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Follow-Back Study of Oldest Workers With Emergency Department-Treated Injuries

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The aging of the U.S. workforce highlights the need to address issues affecting older workers specifically. Telephone surveys were conducted with injured workers identified through a surveillance system based in a sample of emergency departments in the United States. The 176 interviewed cases correspond to a national estimate of 8,263 (s.e. = 1,258) injuries to workers aged 63 years and older during May 15–September 30, 1993. Five percent reported limitations in the types or amount of work they could perform prior to the injury. Ninety-four percent reported familiarity with the task resulting in injury. Fifty-one percent returned to work without missing any workdays; however, 69% required return visits to a health care provider. Thirty-four percent reported receiving training in injury prevention. Twenty percent of the injured workers were self-employed and 43% worked for small businesses. Data from this study provide insight into routinely collected statistics and have implications for future research and intervention efforts. Am. J. Ind. Med. 31:609–618, 1997.

KEY WORDS: occupational injury; accidents, occupational; wounds and injury; older workers; self-employment; agriculture; training; disability; surveillance

INTRODUCTION

''Current Federal policy encourages Americans to retire at older ages than previously and makes it legally possible for all older workers to remain employed, regardless of their chronological age, for as long as they possess the ability and desire to work'' [Kovar and LaCroix, 1987]. Public Law 98-21, implemented in April 1983, raises the minimum age of retirement for the receipt of full social security benefits from 65 to 67 years for persons born after 1959. Public Law 99-592, approved in 1986, effectively extinguishes forced retirement at age 70. About one-fourth to one-third of retirees return to work after retirement [Palmore et al., 1985]. Although labor force participation decreases markedly with age beginning at about 55 years, substantial numbers of our oldest citizens continue to work [U.S. Department of Labor, 1996a]. In 1995, 55% of persons 55–64 years and 12% of persons 65 years and older worked, accounting for 11.4 and 3.7 million workers, respectively. Workers 55 years and older currently represent 12% of the nation's workforce. As the U.S. population ages and the size of the workforce increases, the median age of the workforce and the number of older workers are expected to increase. Bureau of Labor Statistics (BLS) projections of moderate growth estimate 22.1 million Americans aged 55 years and older in the U.S. labor force in the year 2005, representing 15% of the projected workforce [Fullerton, 1995].

Older workers have generally been found to have lower nonfatal injury rates than younger workers [Laflamme et al., 1996; U.S. Department of Labor, 1996b; Personick and Windau, 1995a; Jensen and Sinkule, 1988; Mitchell, 1988; Leigh, 1986; Coleman and Sanderson, 1983; Doering et al., 1983; Root, 1981]. An analysis of workers' compensation data from 29 states in 1981 demonstrated that theage effects

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were robust when controlling for industry and occupation groups [Mitchell, 1988]. Decreased injury incidence with increasing age has also been found within specific occupations such as iron-ore miners [Laflamme et al., 1996]. Several hypotheses have been suggested to explain the lower injury rates among older workers: greater experience among older workers; less exposure to hazards resulting from job selection or seniority; increased safety orientation among older workers; and a ''healthy worker'' effect, in which persons who perform their job safely continue in that job [Laflamme et al., 1996; Ringenbach and Jacobs, 1995; Landen and Hendricks, 1992; Doering et al., 1983; Giniger et al., 1983]. Once injured, however, older workers tend to have poorer outcomes than younger workers, with longer absences from work and higher fatality rates [Laflamme et al., 1996; U.S. Department of Labor, 1996b; Myers and Hard, 1995; Ringenbach and Jacobs, 1995; Personick and Windau, 1995a; Cheadle et al., 1994; Richardson and Schulman, 1994; Rossignol, 1994; Thomas et al., 1994; Agnew and Suruda, 1993; Jenkins et al., 1993; Mitchell, 1988; Doering et al., 1983; Root, 1981]. Reduced tolerance for injuries with age has been demonstrated. A study based in trauma centers across the United States and Canada found that although patients 65 years and older had equivalent measures of injury severity to younger patients, the older group had higher case fatality and complication rates and longer hospital stays [Champion et al., 1989].

