Changing the Child Labor Laws for Agriculture: Impact on Injury

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Objective. The child labor laws are intended to protect young workers from the most dangerous jobs. However, children who work on their parents' farms are exempt from these laws. We evaluated the potential for preventing the occurrence of farm injuries among children by changing the US Federal Child Labor Laws, Hazardous Occupations Orders for Agriculture.

Methods. A retrospective case series of 1193 farm injuries among children from the United States and Canada was assembled. The Hazardous Occupations Orders were systematically applied to each case. Injury preventability was estimated.

Results. A total of 286 (24%) cases of injury involved immediate family members engaged in farm work. Among these children, 33% of those aged younger than 16 years and 36% of those aged 16 or 17 years were performing work prohibited under the Hazardous Occupations Orders.

Conclusions. Removing the family farm exemption from the Hazardous Occupations Orders and raising the age restriction for performing hazardous agricultural work from 16 to 18 years would be efficacious in preventing the most serious injuries experienced by young family farm workers. Potential reductions in injury would meet Healthy People 2010 goals for reducing traumatic injury in the agricultural sector. (*Am J Public Health.* 2007;97:276–282. doi:10.2105/AJPH.2005.078923)

Child labor laws were designed to protect the most vulnerable workers from unsafe and unhealthy work and work environments. In the United States, federal child labor laws limit the hours and times of day that children younger than 16 years may work and set minimum age standards for various types of work.[1,2] They also identify, under the Hazardous Occupations Orders, hazardous jobs that cannot be performed by children younger than 18 years in nonagricultural occupations and younger than 16 years in agricultural occupations. However, children who work on their parents' farms are explicitly exempted from these federal child labor laws. To illustrate: "A child of any age may be employed by his or her parent or person standing in place of the parent at any time in any occupation on a farm owned or operated by that parent or person standing in place of that parent."[2]

Agriculture is the most hazardous industry in the United States for young workers.[3] Nearly half of all work-related fatalities among children occur in agriculture[3] with a risk for fatal injury that is 3 to 4 times that of young workers in other occupational settings.[4,5] Furthermore, 76% of fatally injured agricultural workers younger than 16 years were working in a family business that was exempt from the child labor laws.[3]

Existing approaches to the prevention of farm injuries among children have emphasized education and training with little consideration of public policy approaches.[6] However, public health professionals and child safety advocates recommend policy-oriented approaches as more efficacious alternatives for prevention.[7,8]

The National Research Council and the Institute of Medicine jointly recommended 2 policy changes related to children and agriculture in their 1998 report on the health and safety implications of US child labor: (1) establishment of a minimum age of 18 years for all hazardous work regardless of whether the setting is an agricultural or nonagricultural occupation, and (2) compulsory compliance with the Hazardous Occupations Orders "whether the minor is employed by a stranger or by a parent or other person standing in for the parent."[7] Before initiating these changes in policy, those involved in and affected by these changes should be aware of their potential efficacy.

The goal of this study was to evaluate the National Research Council and the Institute of Medicine's joint policy recommendations with respect to their potential efficacy for injury prevention. Our objectives were to review existing cases of traumatic farm injury to children and (1) describe the characteristics of the injured children according to worker status, (2) identify farm jobs prohibited and not prohibited by the Hazardous Occupations Orders that are most often associated with injuries, (3) estimate the proportion of work-related injuries that could potentially be prevented if the family farm exemption was removed from the Hazardous Occupations Orders (because the child would be restricted from doing the hazardous job), and (4) estimate the proportion of work-related injuries that could be prevented if the age standard for the Hazardous Occupations Orders was raised from 16 to 18 years (because the child would be restricted from doing the hazardous job).

