year, month, and day of the week



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Table 2. Circumstances of work-related fatalities involving older farmers, 1991 to 1995

CIRCUMSTANCE	AGE N (%)			TOTAL INJURIES
	60-69	70-79	≥80	
Entanglement in machinery	9 (10.1)	8 (11.2)	1 (4.4)	18 (9.8)
Rollovers				
• Sideways down a slope	10 (11.2)	11 (15.5)	3 (13.0)	24 (13.1)
• Backward	10 (11.2)	5 (7.0)	2 (8.7)	17 (9.2)
• Other	7 (7.9)	1 (1.4)	1 (4.4)	9 (4.9)
Runovers				
• Crushed by unmanned machinery	7 (7.9)	3 (4.2)	2 (8.7)	12 (6.6)
• Victim not in view of operator	1 (1.1)	0	1 (4.4)	2 (1.1)
• Extra rider on vehicle	0	1 (1.4)	0	1 (0.6)
• After manual start of tractor or other self-propelled machinery*	4 (4.5)	5 (7.0)	2 (8.7)	11 (6.0)
Struck or crushed				
• By falling objects	8 (9.0)	5 (7.0)	2 (8.7)	15 (8.2)
• By falling trees or limbs while cutting wood	3 (3.4)	3 (1.4)	0	6 (3.3)
• By overhead objects while driving machinery	4 (4.5)	5 (7.0)	0	9 (4.9)
• Because of slipped jack or by falling truck grain box	3 (3.4)	1 (1.4)	0	4 (2.2)
Other trauma				
• Motor vehicle crash	4 (4.5)	4 (5.6)	3 (13.0)	11 (6.0)
• Injuries from animals	6 (6.7)	6 (8.5)	1 (4.4)	13 (7.1)
• Falls from height or on same level	5 (5.6)	5 (7.0)	0	10 (5.5)
• Injuries involving towed machines	0	3 (4.2)	0	3 (1.6)
• Injuries due to equipment breakdown or malfunction	4 (4.5)	1 (1.4)	0	5 (2.7)
• Fires, explosions, burns	2 (2.3)	0	0	2 (1.1)
• Drowning	0	1 (1.4)	2 (8.7)	3 (1.6)
• Other	2 (2.23)	3 (4.2)	3 (13.0)	8 (4.4)
TOTAL	89 (100)	71 (100)	23 (100)	183 (100)

*This typically occurs when an operator has to start a machine using a screwdriver to short out the electronic starting mechanism while he is standing or lying on the ground in front of the machine's drive wheels. The operator has forgotten to disengage the machinery's drive transmission, so when it starts, the machine drives over the operator.

- Farmers sometimes have no local retirement housing available to them.³⁰

These circumstances all suggest that it is unlikely that early retirement could be used as an injury-prevention strategy.

Independent life

The leading circumstances associated with fatalities identified in this study (Table 2) are not new, and their continued prominence is cause for concern. Traditionally, farmers and their families value the ability to operate farms in an independent manner³¹; intervention by government and outside agencies is often not welcomed.³² Voluntary safety regulations and educational approaches to prevention are palatable; enforced legislation of the same is not.

To our knowledge, farm owner-operators (and especially older male farmers) have never been

specifically targeted on a large scale for farm safety interventions in Canada. This might be because they are an extremely difficult group to reach and are especially resistant to outside intervention. The magnitude of work-related mortality is unlikely to decline dramatically below current levels if the status quo remains, yet the Canadian agricultural industry is clearly resistant to the idea of legislated safety standards, which have proven effective in other industries and jurisdictions.³³

Regardless of the barriers, there is a clear need to develop effective farm safety initiatives aimed at older farm operators. Researchers and farm safety experts should address the issues identified in this and other papers and design effective intervention strategies to reduce work-related injuries. These issues need to be addressed at a national level with comprehensive and uniform programs for reducing fatalities among Canada's older farm population.

Based on these data, education and public awareness programs aimed at older farmers should address issues surrounding safe use of farm machinery, proper maintenance of same, and the dangers of working in isolated circumstances. Health providers could also educate older farm patients on issues related to aging, such as medication use and physical decline, and on how these issues can increase the chances of suffering life-threatening injuries.

Limitations

There are several limitations to the data presented in this paper. Farm work exposure is not factored into the calculation of rates. In this study, the farm population, as identified by national census, is used to estimate the population exposed to the risks of farm-related injury. This is likely to be less accurate in geographic areas where many agricultural workers are hired help or seasonal workers who do not give a farm as their primary residence. Further, this estimate does not take into account individual working hours daily, weekly, or seasonally. These issues could lead to bias in the expressed rates, and assessment of this bias and improvement of our denominator data are a priority for the CAISP program.

When broken down into various strata, the numbers of injuries reported are relatively small and, therefore, rates based on these numbers could be unstable. Nevertheless, each reported rate reflects the true data for agricultural fatalities in Canada and is, therefore, population based. Also, the number of events, when broken down by specific activity at time of fatal injury, is small. The events do, however, provide readers with an indication of the diverse activities that older farmers were involved in at the time of death and how these activities are relatively similar across age groups. Some caution should be used when extrapolating these results to other populations.

Conclusion

This study has reported the frequency and nature (circumstances) of injuries leading to work-related mortality among farmers aged 60 and older in Canada (1991 to 1995). Rates of injury were higher among older age groups, which confirmed other findings in the literature. Detailed analysis revealed that older farmers were killed while involved in common farming tasks, that most of them were owner-operators, and that many were working alone at the time of injury. Uniform safety programs need to be developed at the national level to help reduce the large number of fatal injuries suffered by older farmers. ♣

Key points

- From 1991 to 1995, 183 farmers aged 60 and older died of work-related injuries, for an overall death rate of 32.8 per 100 000 population per year.
- Rates of fatal injuries were highest in Quebec and the Atlantic Provinces.
- Most injuries were caused by tractor rollovers, being crushed by objects, and being run over by machinery.
- Farmers tend to keep working to an older age than their urban counterparts, and there are few safety regulations for farm work. Family physicians are one of the few sources of safety information for this population.

Points de repère

- De 1991 à 1995, on a rapporté le décès de 183 agriculteurs âgés de 60 ans et plus des suites d'un accident de travail, soit un taux annuel global de mortalité de 32,8 par 100 000 de population.
- C'est au Québec et dans les provinces de l'Atlantique qu'on a enregistré les taux les plus élevés d'accidents mortels.
- La majorité des blessures étaient attribuables à un tonneau du tracteur, à l'écrasement par un objet ou au fait d'être renversé et de passer sous l'équipement.
- Les agriculteurs ont tendance à travailler jusqu'à un âge plus avancé que leurs homologues urbains et il existe moins de réglementation en matière de sécurité pour les travaux agricoles. Les médecins de famille représentent l'une des rares sources d'information sur la sécurité auprès de cette population.

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