

# Farm Injury Surveillance in Two California Counties—General Findings

A. M. Osorio, C. R. Geiser, E. Lee Husting, K. F. Summerill

## Abstract

Because of the known high risk for occupational injuries among agricultural workers, and the unique composition of the California agricultural industry, a two-county surveillance system was developed for the detection of farm-related occupational injuries. The goals of this project include the active surveillance of farm-related work injuries using multiple ascertainment sources, selective field investigations of identified cases and associated health education and outreach. From October 1991 through September 1996, a network of medical care providers and local agencies in Monterey and Fresno Counties provided case reports for the farm injury surveillance system. During the five-year operation of the surveillance system, 5,164 cases were identified. Of these injury cases, 85% were male and 85% were of Hispanic origin. There were approximately twice as many cases in Fresno as in Monterey County which is consistent with the different populations of each region. There were 134 (3%) fatal injuries and 319 (6%) hospitalizations. The two leading causes of the fatalities were motor-vehicle accidents involving tractors and agricultural machine/tractor episodes. Overexertion (14%) and falls (11%) were the most prevalent type of injury event. Despite the preliminary nature of this analysis, the current surveillance project has provided important information about the nature of farmworker injuries in these two counties which can be used in injury intervention activities.

**Keywords.** Agricultural injury, Farm hazards, Surveillance, California, Farmworker.

**T**he U.S. Public Health Service has highlighted workplace injuries as one of the occupational health end-points for the Year 2000 National Disease Prevention Objectives. In particular, farmworkers are cited as a high-risk group needing special attention (table 1). In 1987, there were approximately twofold increases in the fatal injury rate and non-fatal injury among the farmworker group as compared to the general workforce. More recent year estimates continue to show an elevated rate among farmworkers.

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This paper was initially presented at the NIOSH Agricultural Health Conference on 16 July 1997 in Morgantown, West Virginia; submitted for publication in December 1997.

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**Table 1. Healthy People 2000 Occupational Safety and Health Objectives for workplace injuries\***

Objective	Baseline 1987	1991	1992	Target 2000
Fatal injuries – All workers	6.0	4.3	5.0	4.0
Fatal injuries – Farmworkers	14.0	---	24.0	9.5
Non-fatal – All workers	7.7	7.9	8.3	6.0
Non-fatal – Farmworkers	12.4	10.2	11.0	8.0

\* Values reflect the number of work-related injuries per 100 full-time workers by reference year (non-fatal injuries) and number of work-related fatalities per 100,000 full-time workers (fatal injuries) (U.S. DHHS, 1991).

The California farm injury surveillance project is based in two highly agricultural counties in the State (table 2). Both Fresno and Monterey Counties tend to have a higher percentage of Hispanic residents, rural area, and unemployment than the State as a whole. Also, Fresno County has nearly double the percentage of residents living below the poverty level as compared to the entire State.

During the years 1989 through 1991, the U.S. Department of Labor conducted the California portion of the National Agricultural Workers Survey (NAWS). In California, the NAWS collected interview data from 1,844 randomly selected seasonal agricultural workers in nine counties: Fresno, Kern, Kings, Imperial, Monterey, Sonoma, Tulare, Riverside, and Yolo (U.S. DOL, 1993). The California NAWS provided a profile of the farm worker population that is reflective of the target population for our survey: 90% of the workers surveyed were Hispanic, 75% were men, 60% lived with a spouse, child or parent while employed, 2% were less than 18 years of age, half were involved in harvest work, 86% worked with fruits, nuts or vegetables, one third were employed by labor contractors, and 32% reported having health insurance coverage.

The distribution of farm ownership type in California is different from that of the rest of the nation (table 3). Approximately one third of all farms in California and in each of the target counties, Fresno and Monterey, are non-family owned as

**Table 2. Demographic profile for Fresno and Monterey Counties, and California (CDHS, 1996)\***

	Fresno County	Monterey County	California
Total population	773,451	375,680	32,520,134
(Percent of State population)	(2)	(1)	(--)
Percent working-age population (18-64 yr)	57	60	62
Ethnic/racial population (%)			
white, non-hispanic	47	50	54
hispanic	39	37	29
asian	10	8	11
black	5	6	7
Percent rural area	17	17	7
Percent below poverty level	21	12	13
Percent unemployed	14	13	8

\* All figures are for 1994 except rural area (year 1990) and unemployment (year 1995).