The Hazardous Occupations Orders are authorized by the Fair Labor Standards Act (FLSA) of 1938[2] and are contained at Subpart E-1 of Regulations, 29 CFR Part 570. The FLSA was amended in 1966 to address young people working in agriculture. The final regulations became effective in 1970[9] and have been virtually unchanged since that time. A listing of the hazardous agricultural activities that were identified as prohibited for minors younger than 16 years are available as a supplement to the online version of this article at http://www.ajph.org.[2]

METHODS

Our study was a primary review of 4 retrospective case series of farm injuries among children. The latter were assembled to represent fatal injuries, hospitalized injuries, and 2 forms of restricted-activity injuries (injuries that resulted in at least 4 hours of restricted activity or required medical treatment).

Farm injuries among children were generically defined as injuries to children younger than 18 years that occurred at a farm worksite or during activities related to the operation of a farm (excluding injuries in the farm residence). Examination of both work-related and non–work-related injury cases and cases involving a broad range of ages enabled us to estimate the proportion of *all* childhood farm injuries that may be prevented by changing the Hazardous Occupations Orders, as well as the proportion of work-related injuries that may be preventable.

Data Sources

In the United States, there is no comprehensive national database of pediatric agricultural fatalities. Fatality data were obtained with methods developed by the Canadian Agricultural Injury Surveillance Program. This program contains a comprehensive, population-based fatal-injury data set from a neighboring country with farming practices and child labor laws that are analogous to those observed in much of the United States.[10] We developed an enhanced database that contained every known case of an agriculture-related fatal childhood injury in Canada between 1990 and 2001 (n=226). The Canadian fatality case series data were supplemented with 17 US occupational fatality case reports from the National Institute for Occupational Safety and Health's Fatal Assessment and Control Evaluation program for the years 1992 through 2000,[11] for a total of 243 fatality cases.

In the United States, there is also no comprehensive national database of hospitalized pediatric agricultural injuries. A national registry of hospitalized farm injury cases similar to the database of fatalities has been developed in Canada.[10] We used the Canadian Agricultural Injury Surveillance Program case identification approach to identify injured children treated at 5 regional pediatric hospitals and 2 general hospitals in Canada. These hospitals were from the provinces of Alberta and Ontario. A study period of 1990 through 2001 was used for the hospitalized injury portion of this study (n=361).

Data files from the 1998 Childhood Agricultural Injury Survey (n=330)[12] and 2000 Childhood Agricultural Injury Survey on Minority-Operated Farms (n=259)[13] were obtained electronically from the National Institute for Occupational Safety and Health, for a total of 589 restricted activity injury cases. Injuries identified within these surveys represent a spectrum of farm injuries among children that resulted in at least 4 hours of restricted activity with 10.4% (n=61) requiring hospitalization, 78.3% (n=461) requiring treatment in the emergency department or by an outpatient provider, and 11.4% (n=67) not requiring medical treatment. Data for both surveys were collected by telephone interview from random samples of US farm operators. Analogous data were not available in Canada.

Instrument

A standardized data abstraction instrument was developed in consultation with a child labor expert from the US Department of Labor. A study glossary was developed in concert with the instrument detailing the exact specifications and circumstances under which each Hazardous Occupations Orders–prohibited job category would apply if the exemption were lifted and the minimum age raised. The ability of the investigators to apply the instrument in a valid and reliable manner was assessed through iterative testing with actual cases. Data elements covered within the instrument included case demographics, detailed descriptions of the injury event, and applicability of the Hazardous Occupations Orders–prohibited job categories.

Given the specificity of the Hazardous Occupations Orders, several assumptions guided our coding of prohibited work. For Hazardous Order 1 (operating a tractor of >20 horsepower), we considered all tractors operated by children to be greater than 20 horsepower unless the horsepower was specified or the youth was operating a "lawn tractor." For Hazardous Order 5 (felling, bucking, skidding, loading or unloading timber with butt diameter of >6 inches), we considered all work with timber to involve a butt diameter of more than 6 inches. For Hazardous Order 6 (working from a ladder or scaffold at a height of >20 feet), we considered work from the top of a silo and work on a barn roof to be working at a height of more than 20 feet, unless a lower height was specified. For Hazardous Order 9 (handling or applying toxic agricultural chemicals), we considered all work with chemicals to be hazardous.

