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Injuries Among Farm Workers in the United States 1995

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Injuries Among Farm Workers in the United States, 1995

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DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

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Executive Summary

The Traumatic Injury Surveillance of Farmers (TISF) survey project is the first national surveillance project in over 15 years to provide injury data for the entire agricultural production industry (i.e., farms). These data provide sufficient detail to target both specific farm types and farm workers at high risk of work injuries. This document, the third in a series of three publications, summarizes nonfatal lost-time work injury estimates for the agricultural production industry for 1995.

Major findings from the 1995 TISF include:

- An estimated total of 195,825 lost-time work injuries occurred on U.S. farms in 1995, after adjustment for non-response in the survey. This represents an incidence rate for all farming operations of 6.8 injuries/200,000 hours worked (200,000 hours is equivalent to 100 full-time workers).

- The highest injury rates were associated with beef, hog, or sheep operations (10.2 injuries/200,000 hours worked), followed by cash grain operations (7.6 injuries/200,000 hours worked), nursery operations (7.3 injuries/200,000 hours worked), and field crop operations (5.8 injuries/200,000 hours worked).

- The greatest number of injuries were in beef, hog, or sheep operations (43.3%), followed by cash grain operations (17.1%), vegetable, fruit, or nut operations (10.9%), and dairy operations (8.7%).

- The leading causes of lost-time work injuries on farms were machinery, excluding farm tractors (21.3%), livestock (20.0%), and working surfaces (8.5%). Farm tractors accounted for 4.1% of these nonfatal injuries.

- The injuries typically occurred to the workers' leg, knee, or hip (17.4%), back (14.4%), fingers (13.2%), or their arm or shoulder (12.9%).

- Sprains and strains (28.2%) accounted for the largest number of lost-time injuries, followed by fractures (17.4%), lacerations (15.2%), and bruises (15.2%).

- Farm operators and their family members accounted for most of the injuries (63.8%) reported in the 1995 TISF.

- Injured workers were usually male (88.8%), and the race or ethnic origin of the worker was typically white (81.3%). Hispanics accounted for the second highest number of injuries (16.8%).

- Of the estimated 131,540 injured family workers, 98.6% were white, with 52% of the injured family members working on beef, hog, or sheep operations. The estimated injury rate for family workers on all farms was 8.3 injuries/200,000 hours.

- Of the estimated 59,888 injuries among hired workers, Hispanics accounted for 51.9%, with 25% of the injured workers working on beef, hog, or sheep operations. The injury rate for hired workers on all farms was 4.9 injuries/200,000 hours.

The tables of farm injury statistics contained in this document are designed as a resource for safety and health professionals and researchers to answer the major questions about farm-related work injuries. Farm injury statistics for 1995 are provided for the Nation, major regions, and selected States. The content of this document fills a critical information gap by providing detailed data on agricultural injuries in the U.S.

Section I: The Traumatic Injury Surveillance of Farmers Survey

INTRODUCTION

Workers in the agriculture industry of the United States (U.S.) have received a great deal of attention recently because of their high risk for fatal injuries and suspected risk for serious nonfatal injuries [NIOSH, 1992; National Coalition for Agricultural Safety and Health, 1989]. A major problem with planning injury prevention programs for these agricultural workers is a lack of surveillance data, especially for those injuries which are nonfatal. To address this lack of nonfatal injury data, the National Institute for Occupational Safety and Health (NIOSH), working in cooperation with the National Safety Council (NSC) Agricultural Division and the U.S. Department of Agriculture (USDA), developed the Traumatic Injury Surveillance of Farmers (TISF) survey.

The objective of the TISF was to determine the frequency, incidence rate, and characteristics of agricultural work-related injuries occurring in the U.S. using a uniform surveillance system. This was accomplished by collecting data on agricultural work-related injuries that occur during a calendar year on a random sample of farms across the U.S. The TISF provides injury estimates at the State, regional, and U.S. level.

The intent of the following document is to present the third and final year of TISF results in an easily accessible statistical abstract format. This is the third in the series of TISF reports [Myers, 1997; Myers, 1998]. No attempt is made to interpret the results presented here because of the quantity of data presented, and because these data represent only one part of a more complex survey. It is hoped that the data will be used by public health and safety professionals, engineers, and other groups working in the area of farm safety to help in their intervention programs and injury control research.