**Table 3. Farm ownership characteristics for Fresno and Monterey Counties, California and the U.S., 1992 estimates (U.S. BOC, 1995a,b)**

	Fresno County	Monterey County	California	United States
Total number of farms	7,021	1,245	77,669	1,925,300
Number of farm owners – Family (% of total farms in area)	4,915 (70)	834 (67)	50,485 (65)	1,655,758 (86)
Number of farm owners – Other (% of total farms in area)	2,106 (30)	411 (33)	27,184 (35)	269,542 (14)

opposed to only 14% for the U.S. Corporate farming poses different challenges in the prevention and detection of occupational injuries and hazards.

Furthermore, the two counties selected for the California Farm Survey are agriculturally very diverse and highly productive: (1) for 1992, Fresno County was the top county nationwide for number of farms (7,021), dollar value of crops sold (\$1.42 billion) and acreage in the following commodities: fruits, nuts, berries, cotton, tomatoes, orchard crops, and grapes; and (2) for 1992, Monterey County was the third leading county nationwide for dollar value of crops (\$1.16 billion) and the top county for acreage in the following commodities: vegetables, sweet corn and melons, lettuce and romaine, vegetables harvested for sale, and strawberries (U.S. BOC 1995c). Because of the known high risk for occupational injuries among agricultural workers, especially migrant farmworkers, and the unique composition of the California agricultural industry, a two-county surveillance system was developed for the detection of farm-related occupational injuries.

## Methods

The overall goal of this project was to evaluate occupational farm injuries in two California counties, Fresno and Monterey. Specific goals included: (1) the active surveillance of farm-related work injuries using multiple ascertainment sources, (2) selective field investigations of cases identified through the surveillance system, and (3) health education and outreach to the affected labor, management, and medical groups. This report will focus on the surveillance portion of the project.

The surveillance case definition deals with occupational, agricultural and injury type criteria: (1) occupational: the injury occurs at an agricultural site where the index case is working or is associated with agricultural production or service, or is due to farm machinery or agricultural hazards, (2) agricultural: the injury occurs within the general agriculture, forestry and fishing industries, and (3) injury type: conditions eligible for inclusion in the surveillance system include fractures, lacerations, burns, strains, insect bites, and chemical agent exposure.

Data collection for the surveillance system occurred from October 1991 through September 1996. Project field representatives (one based in each county) developed and maintained contact with a health care provider network of case reporters in Monterey and Fresno Counties. The source for data reports included clinic and hospital personnel, state and local agencies (such as the California OSHA, the California Highway Patrol, and the local coroner's office), and the local media.

The reporting form used for the surveillance system is the Doctors' First Report of Occupational Injury and Illness (DFR) which is legally required in California as part of the workers' compensation system. The DFR form contains information

about the patient (demographics and location), the employer (name, location, and nature of business), the treating physician, the occupational event (time, date, and circumstances), and subsequent medical evaluation and diagnosis. Physicians are required to complete this report of occupational injury or illness and submit it to the insurance carrier within five days of any initial examination. The project field representatives routinely collected the DFRs at the various clinic and hospital sites within the health care provider network.

As needed for clarification of any injury event, the two project field representatives would make contact with the patient and conduct visits to the work site. The information from the two county-based field representatives was sent to the project headquarters in Berkeley, California. At the Berkeley offices, data quality review and entry, and periodic data trend analyses were conducted. To avoid duplication of cases due to multiple reporting sources, a comparison of name, age and/or date of birth, social security number and injury date/location was conducted. In order to maintain good communication between the headquarters and field staff and to discuss current cases that may have needed more follow-up, 2-4 teleconferences per month and annual project staff retreats in one of the two surveillance counties were held. During the course of the surveillance project, 35 of the more extensive case follow-up investigations resulted in non-technical investigation summaries and used as part of the education and outreach efforts also conducted by the county-based field staff.

Initial data entry was performed using Epi-info software. Later, SPSS was used for further data quality review as well as data analysis. ICD-9 E code designations were performed for all cases by a trained coder. Because of the extensive data set created by the surveillance project and the fact that data analysis is on going, only preliminary overall data analysis results will be presented.

## Results

The final reporting network for each county is comprised of the following components: (1) Fresno County: 7 general hospitals (including a regional trauma center) and 7 clinics participated with 3 smaller hospitals and 3 clinics not participating. In addition, case reports were obtained from local newspapers, Cal-OSHA and the coroner's office; (2) Monterey County: 5 hospitals (including a regional trauma center), and 4 clinics participated with 5 other clinics not participating. Also, there were case reports from local newspapers, Cal-OSHA, coroner's office, and emergency response system. The major hospital emergency and outpatient departments in each county participated in the reporting network.