Data Abstraction, Coding, and Analysis

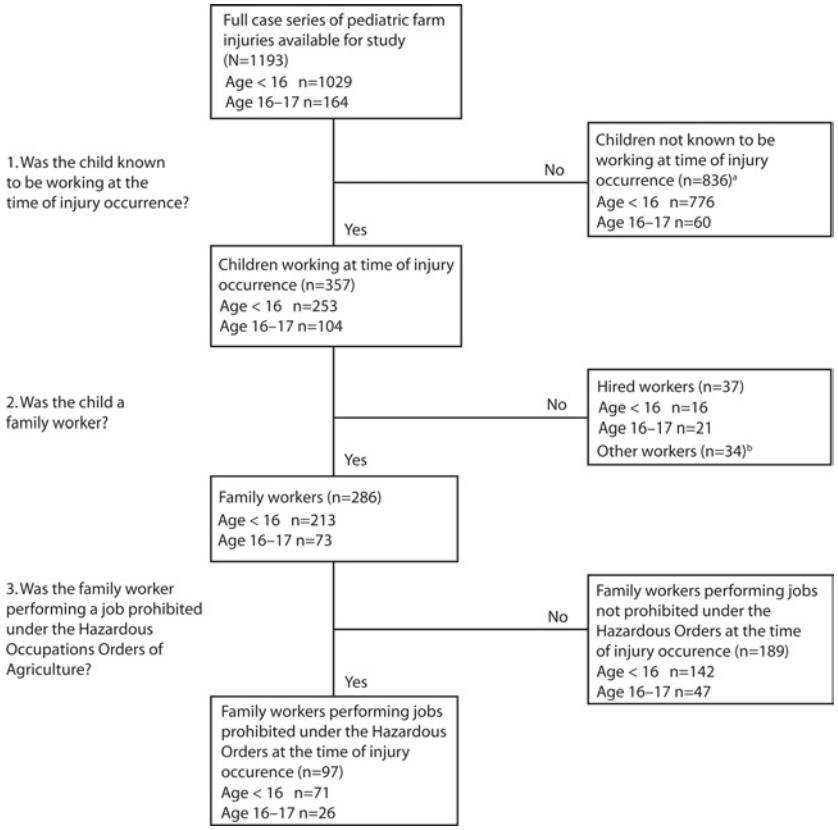
With a standard protocol, 2 investigators independently abstracted and coded all cases involving children performing farm work at the time of injury. The protocol was developed through a series of validation exercises. In each exercise, 10 randomly selected cases were reviewed and interrater agreement was assessed. All disagreements were resolved through discussion with the study team, including consultation with the child labor expert for specific interpretation of the Hazardous Occupations Orders–prohibited job categories, and the protocol was updated. Agreement reached 90% in the third exercise, and the final case review proceeded. Any subsequent disagreements were resolved by consensus. The data analyses are descriptive, and standard summary statistics are presented.

RESULTS

The characteristics of the full case series of 1193 injured children as they relate to the Hazardous Occupations Orders are presented in Figure 1. The majority of injured children were younger than 16 years (n=1029; 86%) and were not working at the time of their injury (n=836; 70%). A total of 286 (24%) cases involved family members engaged in farm work. Very few of the injured children were designated as non-family hired workers on the farm (n=37; 3%).

Applicability of Hazardous Occupations Orders

Approximately one third (33% for those aged younger than 16 years, 36% for those aged 16–17 years) of the children working on a family farm were engaged in jobs prohibited by the Hazardous Occupations Orders if



[a]Includes 111 cases where the work status of the child could not be determined.
[b]Includes visitors, neighbors, relatives of hired workers, and other workers where the familial relationship is unknown.