The Bureau of Labor Statistics (BLS) estimates 168,500 occupational injuries and illnesses involving days away from work among workers 55 years and older in 1994 [U.S. Department of Labor, 1996c]. The National Institute for Occupational Safety and Health (NIOSH) estimates 137,000 work injuries requiring emergency department treatment among the same age group in 1993; a rate of 0.92 injuries per 100 workers based on average employment data from the Current Population Survey [Layne and Landen, 1996]. Estimates of the incidence of work-related injuries among workers 55 years and older from BLS and NIOSH are underestimates, and there is an overlap in the injuries captured by each system. The survey from which the BLS estimate is derived excludes important categories of workers (e.g., the self-employed, farms with fewer than 11 employees, private household workers, and government employees) and does not include injuries that do not result in days away from work. Based on employment data from 1994 [U.S. Department of Labor, 1995a], it is estimated that about 65% of older workers were wage and salary workers in private industries and would have been represented by the BLS survey. Emergency departments, on which the NIOSH estimate is based, do not include injuries treated in other health care settings, such as physician offices and clinics. An occupational supplement to the National Health Interview survey in 1988 estimated that about 27% of work injuries among persons 55 years and older were treated in emergency departments [Layne and Landen, 1996].

The greatest numbers of occupational injuries among workers 55 years and older occur in the services industry, manufacturing, and the wholesale and retail trades [Layne and Landen, 1996; U.S. Department of Labor, 1996c], while the highest rates occur in agriculture and manufacturing [Layne and Landen, 1996; Mitchell, 1988]. High rates in agriculture have also been found using a nationally representative survey of Americans 51 to 61 years old [Zwerling et al., 1995]. The leading types of injuries among workers 55 years and older are lacerations, bruises, and contusions, sprains and strains, and fractures [Layne and Landen, 1996; Personick and Windau, 1995a; Root, 1981]. Leading causes of injury are contact with objects, falls, and bodily reaction and exertion [Layne and Landen, 1996; U.S. Department of Labor, 1996b; Personick and Windau, 1995a; Root, 1981]. Fractures and injuries resulting from falls are more common among older than younger workers [U.S. Department of Labor, 1996b; Personick and Windau, 1995a; Buck and Coleman, 1985; Root, 1991].

As discussed above, NIOSH collects data on work injuries among persons 55 years and older through an emergency department-based surveillance system—the National Electronic Injury Surveillance System (NEISS). These data have been collected since December 1992. Data for the first complete year of surveillance, 1993, have been analyzed and reported elsewhere [Layne and Landen, 1996]. Similar to other analyses, injury rates decreased with age. The injury rate decreased from a rate of 1.06 per 100 workers aged 50–59 years to a low of 0.50 per 100 workers aged 75 years and older. Differences were also noted in types and causes of injury by age among older workers. Workers 65 years and older were more likely than their younger counterparts (55–64 years) to sustain fractures or dislocations, to be hospitalized for their injuries, and to have injuries resulting from falls to the same level.

A strength of the NEISS is the ability to conduct interviews with cases. Telephone interviews were conducted with the oldest workers identified in the surveillance system, workers 63 years and older, for a 4-1/2 month period in 1993 to collect detailed information about the injury event, the worker, employment characteristics, health services utilization, and the impact of the injury on the worker's life. The data provide much contextual information that gives insight into less detailed surveillance data that are collected on a regular basis. For example, information on industry and occupation are routinely available, but not the size of the establishment or lifetime experience in a particular occupation. Information is rarely available on training or the injured worker's perception regarding injury prevention. And, while impact of the injury is frequently assessed in terms of time away from work, outcomes implicit with time away from work, such as pain, physical limitations, or utilization of health services, are rarely collected.

MATERIALS AND METHODS

NEISS, operated by the Consumer Product Safety Commission (CPSC), is a probability sample of hospital emergency departments selected from the population of all hospital emergency departments in the United States and its territories, stratified by geographic region and hospital size [U.S. Consumer Product Safety Commission, 1992; U.S. Consumer Product Safety Commission, 1988; Marker et al., 1988]. There are 91 emergency departments in the sample, which collect data on injuries associated with consumer products and recreational activities. Each case in NEISS is assigned a statistical weight based on the hospital's probability of selection from strata of hospital sizes. These weights are used to make national injury estimates.