A total of 5,164 cases were identified during the five-year operation of the surveillance system in Fresno and Monterey Counties (fig. 1). Because of the initial start-up time needed in the first year and the closing down of the system in the final year, the bulk of the cases were identified during the 1992 through 1995 time period. The majority of the identified injury cases were male (85%), White (97%), and Hispanic (85%). Seventy-nine percent of the injury cases are between 20 and 51 years of age (fig. 2). Except for a few injuries which occurred outside of the two county surveillance area where they were treated, there were nearly twice as many cases identified in Fresno County (63%) as compared to Monterey County (35%, table 4).

Of special interest were the injuries identified in individuals less than 18 years of age: 25 cases with age less than 10, 15 cases with age range 10 to 14, and 66 cases with age range 15 to 17. Among the youngest age group (< 10 years old), the

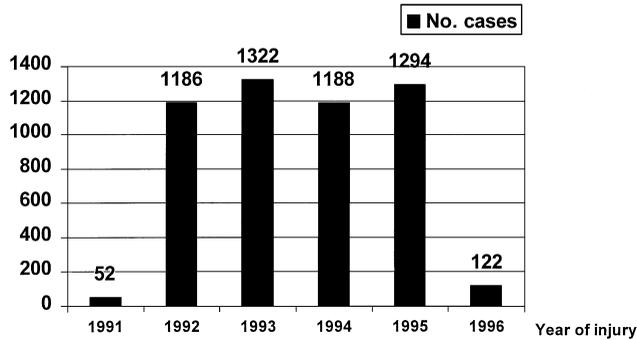


Figure 1—Reported farm injuries in Monterey and Fresno Counties, California, 1991-1996 (n = 5,164 cases).

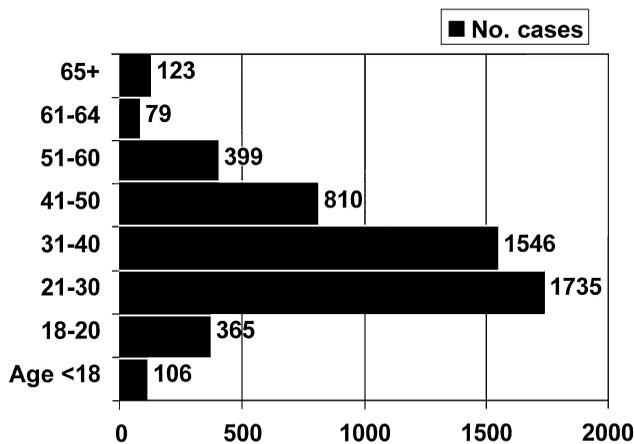


Figure 2—Age distribution among farm injury cases in Monterey and Fresno Counties, California, 1991-1996 (n = 5,163 cases, one case with missing age information).

following types of injuries occurred: 9 horse injuries, 5 falls, 4 truck/van episodes, 2 tractor/related machinery events, 2 cutting tools injuries, 1 golf cart injury, and 1 electrocution. In contrast, there was a predominance of animal-related injuries for the age range 10 to 15: 12 horse, 1 pig, 1 trailer, and 1 fall associated events.

Among the injured cases identified, 134 (3%) involved fatalities, and 319 (6%) involved a hospital stay (table 5). Among the 134 fatalities reported, there were 16 episodes involving multiple fatalities. The most prevalent situations reported for the injury fatalities included: 56 motor-vehicle accidents involving tractors, 19 agricultural machine/tractor episodes, 10 individuals found dead in the farm fields, 3 plane crashes, 3 shootings/hold-ups, and 2 livestock episodes. At least 144 (2.8%) of the surveillance injury cases were involved in multiple-person farm injury episodes. The most prevalent types of primary injury event were overexertion and strenuous movement (13.5%) and falls from the same level (8.4%, table 6).

The work environment associated with the farm injury cases includes a wide variety of commodities and work tasks (tables 7 and 8). Among the farm injury

**Table 4. Selected traits of farm injury cases in Fresno and Monterey, California, 1991-1996 (n = 5,164 cases)**

	N	%
Gender*		
Female	787	15
Male	4,376	85
Race†		
White	4,359	97
Non-white	115	3
Ethnicity		
Hispanic	4389	85
County where injury occurred		
Fresno	3,253	63
Monterey	1,807	35
Other	103	2

\* 1 case lacked age information.

† 690 cases lacked race information.

**Table 5. Severity of injuries among the cases in Fresno and Monterey Counties, California, 1991-1996 (n = 5,164 cases)**

	N	%
Vital status		
Non-fatal	5030	97
Fatal	134	3
Number of hospitalizations per injury case*		
No hospitalizations	4837	93.8
1 hospitalization	279	5.4
2 hospitalizations	30	0.6
3 hospitalizations	4	0.1
4 hospitalizations	1	0.02
9 hospitalizations	5	0.1

\* 8 cases lacked hospitalization frequency information.