FIGURE 1—Flow chart of pediatric farm injuries case series, yielding the 286 cases under study.

the exemption were lifted and the minimum age raised. This percentage varied by data source, with children who were fatally injured being the most likely to have been performing prohibited jobs (Figure 2). Hazardous Order 1, operating a tractor with more than 20 horsepower, and Hazardous Order 2, operating or assisting to operate farm machinery, were the leading prohibited job categories for both age groups (Table 1).

Potential for Preventing Injuries

If the Hazardous Occupations Orders were implemented and enforced on family farms, 33% (71/213) of work injuries to children aged younger than 16 years could hypothetically have been prevented because children would have been restricted from engaging in these hazardous jobs (Table 1). If the Hazardous Occupations Orders were implemented and enforced on family farms and the age restriction for hazardous work were raised from 16 years to 18 years, 36% (26/73) of the work injuries to those aged 16 or 17 years could hypothetically have been prevented (Table 1). Overall, with both changes to the Hazardous Occupations Orders, 34% (97/286) of the work injuries could potentially have been preventable.

Work Injuries Not Covered by the Hazardous Occupations Orders

The Hazardous Occupations Orders do not prohibit the majority of jobs that lead to work-related injury to those younger than 18 years (189/286; 66%). Leading categories of work not covered by the Hazardous Occupations Orders (Table 2) include the following: (1) working with animals in situations *not* covered by Hazardous Order 4 (40%), (2) farm work with other machinery *not* covered in Hazardous Occupations Orders 2 and 3 (25%), and (3) farm maintenance in situations *not* covered by Hazardous Order 6 (13%). The leading specific jobs associated with injury were as follows: (1) farm work with all-terrain vehicles (12%), (2) feeding large animals (10%), (3) farm work on horseback (9%), and (4) working with other farm machinery (9%). The severity of these 189 work injuries varied, with 8% (n=15) fatal, 31% (n=59) requiring hospitalization, 52% (n=99) requiring treatment in the emergency department or by an outpatient provider, and 8% (n=16) not requiring medical treatment.

DISCUSSION

Our study demonstrates that removal of the family farm exemption from the Hazardous Occupations Orders has the potential to eliminate one third of the occupational injuries experienced by children younger than 16 years who are working on their parents' farms. Removal of the family farm exemption in combination with a change in the age restriction for hazardous work could lead to similar reductions among children aged 16 and 17 years. These policy changes were recommended by the National Research Council and Institute of Medicine in their 1998 joint report on child labor in the United States[7] but have never been implemented by Congress through an amendment to the FLSA. If implemented and enforced, these changes could also lead to reductions in injury rates that meet or exceed national health objectives recommended in the Healthy People 2010 initiative being led by the US Department of Health and Human Services.[14]

Children working in agriculture continue to have the highest rate of fatal work injuries compared with children in other work environments, with the preponderance of these fatal injuries occurring on farms that are family owned and operated.[3] Protection from physical harm is a fundamental human right for children,[15] and it is well recognized that children require higher standards of protection than adults.[7] These facts are not recognized in existing occupational health and safety legislation aimed at family farms, which is perplexing given the magnitude of the pediatric farm injury problem. Given