Work-related injuries are typically excluded from NEISS. Through an interagency agreement between the CPSC and NIOSH, data on work-related injuries to persons aged less than 18 years have been collected since July 1992 [Layne et al., 1994], and for workers aged 55 years and older, since December of 1992. Data on work-related injuries are collected regardless of product involvement. Consistent with standardized ''injury at work'' guidelines, injuries were considered ''at work'' if they were sustained while: performing work done for compensation on or off employer premises; on employer premises while arriving or leaving work, or on a break from duties. Injuries were considered ''at work'' if working as a volunteer emergency medical service provider, firefighter, or law enforcement officer [Jenkins et al., 1993]. Divergent from standardized guidelines, injuries sustained while performing other volunteer work for organized groups, such as hospitals, were considered work-related for this study. Information on the victim, employment, the injury, and a brief description or scenario are abstracted from the emergency department records.

In order to obtain more detailed information about the circumstances surrounding injuries among older workers and consequences of the injuries, an instrument for an approximately 15-minute telephone survey was developed. The survey was administered to cases 63 years and older who sustained an injury between May 15 and September 30, 1993. The minimum age of 63 years and time frame were dictated by budget constraints. However, a minimum age of 63 years is reasonable, since 62 years of age is often an operational age for early retirement. The instrument elicited detailed information on injury circumstances, health services utilization, resulting disability, job characteristics, and demographics. Consent to participate in the study was requested after informing the respondents of how they were identified for the study, the goals of the study, the types of questions that would be asked, the estimated time to complete the survey, and the confidentiality of their responses.

Industry was coded according to the Standard Industrial Classification Manual, 1987 [Office of Management and Budget, 1987]. Data on body part injured and nature of injury were derived directly from the physician's diagnosis on the emergency department record and coded according to CPSC guidelines [U.S. Consumer Product Safety Commission, 1994]. Source of injury and injury event were coded according to the Occupational Injury and Illness Classification Structures from the Bureau of Labor Statistics [U.S. Department of Labor, 1994b].

A total of 291 cases were reported by NEISS hospital emergency departments as work-related injuries to persons 63 years and older during the study period. Thirty-nine cases could not be contacted because the hospital did not provide a phone number, and 24 cases had phone numbers that were incorrect or not working, leaving 228 cases who could be interviewed by telephone. An interview was not conducted with 2 cases because the respondent did not speak English, and 27 cases refused to participate in the study. Interviews were conducted with 199 persons, for an 87% response rate. Thirteen cases were excluded from further analyses because the injury was found not to be work-related upon interview. These cases were typified by injuries associated with handyman or hobby activities at home. Two cases involving eye irritation were excluded because emergency room personnel were unable to document an injury. Two other cases were excluded from further analyses because age had been incorrectly entered into the database or the initial injury event occurred prior to the timeframe for the survey.

Since not all cases identified from the surveillance system were interviewed, the statistical weights assigned to each interviewed case will underestimate the number of similar cases represented nationally. If the interviewed cases were comparable to cases that were not interviewed, then the interviewed cases could be treated as a random sample of the surveillance cases [Cochran, 1977], and the weights and variances appropriately adjusted. Weighted estimates (original NEISS weights) for the 183 work-related cases for whom interviews were conducted were compared to the 92 cases for whom interviews were not conducted, using available data from the surveillance system. The estimated mean ages of the two groups were comparable, 68.0 years among interviewed cases compared to 67.3 years among cases without interviews. However, females appeared to be overrepresented among interviewed cases; an estimated 34% of the interviewed cases were female compared to 26% of cases without interviews. It also appeared that interviewed cases were less likely than cases without interviews to have injuries to the head/neck region and to have injuries resulting from falls. An estimated 13% of the interviewed cases sustained injuries to the head or neck, compared to 27% of cases without interviews. And, an estimated 27% of interviewed cases sustained injuries from a fall, compared to 34% of cases without interviews. Comparisons among other variables available from the surveillance system (race, diagnosis, disposition, source of injury, occupation group, and industry division) are not reported because of relatively

small point estimates or missing data. The available comparisons between the interviewed cases and cases without interviews suggest heterogeneity. For this reason, there was no attempt to adjust the weights assigned to interviewed cases. Data are not available on how the potential differences between the cases that were and were not interviewed may affect the estimates, and any biases are likely to vary from item to item queried in the survey [Cochran, 1977]. Standard errors (s.e.) were computed to indicate the reliability of the estimates [US Consumer Product Safety Commission, 1988].