**Table 6. Primary types of injury event with a prevalence greater than 100 for farm injury cases in Fresno and Monterey Counties, California, 1991-1996 (n = 4,861 cases, 303 lacked information)**

Description	N	%
Overexertion and strenuous movement	663	13.6
Fall same level	409	8.4
Other struck by	322	6.6
Agricultural machines	319	6.6
Foreign body to eye	276	5.7
Caught in or between objects	259	5.3
Struck by falling object	246	5.1
Unspecified cutting or piercing objects	181	3.7
Knives and daggers	176	3.6
Fall from one level to another	148	3.0
Striking against or struck by object or person	107	2.2
Other agricultural chemical	106	2.2
Other cutting objects	106	2.2

**Table 7. Work environment associated with the farm injuries in Fresno and Monterey Counties, California, 1991-1996\***

Type of Commodity	N	%
Almonds	10	0.5
Apple	10	0.5
Artichoke	12	0.6
Berries	57	3.0
Broccoli	53	2.8
Cattle/livestock	42	2.2
Cauliflower	22	1.2
Celery	14	0.7
Chile pepper	17	0.9
Citrus, nonspecific	25	1.3
Cotton	140	7.4
Dairy	76	4.0
Flowers	37	1.9
Fruits, nonspecific	198	10.4
Grape	139	7.3
Lettuce	192	10.1
Melon	160	8.4
Mushroom	16	0.8
Onion	19	1.0
Orange	24	1.3
Poultry	172	9.0
Raisin	13	0.7
Sugar	20	1.1
Tomato	317	16.7
Vegetable, nonspecific	52	2.7
Other commodities	64	3.4

\* Primary commodity categories for farm injury cases in Fresno and Monterey Counties, California, 1991-1996 (n = 1,901 cases, 3,263 lacked information or a single commodity was not applicable).

**Table 8. Work environment associated with the farm injuries in Fresno and Monterey Counties, California, 1991-1996\***

Type of Work Task	N	%
Administrative/supervisor/office	219	4.4
Agricultural consultant	3	0.1
Cattle work	41	0.9
Chemical application/spraying	50	1.0
Dairy	31	0.6
Dehydration process	4	0.1
Farmworker, nonspecific	1555	31.1
Farmer (owner/operator)	19	0.4
Gardening/nursery	25	0.5
Harvesting	229	4.6
Irrigation	222	4.4
Machine/tool operator	199	4.0
Maintenance/repair	495	9.9
Other (e.g., ice production, lab work, security, safety training, housekeeper, bee keeper)	21	0.4
Packing/assembly line	507	10.1
Picking/sorting/pruning	451	9.0
Poultry	170	3.4
Seed production	7	0.1
Vehicle driver	574	11.5

\* Primary work task categories for farm injury cases in Fresno and Monterey Counties, California, 1991-1996 (n = 4,822 cases, 302 lacked information and 40 were non-occupational).

cases, 140 (2.7%) involved an investigation by the highway patrol, 166 (3.2%) by the coroner, and 139 (2.7%) by the California OSHA.

## Discussion

The preliminary results from the farm injury surveillance system are consistent with the composition of the farm labor force in Fresno and Monterey Counties. The surveillance farm injury cases were 85% Hispanic and 85% male, as compared to the California NAWS group which was 90% Hispanic and 75% male (U.S. DOL, 1993). In addition, the NAWS indicated that 2% of the work force was under 18 years of age and the farm injury group had 2% below the age of 18. The nearly 2 to 1 ratio of Fresno injury cases to Monterey cases is consistent with the nearly twice as large population found in Fresno County (table 2). The variety of commodities and work tasks associated with the farm injury cases is consistent with the type of agriculture found in the two target counties (U.S. BOC, 1995c).

The recently completed Traumatic Injury Surveillance of Farmers (TISF) report can provide some comparisons for the findings of the farm injury surveillance project (Myers, 1997). TISF summarizes non-fatal lost-time injury estimates for the agricultural production industry for 1993. This nationwide mail survey used a sampling scheme to obtain adequate geographical and farm type representation. All information in the survey is self-reported by farm owners. There are differences in the methods employed by TISF and the farm injury surveillance system: the survey research design, injuries are restricted to those associated with at least a half-day of lost work time, all reports are from farm owners and mail questionnaires are used in TISF, in contrast to the active reporting surveillance design, including all injuries, primarily health care provider reporting, and selected supplemental field investigations and informal worker interviews found in our surveillance system. Nonetheless, the results of TISF can be used as an approximate comparison for selected findings of the farm injury surveillance project.