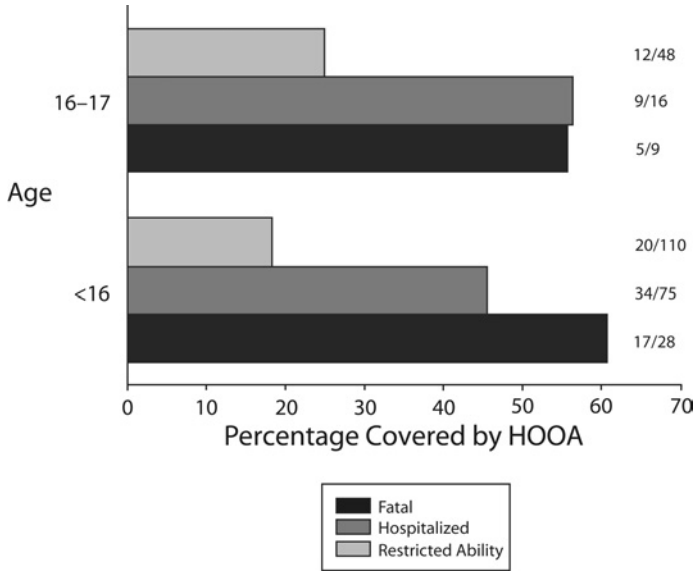


FIGURE 2—Percentage of injured children working on a family farm who were performing a job prohibited under the Hazardous Occupations Orders of Agriculture (HOOA) at the time of injury, by age group and data source.

these observations and in light of our research findings, there is a clear need for at least minimum safety standards to protect children from harm on family farms.

The Hazardous Occupations Orders should be considered the *minimum* safety requirement for *all* working youths, because the Orders do in fact cover many of the most serious traumatic injury circumstances that affect children working on farms (Figure 2) and are thus likely to be efficacious. However, removing the family farm exemption from the Hazardous Occupations Orders and raising the age standard will be insufficient to ensure that the farm work performed by children is safe. Our study findings build upon the National Institute for Occupational Safety and Health recommendations for changes to the Hazardous Occupations Orders[16] and provide additional objective evidence that can assist in the revision of the content of the Hazardous Occupations Orders to make them more relevant to contemporary farm environments and practices. With respect to children at work, the changes should include (1) identification of high-risk activities that impose risks for blunt animal trauma, and (2) replacement of out-of-date lists of farm machinery with ones that reflect modern agricultural practice. There is an obvious need to update the Hazardous Occupations Orders, and there is an additional need for further evaluation of their content and implementation.

The adoption of changes in the Hazardous Occupations Orders will clearly require a paradigm shift within farm society and among the health and safety professionals who serve the agricultural population. Existing injury prevention initiatives aimed at farmers have traditionally favored voluntary over regulatory approaches to prevention.[6,17] However, we believe that a shift toward policy-oriented approaches is inevitable and will be guided by the known lack of efficacy of educational approaches to injury prevention,[18–20] the inadequacy of voluntary engineering controls,[21,22] the magnitude of the pediatric farm injury problem,[8,10,23] and the political will of national public health and medical organizations.

Beyond the Hazardous Occupations Orders, our study results suggest a need for other measures that address the physical safety of children on farms. The study findings clearly put the burden of occupational injuries to children on farms into a broader context. Assuming that the Hazardous Occupations Orders are efficacious, implementation and enforcement of these policies would still have no impact on the majority of farm injuries experienced by children who were present in the farm worksite but were not themselves engaged in farm work. New occupational policies and other preventive initiatives are required to address these injury patterns, which are heavily concentrated in the very young.[6,24,25] These common and often lethal injury events are not addressed in any existing regulations.

Generalizability

An important concern surrounding our analysis was whether patterns of farm injuries among children observed primarily in Canada could be generalized to the United States. National, record-level data describing pediatric farm fatalities exist for the United States[26] but are not available to researchers operating outside the federal government, because of confidentiality restrictions (Ryan Smith, Office of Safety and Health Statistics, Bureau of Labor Statistics, oral communication, August 8, 2005). Hospital medical records are also not available for similar reasons. Hence, our study relied heavily upon Canadian injury records, and an obvious concern is the generalizability of Canadian injury patterns to the United States context.