Ninety-five percent of the interviews were conducted by a single interviewer. Forty percent of the interviews were conducted within 30 days of the injury, and 45% were conducted 31–60 days after the injury. Interviews were conducted with the injured worker for 171 of the cases; proxies were used for 12 cases. All but one of the injured workers for which a proxy was used were male. Proxies, typically spouses, were used because of difficulty, or anticipated difficulty, in reaching the injured worker by phone, not because of health problems. Eleven of the workers for whom proxies were used were reported to have returned to work at the time of the interview, with 10 working 40 hr or more per week. There was no gold standard on which to judge the validity of the proxy responses, and the small numbers of proxies precluded a comparison with responses of injured workers. Seven of the total cases were excluded from the analyses because the interviewer felt the respondent may have had difficulty hearing or understanding the questions, leaving 176 cases in the analyses.

RESULTS

Descriptive characteristics that are available from the NEISS are presented in Table I for the respondents interviewed during the 4-1/2-month study period and for all the surveillance cases in calendar year 1993. Based on the NEISS, there were an estimated 32,785 (95%CI = 25,104–40,466) injuries to workers aged 63 years and older during 1993 (Table I). [Confidence interval (CI) calculated using standard error (s.e.) provided in Table I: estimate $\pm(1.96)$ (s.e.).] The 176 interviewed cases correspond to an estimated 8,263 (s.e. = 1,258) injuries between May 15 and September 30, 1993. The proportional distributions of data elements among survey respondents and 1993 surveillance cases were fairly similar. Characteristics that differed by more than 5 percentage points between the survey respondents and 1993 surveillance cases include: proportion of 65– to 69-year-olds (36% of survey respondents compared to 43% of surveillance cases); males (67% compared to 60%); females (34% compared to 41%); workers for which industry was not classifiable (6% compared to 13%); injuries resulting from contact with objects or equipment (52% compared to 45%); workers injured with machinery (19% compared to 13%); and workers injured with tools (16% vs 8%).

TABLE I. Occupational Injuries to Workers 63 Years and Older Treated in Emergency Departments: Surveillance Data from Telephone Survey Respondents Injured May 15–September 30, 1993 and Surveillance Cases for Calendar Year 1993

Data element	Respondents 5/15–9/30/93 Estimate[a] (s.e.)	Surveillance 1/1–12/31/93 Estimate[a] (s.e.)
Injured workers	8,263 (1,258)	32,785 (3,919)
Age group (yr)		
63–64	2,925 (548)	10,369 (1,316)
65–69	2,982 (575)	13,944 (2,030)
70+	2,354 (482)	8,472 (1,221)
Gender		
Male	5,496 (933)	19,515 (2,571)
Female	2,767 (460)	13,270 (1,656)
Industry division		
Services	2,673 (402)	10,908 (1,484)
Agriculture/forestry/fishing	1,327 (538)	4,707 (1,290)
Retail trade	1,218 (349)	4,855 (825)
Manufacturing	1,201 (298)	4,047 (731)
Other	1,388 (341)	4,158 (623)
Not ascertained	456 (187)	4,111 (866)
Event		
Contact with objects and equipment	4,303 (607)	14,688 (1,864)
Falls	2,365 (563)	11,006 (1,669)
Other	1,595 (387)	7,091 (1,160)
Source of injury		
Structures and surfaces	2,209 (487)	7,411 (934)
Machinery	1,543 (459)	4,261 (743)
Tools, instruments, and equipment	1,282 (338)	2,745 (527)
Other	3,229 (452)	18,370 (2,475)
Nature of injury		
Lacerations	2,311 (430)	9,823 (1,222)
Contusions	1,833 (448)	7,605 (961)
Fractures/dislocations	1,522 (428)	5,535 (1,052)
Sprains/strains	1,003 (340)	3,335 (689)
Other	1,594 (316)	6,606 (897)
Body part		
Hand/finger	2,569 (458)	10,064 (1,523)
Shoulder/arm/wrist	1,790 (472)	6,222 (1,061)
Leg/knee/ankle	1,276 (333)	4,001 (606)
Head/face/neck	1,046 (273)	5,925 (819)
Other	1,582 (289)	6,574 (800)
Disposition		
Treated and released	7,899 (1,250)	30,697 (3,780)
Hospitalized	364 (156)	2,089 (480)

[a]Estimates were rounded to the nearest integer because the estimate represents injured workers. Columns may not add up to the total estimated injuries as a result of this rounding.