These data were collected by the USDA, National Agricultural Statistics Service (NASS) through an interagency agreement with NIOSH. The injury estimates and incidence rates presented in this statistical abstract were calculated by NIOSH and are presented here with the approval of USDA, NASS. Access to all TISF data files, or additional injury estimates from the TISF, are subject to the approval of USDA, NASS.

METHODS

General Survey Design:

The TISF surveillance system was a mail survey-based surveillance system using a Total Design Method methodology [Dillman, 1978]. The TISF survey used a personalized letter to the person asked to complete the survey, emphasizing that their response was important. Each person was sent a postcard after the first mailing of the survey reminding them to complete the questionnaire. Approximately 3 to 4 weeks after the initial mailing, a second letter and copy of the survey was sent to those people who had not responded. To increase the response rates, the TISF survey was conducted in January and February, a time of the year when most farm operators are less active. The survey instrument used for the TISF was kept at a maximum of four pages. The 1995 instrument is provided in Appendix A. Finally, an abbreviated telephone survey was conducted on a random sample of 1,000 non-responding farm operators to allow for the assessment of non-response bias in the main survey.

The sample selection and sampling frame information for the survey was provided by USDA, NASS through an interagency agreement. All agricultural production operations in the U.S. were in the population for study. NASS drew all samples, conducted the mailings, conducted follow-back contacts to the farm operations for assessing non-response, entered data, and provided all sampling frame information required by the NIOSH sampling design.

For the survey, an injury was defined as any condition that results in ½ day or more of restricted activity (e.g., person could not perform work or other normal duties, missed work, missed school), or required professional medical treatment. An agricultural work-related injury was defined as any injury meeting this definition that occurred while performing work (either on the farm or off the farm) associated with the farm business. This definition excluded injuries to contractors working for the farm operation, injuries associated with work not done for the farm business, or injuries occurring on the farmstead while the person was not working for the farm business. While the total number of work-related lost-time injuries was requested for the calendar year on the survey, descriptive information was only collected for the most recent injury event.

All information provided on the survey was self-reported by the farm operator. As such, variables such as race or ethnic origin, age, and the cause of the injury event are subject to the interpretation of the farm operator.

Sampling Design:

A two-stage random sample of farm operations was drawn to provide estimates for the study population. The sample-based estimators for this two-stage design are provided in Appendix B. The

first-stage sample consisted of 42 primary units, which were individual States, or combinations of States, that ensured a reasonable number of farming operations per primary unit (Table 1-1). The primary units were stratified by geographic region in the U.S. (Table 1-2). Selection of these units was systematic within a region. The stratification of the first-stage sample by region reduced the effect of using systematic rather than random sampling. Equal probability sampling assumptions were used for the first-stage sample. The number of samples in the first-stage (n_1) ranged from 15 to 19 depending on the year of the survey. The second-stage sample was a stratified simple random sample of farming operations (i.e., secondary units) within the selected first-stage units. The second-stage stratification was by type of farming operation. Sample size allocations within strata were proportionally allocated by farm type. The total number of farms in each primary unit is given in Table 1-1. All responses to the mail survey were on a "per farm" basis. The second-stage sample size (n_2) was 1,400 farms per first-stage sampling unit.

Upon completion of the mail survey, a random sample of 1,000 non-respondents from all primary units were contacted by telephone to obtain basic survey information which was used to assess non-response bias in the mail survey.

Injury, Restricted Workday, and Exposure Estimates:

The national and regional estimates and variances for injuries, restricted workdays, and hours of exposure were obtained by using the unbiased estimators of a two-stage sample, which are presented in Appendix B. The State estimates for injuries and hours of exposure were obtained using the unbiased estimator for a stratified simple random sample (Appendix B.). All sample-based estimators and variance estimators were derived from Cochran [1977].

Incidence Rate Estimates:

The injury incidence rates and the restricted workday incidence rates were estimated as the estimated injuries or restricted workdays at the State, regional, or national level, divided by the estimated exposure at the State, regional, or national level, respectively. The rates are in terms of 200,000 hours, which is the Bureau of Labor Statistics definition of 100 full-time workers [BLS, 1990].