In the United States, leading causes of farm injury to children include tractor-related injuries, farm machinery (including power takeoff) injury, livestock injury, falls from structures, chemical burns, and poisonings.[8] Leading causes of traumatic injury in the present case series were very similar, which provides some assurance as to the generalizability of our findings. Second, although regional differences exist, the leading types of crops and livestock produced on US and Canadian farms are similar,[27–29] suggesting more similarities than differences in agricultural practices between the countries. Finally, similar to the situation in the United States surrounding the Hazardous Occupations Orders, children who live on Canadian farms are exempt from most provincial occupational health and safety legislation that would prohibit their participation in hazardous work

TABLE 1—Hazardous Occupations Orders (HO) Categories of Prohibited Jobs Involved in Cases of Fatality, Hospitalized Injury, and Restricted-Activity Injury, by Age, Among Family Members Aged Younger Than 18 Years Injured While Working on a Family Farm: 1990–2001

Hazardous Order Number and Job Category	Fatalities	Hospitalized Injuries	Restricted-Activity Injuries[a]	Total (%)
Aged < 16 Years				
No. cases of injury	28	75	110	213
HO1: Tractor	9	16	12	37 (17.4)
HO2: Farm machinery	4	13	3	20 (9.4)
HO3: Other machinery	0	1	0	1 (0.5)
HO4: Animals	0	0	2	2 (0.9)
HO5: Timber	1	1	1	3 (1.4)
HO6: Working from heights	0	2	2	4 (1.9)
HO7: Transportation	3	4	2	9 (4.2)
HO9: Chemicals	0	1	0	1 (0.5)
No. cases (%) involving children working in 1 or more hazardous job categories[b]	17 (60.7)	34 (45.3)	20 (18.2)	71 (33.3)
Aged 16–17 Years				
No. cases of injury	9	16	48	73
HO1: Tractor	4	5	5	14 (19.2)
HO2: Farm machinery	1	5	5	11 (15.1)
HO6: Working from heights	0	0	3	3 (4.1)
HO8: Working in storage units	1	0	0	1 (1.4)
HO9: Chemicals	0	0	1	1 (1.4)
No. cases (%) involving children working in 1 or more hazardous job categories[b]	5 (55.6)	9 (56.3)	12 (25.0)	26 (35.6)

[a]Data collection in 1998 and 2001 only.
[b]Summed categories may not equal numbers of children performing jobs, because injured children may have performed jobs in more than 1 hazardous category.

activities.[30] Thus, our findings are likely generalizable to children who work on US farms.

Strengths and Limitations

Ours is one of the first studies to evaluate the potential impact of one component of a public policy on the reduction of farm injuries among children. We have used an accepted evaluative approach[22] and have taken steps to ensure reliability and validity of our data collection methods and case interpretations. Although data limitations required that we review injuries from Canada and rely on similarities in agricultural practices in the United States and Canada, there are substantially more farms in the United States, with the likelihood of many more work-related farm injuries to children. Thus, the impact of these policy changes for prevention would be even greater than the injury numbers in this study suggest.

Although our study examined a large case series, additional limitations associated with our sources of injury data warrant recognition. First, irrespective of our arguments about the generalizability of Canadian injury patterns to the US context, the absence of trauma data from the United States is an important limitation that could not be overcome, given existing restrictions on data access. Second, our hospital data were subject to patient referral biases in that the pediatric hospitals are tertiary centers providing regional pediatric trauma care. Hence, severe injuries and injuries requiring diagnostic (e.g., head injuries requiring advanced imaging) and trauma procedures (e.g., certain orthopedics) are likely to be overrepresented. Third, because our case retrieval process centered around "traumatic injury," we are likely to have obtained poor coverage of farm injuries among children involving 3 of the Hazardous Occupations Orders: Hazardous Order 9—toxic agricultural chemicals, Hazardous Order 10—blasting agents, and Hazardous Order 11—anhydrous ammonia.