Among the survey respondents, work in hospitals accounted for an estimated 1,212 (s.e. = 272) injuries, representing 45% of the injuries attributed to the services

industry division, and 15% of all injuries. The event category of ''contact with objects or equipment'' includes injuries resulting from the worker striking against an object (1,171; s.e. = 259), and being struck by an object (2,294; s.e. = 491), including loss of grip of handheld objects, such as knives or tools. The majority of falls (71%) were falls to the same level, as opposed to falls from a height or stairs or steps.

Temporal Characteristics

Eighty-five percent (6,999; s.e. = 1,029) of the workers received emergency department treatment the day their injury occurred; 97% (8,039; s.e. = 1,203) were treated within 4 days. Sixty-three percent (5,184; s.e. = 942) of the injuries occurred during daytime hours, 8 AM–4 PM, followed by 21% in the evening hours from 4 PM to midnight (1,723; s.e. = 442).

Employment Characteristics

Ninety-three percent (7,676; s.e. = 1,175) of injured workers were working for wages or salary, with 7% injured doing volunteer work. Injured workers were asked, ''At the time of your injury, about how many hours did you work each week for the job where you were injured?'' Fourteen percent (1,181; s.e. = 278) of the injured persons worked 20 hours or less per week, 17% (1,433; s.e. = 304) worked between 21 and 30 hours per week, 41% (3,383; s.e. = 689) worked between 31 and 40 hours per week, and 21% (1,750; s.e. = 443) reported working more than 40 hours a week. To assess any work limitations that may have existed prior to the injury, workers were asked, ''Before your injury were there certain types of work you could not do, or were you limited in the amount of time you could work?'' Ninety-three percent (7,694; s.e. = 1,094) of respondents answered ''no,'' with 5% answering ''yes.''

Table II shows the injury distribution by type of employer and establishment size. Among the 5,084 (s.e. = 723) injured workers employed by private companies, 31% worked for businesses with 10 or fewer employees, 22% for businesses with 11–49 employees, 36% for businesses with greater than 50 employees, and 11% did not know or did not report the size of the business. Among the 1,662 (s.e. = 473) injured workers who were self-employed, 92% employed 10 or fewer employees, with another 6% not reporting the number of workers. The size of the business varied by industry. Among the 2,673 (s.e. = 402) injuries within the services industry, 43% of the injuries occurred in businesses with 50 or more employees. Among the 1,327 (s.e. = 538) injuries in the agriculture, forestry and fishing industry, 96% occurred in businesses with fewer than 10 employees, with persons not reporting the size of the business accounting for the remaining 4%.

TABLE II. Employer Characteristics, Occupational Injuries to Workers 63 Years and Older Treated in Emergency Departments, May 15–September 30, 1993

Employer characteristics	Estimate[a] (s.e.)
Total	8,263 (1,258)
Type of employer	
Private	5,084 (723)
Government	1,050 (317)
Self-employed	1,662 (473)
Don't know/not ascertained	466 (186)
Size of establishment (No. of workers)[b]	
≤10	3,571 (1,046)
11–49	1,229 (283)
50+	2,580 (415)
Don't know/not ascertained	883 (176)

[a]Estimates were rounded to the neartest integer because the estimate represents injured workers. Columns many not add up the estimated injuries as a result of this rounding.
[b]The size of the establishment was queried by asking, ''Approximately how many people are employed by this business at the location where you worked most?''

Work History

Eighty-six percent (7,085; s.e. = 1,234) of injured older workers worked for more than a year at the business where the injury occurred. Thirty-six percent (2,969; s.e. = 649) worked more than 20 years at the business where the injury occurred. Ninety-two percent (7,615; s.e. = 1,244) of injured workers had worked in the occupation at the time of injury, regardless of employer, for one or more years, and 80% (6,622; s.e. = 1,031) had worked in that occupation for 5 or more years. Injured workers were asked, ''Is this the type of work you have done the longest in your lifetime?'' Sixty-two percent (5,097; s.e. = 807) of respondents answered ''yes,'' while 36% (2,995; s.e. = 597) answered ''no.''