The sampling variance calculation for the exposure-based incident rates was estimated using the linear combination of variances of the injury estimate and the exposure estimate as described by Cochran [1977]. The general form of the variance expression is:

$$v(R) = 200{,}000^2 \left(\frac{1}{\bar{x}}\right)^2 [v(y) + R^2 v(x) - 2R\, cov(y,x)]$$

Table 1-1. Primary (States) and secondary (Farms) sample units for the TISF Surveillance System.

Primary Units (States)	Secondary Units (Farms)
Alabama	47,000
Alaska, Washington	44,000
Arizona	8,100
Arkansas	48,000
California	84,000
Colorado	27,000
Connecticut, Rhode Island, Massachusetts	11,670
Delaware, Maryland	18,600
Florida	41,000
Georgia	48,000
Hawaii	4,650
Idaho	22,100
Illinois	83,000
Indiana	71,000
Iowa	105,000
Louisiana	34,000
Kansas	69,000
Kentucky	95,000
Maine, New Hampshire, Vermont	16,800
Michigan	55,000
Minnesota	90,000
Mississippi	41,000
Missouri	109,000
Montana, Wyoming	33,600
Nebraska	57,000
Nevada, Utah	15,500
New Jersey	8,300
New Mexico	14,000
New York	39,000
North Carolina	65,000
North Dakota	33,500
Ohio	86,000
Oklahoma	70,000
Oregon	37,000
Pennsylvania	54,000
South Carolina	25,500
South Dakota	35,000
Tennessee	91,000
Texas	186,000
Virginia	47,000
West Virginia	21,000
Wisconsin	81,000

Table 1-2. Geographic regions of the United States used in the TISF survey.

Region	States	Scheduled Survey Year(s)
Northeast	Maine	1994
	Vermont	1994
	New Hampshire	1994
	Massachusetts	1995,1996
	Connecticut	1995,1996
	Rhode Island	1995,1996
	New York	1995
	Pennsylvania	1994,1996
	New Jersey	1994
South	Delaware	1996
	Maryland	1996
	West Virginia	1995
	Kentucky	1995
	Virginia	1994,1996
	Tennessee	1994
	North Carolina	1994
	South Carolina	1995
	Georgia	1995
	Florida	1994,1996
	Alabama	1995
	Mississippi	1996
	Louisiana	1996
	Arkansas	1996
	Oklahoma	1994
	Texas	1996
Midwest	Ohio	1996
	Michigan	1994
	Indiana	1995
	Illinois	1995
	Wisconsin	1994
	Minnesota	1996
	Iowa	1994
	Missouri	1994,1995
	Kansas	1994,1996
	Nebraska	1996
	South Dakota	1995
	North Dakota	1994
West	Montana	1995
	Wyoming	1995
	Colorado	1994
	New Mexico	1996
	Arizona	1994
	Nevada	1995
	Utah	1995
	Idaho	1995
	Washington	1994
	Oregon	1995
	California	1994,1996
	Alaska	1994
	Hawaii	1996

where: v(R)= variance of the rate, R;
v(y)= variance for the numerator (e.g., injuries);
cov(y,x)= covariance between the numerator and the hours of exposure;
$\bar{x}$ = mean for hours of exposure.
v(x)= variance for the hours of exposure;

The covariance term for the State estimate accounted for the stratification of the sampled farms, while the covariance term for the regional rates included the first-stage and second-stage components of the covariance term. For the national estimates, only the first-stage covariance term was assessed, with the second-stage component assumed to be negligible.

Categorical Frequency Estimates:

The frequency estimates for the categorical variables on the TISF survey were based on all farms that reported only one injury (farms with more than one injury were excluded). This was done to avoid bias during the construction of frequency distributions of categorical variables. Because the TISF survey results only have detailed information for the most recent injury event, including farms that reported more than one injury would bias the distributions by causing the distribution of injuries by month to be artificially skewed towards the later months of the calendar year. Furthermore, if different types of injuries were associated with the time of the year, then including injury descriptions for farms with more than one injury could bias other categorical variables.