Of the 72,000 farm injuries identified by TISF, the injured population was 90% male, 76% White, and 22% Hispanic with an estimated rate of 5.5 injuries per 100 full-time workers (Myers, 1997). For the farm injury surveillance group, the cases were 85% male, 97% White, and 85% Hispanic. Because of the migratory and seasonal nature of the agricultural workforce, there are no reliable worker population estimates and an injury rate can not be calculated. In looking at the subgroup of only hired farmworkers from TISF, one finds an injured population that is 96% male and 56% Hispanic which still does not reach the higher Hispanic proportion found in our surveillance injury group. The TISF has 87% of the injured hired worker group between the ages of 19 and 50, while the surveillance farm injury group has 79% between the ages of 20 and 51 with slightly higher percentages of both younger and older workers. The leading types of injury event among the surveillance injury cases are: overexertion and strenuous movement (14%), and falls (11%, combined for at same level and at elevation). Similarly, TISF found 22% for overexertion and 14% for falls among the injured hired farm workers.

There are potential limitations to the survey which need to be considered in the interpretation of the final results. The dependence on health care provider reporting requires that medical personnel are aware of farm hazards and fill out the required forms. Thus, there will definitely be less than 100% capture of all farm-related injuries in the two counties of interest. However, the two project field representatives located in each county conducted frequent visits to the health care provider network sites and performed numerous outreach and training presentations. The long period

of data collection (from 1992 through October of this year) have introduced certain factors that may make interpretation of the final complete data set problematic. There has been increasing use of farm labor contractors in California. Incentives or disincentives for seeking health care for farm injuries may come into play when the labor-management relationship changes. The long duration of this surveillance has resulted in the change of project staff. Every effort was made to maintain a high level of adherence to established project protocol but there may be differences in the field survey techniques in the early years of the project when compared to the later years with different field staff.

Three key regulatory activities have come into play approximately midway into the course of this project which possibly have influenced the way farming and worker protection is conducted in the State: (1) the California OSHA worker standard which requires an illness and injury prevention plan to be in place at all worksites including farms; (2) the California Department of Industrial Relations based Targeted Industries Partnership Program which conducts unannounced visits to farms for possible employer violations; and (3) the EPA Worker Protection Program regulation which attempts to ensure adequate training and protection against pesticide poisoning among farm workers but which also has potentially increased awareness of worker safety issues in general. Lastly, there has been increased labor organizing activities within the farm worker community within the last few years.

## Conclusions

Over five years, the Fresno and Monterey County surveillance system identified 5,164 injured farm workers that are 85% male and 85% Hispanic. Seventy-nine percent of the injury cases are between 20 and 51 years of age with 2% of the cases less than 18 years of age. There were approximately twice as many cases in Fresno as in Monterey County which is consistent with the different populations of each region. There were 134 (3%) fatal injuries and 319 (6%) hospitalizations. The two leading causes of the fatalities were motor-vehicle accidents involving tractors and agricultural machine/tractor episodes. Approximately 3% of the surveillance injury cases involved multiple-person episodes. At least 144 (2.8%) of the surveillance injury cases were involved in multiple-person farm injury episodes. Overexertion (14%) and falls (11%) were the most prevalent type of primary injury event. A wide variety of commodities and work tasks were associated with the surveillance injury cases consistent with the diverse agricultural industry in both target counties. Some comparable findings can be found in the NAWS and TISF reports (U.S. DOL, 1993; Myers, 1997).

There are important factors that will need to be considered in the final analysis of the surveillance data set: increased farm labor contracting, project staff turnover, regulatory activities and labor organizing activities. Despite the limitations already mentioned and the preliminary nature of this analysis, the current surveillance project has provided important information about the nature of farmworker injuries in two highly agricultural counties that can be used in injury intervention activities. A final report will be prepared which provides more in depth data analysis and a description of the field investigation and outreach efforts.

**ACKNOWLEDGMENTS.** The authors wish to thank the following individuals for their assistance in the development of this project: Carol Conroy; Yolanda Cervantes; Jim Rogge; Stan Sciorintino, Marian McDonald, and Gene Freund. The authors would

like to acknowledge the financial support and expertise provided by NIOSH and to especially thank the following NIOSH staff: John Sestito, Nina Lalich, and Janet Ehlers. Most importantly, we would like to thank the many farm workers and owners who made this project possible and helped us better understand their industry.

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