Injury Event

At the time of the injury, 95% (7,826; s.e. = 1,186) of the respondents were engaged in work tasks and 5% were injured on employer premises while on a break, arriving, or departing work. Common tasks leading to injuries among older workers involved lifting or moving objects (30%), working with machinery (19%), moving from one work area to another (12%), and food service and preparation (10%). Of the 1,465 (s.e. = 390) injuries associated with working with machinery, 98% were among males.

In response to the question, ''Was this a new or unfamiliar job task?,'' 94% (7,331; s.e. = 1,178) reported ''no.'' Among workers reporting that the task was not new, 74% performed the task ''frequently,'' 18% performed the task ''occasionally,'' and 6% ''hardly ever'' performed the task. Injured workers were asked, ''Was there anything

different about this time, such as a wet floor, malfunctioning equipment, weather, and how you felt?'' Thirty percent (2,199; s.e. = 464) responded ''yes'', 61% (4,437; s.e. = 770) responded ''no,'' and 9% did not answer the question. Differences that were mentioned included wet and slick surfaces (31%), equipment or materials not in usual place (16%), and malfunctioning equipment (15%).

Training

To assess previous training, workers who were injured while working (7,826; s.e. = 1,186) were asked, ''Had you received training on how to avoid injury while doing this kind of work?'' Thirty-four percent (2,622; s.e. = 614) reported that they had received training, while 66% (5,153; s.e. = 728) reported not receiving training. Eighty-six percent (1,043; s.e. = 381) of workers in agriculture reported no training compared to 69% (2,533; s.e. = 422) in retail trades and services. Although the point estimates are relatively small, the data suggest that a relatively small proportion (37%) of injured workers in manufacturing reported no training. Eighty percent (1,335; s.e. = 363) of self-employed reported no training compared to 64% (3,525; s.e. = 561) of employees of private companies and the government. The proportion reporting no training decreased by size of the business. The proportion reporting no training was 77% among small businesses (<10 employees), 68% among midsize businesses (11–49 employees), and 52% among large businesses (50 or more employees).

Injury Prevention Perceptions

To assess attitude toward injury prevention, workers were asked, ''Do you think that the injury could have been prevented in some way, or do you think that it was just one of those things that happens?'' Thirty-eight percent (3,122; s.e. = 567) reported that the injury was preventable, while 59% (4,837; s.e. = 907) reported that the injury was just one of those things that happens. Among those reporting that the injury was preventable, suggested prevention measures included following safe work practices (23%), such as using personal protective equipment and appropriate handling and use of equipment; being more cautious (15%); better housekeeping (14%); and, maintenance of equipment (13%).

Injury Reporting

Ninety-seven percent (5,965; s.e. = 901) of workers who were not self-employed reported the injury to their employer. The filing of a workers' compensation claim was assessed for the 7,677 (s.e. = 1,175) injured workers who were not performing volunteer work (Table III). Filing of claims was rare among the self-employed and persons working in agriculture/forestry/fishing. Claims were more common among businesses with 11 or more employees than businesses employing 10 or fewer persons (56% vs 37%).

TABLE III. Filing of Workers' Compensation Claims by Employer Characteristics, Occupational Injuries to Workers 63 Years and Older Treated in Emergency Departments, May 15–September 30, 1993

		Claim filed			
Characteristic	**Total[a] (s.e.)**	**Total**	**Yes**	**No**	**Unk.**
Injured workers	7,677 (1,175)	100%	47%	44%	9%
Industry Division					
Services	2,410 (379)	100%	52%	38%	9%
Agriculture/forestry/fishing	1,327 (538)	100%	17%	83%	0%
Other	3,940 (744)	100%	54%	34%	12%
Type of employer					
Private	4,920 (722)	100%	61%	31%	10%
Self-employed	1,662 (473)	100%	7%	94%	0%
Government	850 (242)	100%	64%	19%	17%
Don't know/not ascertained	243 (130)	100%	8%	65%	28%
Size of establishment (no. of workers)					
≤10	3,334 (964)	100%	37%	55%	8%
11+	3,534 (496)	100%	56%	35%	9%
Don't know/not ascert.	809 (169)	100%	50%	38%	13%
Hours worked/week					
<30	2,084 (394)	100%	50%	45%	0%
≥31	4,887 (904)	100%	55%	39%	10%
Don't know/not ascert.	705 (239)	100%	2%	72%	26%

[a]Persons injured while doing volunteer work were excluded from the analyses. Estimates were rounded to the nearest integer because the estimate represents injured workers. Columns may not add to the total estimated injuries and row percentages may not add to 100% as a result of rounding.