The frequency estimates for farms with only one injury were adjusted for each stratum within a specific State to provide frequency results that sum to the estimated total injuries within each State. Because the regional and national estimates were derived from the State estimates, no further adjustments were required beyond the State level. The adjustment was a simple proportional increase of the sampling weight to make all farms with one reported injury account for the additional injuries not included for farms with more than one injury. For example, if the total estimated number of injuries for stratum A was 100 injuries, but the estimated number accounted for by farms reporting only one injury event was 85 for that stratum, then the sampling weight for the farms reporting only one injury event in stratum A would be increased by a factor of 1.18 (i.e., 100 divided by 85). This adjusted sampling weight was used to construct the categorical frequency tables.

Frequency tables for States, regions, and the nation are presented at differing levels of detail because of differing levels of data available at the three levels. National frequency tables provide the highest level of detail and cross classification of information, while the State data are only provided at the univariate level. The regional tables provide much of the same detail as the national tables, except for age-specific data, and

the use of broad farming groups (crops and livestock) rather than the specific farm types presented in the national tables. Finally, not all categories for all variables may be presented in these tables, such as specific age groups or racial groups, because of an insufficient number of cases to make reliable estimates.

Non-Response Bias:

The analysis of the 1995 survey indicated that the results based on the follow-back interviews conducted with 1,000 non-respondents did not differ significantly from the results derived from the main survey. Therefore, no adjustments were made to the results derived from the main survey respondents. Results from the 1994 TISF did have a significant response bias, and as such, care should be taken when comparing these results to those reported for 1994.

HIGHLIGHT OF RESULTS

A total of 11,630 of the sampled 21,000 farm operations responded to the mail survey for a response rate of 55.3 percent. The survey response rate by State ranged from a high of 68 percent for the State of Oregon to a low of 47 percent for the State of South Dakota. Evaluation of the survey of 1,000 non-responding farm operations from the main survey did not show a significant bias in the main survey associated with the non-responding farms.

There were an estimated 195,825 lost-time work injuries on farms in 1995. This represented an incidence rate of 6.8 lost-time injuries per 200,000 hours of farm work. These injuries resulted in an estimated 3,388,740 restricted workdays, with a corresponding lost workday rate of 118.2 lost workdays per 200,000 hours of work.

The region of the nation with the highest number of lost-time injuries was the Midwest with an estimated 89,212 lost-time injuries. The highest estimated injury rate also occurred in the Midwest (9.1 lost-time injuries per 200,000 hours of farm work).

The major sources of injury on U.S. farming operations were machinery, excluding tractors (21.3%),livestock (20.0%), and working surfaces (8.5%). These injuries most frequently resulted in a sprain or strain (28.2%), fracture (17.4%), or cut (15.2%). The body parts most commonly injured were the leg, knee, or hip (17.4%), the back (14.4%), and the fingers (13.2%). Workers 30 to 39 years of age reported the highest number of injuries (21.7%). Males were involved in these injury events 88.8 percent of the time.

Beef, hog, or sheep operations were found to have the highest number of lost-time work injuries (84,736 injuries) and restricted workdays (1,869,561 restricted workdays). Cash grain operations had the second highest number of injuries (33,481 injuries);

followed by vegetable, fruit, or nut operations (21,406 injuries. Cash grains operations had the second highest number of restricted workdays (607,160 restricted workdays); followed by dairy operations (318,711 restricted workdays); and vegetable, fruit, or nut operations (204,412 restricted workdays). The highest injury rates per 200,000 hours of work were seen in beef, hogs, or sheep operations(10.2 injuries per 200,000 hours); followed by cash grain operations (7.6 injuries/200,000 hours); nursery operations (7.3 injuries/200,000 hours); and field crop operations (5.8 injuries/200,000 hours).

Family workers (including partners and family members of the partner) accounted for more injuries(131,694 injuries) and more restricted workdays (2,757,223 restricted workdays) than hired workers (59,888 injuries resulting in 606,542 restricted workdays). Family members had higher injury rates than hired workers on most types of farm operations, except nursery, poultry, and dairy operations.

The complete results of the 1995 TISF are presented in Sections 2 through 4 of the statistical abstract. Section 2 presents the national statistics, Section 3 the region-specific statistics, and Section 4 the State-specific statistics.

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