Conclusions

This novel evaluation addressed a leading public health problem on North American farms—the occurrence of injuries to populations of working children. Through this analysis we demonstrated that the Hazardous Occupations Orders, if implemented and enforced, have the potential to prevent one third of work-related injuries sustained by children working on family farms. Within the agricultural sector, this would exceed the population health goals espoused in the Healthy People 2010 initiative.[14]

Findings from our evaluation also provide strong and objective evidence in support of (1) elimination of the existing exemption of family farms to be in compliance with these Hazardous Occupations Orders and (2) harmonization of the minimum age standards for agricultural Hazardous Occupations Orders with those of other work environments. There is also an obvious need to revise the Hazardous Occupations Orders to be relevant to contemporary agriculture, along with a continuing need to address injuries to nonworking children on farms, especially the very young.

Policy-oriented approaches to farm injury prevention among children have historically met with opposition from agricultural organizations, mainly for financial (costs to the farm enterprise) and cultural (e.g., traditional work practices) reasons.[17] Agriculture is exempt from much existing occupational health and safety legislation for these reasons. Although it is recognized that changes to the Hazardous Occupations Orders may lead to new labor practices and safety requirements for farm operations, and some of these will have financial implications, public health practice obligations and, specifically, the need for protection of children on farms should supersede such economic and cultural arguments.

Creative policy-oriented solutions that tackle the occurrence of farm injuries among children in a direct manner are clearly the

TABLE 2—Nonprohibited Jobs Involved in Cases of Fatality, Hospitalized Injury, and Restricted-Activity Injury Among Family Members Younger Than 18 Years Injured While Working on a Family Farm: 1990–2001

Job	Fatalities	Hospitalized Injuries	Restricted-Activity Injuries[a]	Total (%)
Working with animals	3	17	56	76 (40.2)
Feeding horses and cattle	1	5	12	18 (9.5)
Farm work on horseback	1	1	15	17 (9.0)
Herding livestock	0	4	10	14 (7.4)
Leading/grooming	0	3	6	9 (4.8)
Branding/breeding/vaccinating	0	1	3	4 (2.1)
Catching/holding a pig	0	0	3	3 (1.6)
Milking with pipeline	0	0	2	2 (1.1)
Other animal	1	3	5	9 (4.8)
Farm work with machinery	8	9	30	47 (24.9)
All-terrain vehicle operation	2	1	19	22 (11.6)
Other machinery	3	8	6	17 (9.0)
Tractor repair or maintenance	1	0	3	4 (2.1)
Farm truck	2	0	2	4 (2.1)
Farm maintenance	2	8	14	24 (12.7)
Repairing fence	1	3	6	10 (5.3)
Burning brush/garbage	0	3	2	5 (2.6)
Cleaning animal enclosures	1	0	4	5 (2.6)
Building maintenance	0	2	2	4 (2.1)
Farm work with hand tools	0	1	6	7 (3.7)
Loading or unloading hay	0	4	2	6 (3.2)
Pruning or hand harvesting	0	0	3	3 (1.6)
Other or insufficient information	2	9	15	26 (13.8)
Total	15	48	126[b]	189[c] (100.0)

[a]Data collection in 1998 and 2001 only.
[b]Hospitalized as inpatient (11/126; 8.7%), emergency department/outpatient medical treatment (99/126; 78.6%), not formally treated (16/126; 12.7%).
[c]Children working on a family farm aged <16 years: 142 (75%); aged 16–17 years: 47 (25%).

next step in the amelioration of this ongoing pediatric injury problem if our society is committed to meeting the Healthy People 2010 national goals. From a public health perspective, there is no logical argument for preventing implementation of such policy solutions in the face of existing evidence. ■

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Contributors

B. Marlenga, R.J. Brison, and W. Pickett contributed to the conception and design of this study and the acquisition of data. B. Marlenga and W. Pickett led the writing. R.L. Berg and J.G. Linneman completed the analyses. All authors reviewed the article, contributed to critical revisions, and provided assistance in all other aspects of the study.

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Human Participant Protection

This project was approved by the institutional review boards of both Marshfield Clinic Research Foundation and Queen's University.

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