Health Services Utilization

Ninety-six percent (7,898; s.e. = 1,250) of injured workers were treated and released from the emergency department, with the remaining 4% hospitalized for their injuries (Table I). Sixty-nine percent (5,717; s.e. = 1,112) of injured workers required return visits to a health care provider for injury treatment. Suture removal and checking on the injury were most common (1,881; s.e. = 383 and 1,877; s.e. = 367 workers, respectively), followed by radiography or other tests (1,388; s.e. = 532). Among the 5,717 (s.e. = 1,112) workers requiring return visits to a health care provider, 42% had made one visit at the time of the interview, 20% had made two visits, and 36% had made three or more visits. Forty-four percent (2,559; s.e. = 575) of workers requiring additional treatment for their injury were continuing to visit health professionals at the time of the interview, including 30% (1,069; s.e. = 386) of the persons who had made one or two visits for treatment at the time of the interview.

Injury Sequelae

Workers were asked, ''Other than the day of the injury did you experience pain or other health problems, such as a

TABLE IV. Days of Missed Work by Select Characteristics, Occupational Injuries to Workers 63 Years and Older Treated in Emergency Departments, May 15–September 30, 1993

Characteristic	Total[a] (s.e.)	Missed work			
		Total	0 days	≥1 day	Unknown
Injured	8,263 (1,258)	100%	51%	42%	7%
Age group (yr)					
63–64	2,925 (548)	100%	63%	29%	8%
65–69	2,982 (575)	100%	42%	46%	11%
70+	2,354 (482)	100%	45%	54%	1%
Gender					
Male	5,496 (933)	100%	62%	33%	6%
Female	2,767 (460)	100%	29%	61%	10%
Nature of injury					
Lacerations	2,311 (430)	100%	65%	26%	9%
Contusions	1,833 (448)	100%	51%	40%	10%
Fx/dislocations	1,522 (428)	100%	20%	75%	5%
Sprains/strains	1,003 (340)	100%	58%	41%	2%
Other	1,594 (316)	100%	55%	38%	7%
Event					
Contact objects and equipment	4,303 (607)	100%	62%	28%	10%
Falls	2,365 (563)	100%	32%	63%	5%
Other	1,595 (387)	100%	45%	52%	3%

[a]Estimates were rounded to the nearest integer because the estimate represents injured workers. Columns may not add up to the total estimated injuries and row percentages may not add to 100% as a result of this rounding.

limp, limited use of hand, or problems concentrating, as result of the injury?'' Fifty-four percent (4,466; s.e. = 939) answered affirmatively. The main problems mentioned were pain (2,282; s.e. = 489), and limited use of hand and arm (1,297; s.e. = 448). An estimated 1,485 (s.e. = 386) workers experienced, or expected to experience, the pain or health problem for at least 2 weeks. When asked, ''Other than the day of your injury, did you need help in handling your routine needs, such as everyday household chores, doing necessary business, shopping or getting around for other purposes, as a result of this injury?,'' 19% (1,583; s.e. = 344) responded affirmatively.

Return to Work

Fifty-one percent (4,178; s.e. = 624) of injured workers returned to work without missing any workdays (Table IV). Workers 65 years and older, women, persons sustaining fractures and dislocations, and injuries resulting from falls were least likely to return to work immediately. Days of missed work was censored for 27% of the cases because the injured worker was interviewed prior to return to work, preventing a more detailed analysis of number of missed work days.

DISCUSSION

Changing demographics of the workforce highlight the need to address special employment concerns for older workers. Although older workers appear to be at decreased risk of work injuries in general, apparent decreased tolerance for injuries is of particular concern. Compensation costs for work injuries have been shown to increase with age [Root, 1991]. Efforts to prevent injuries to older workers can reduce associated costs, and help ensure that this particularly active and productive segment of the older population, persons who continue to work into their 60s and later, retains their functional independence and quality of life. This follow-back study of older workers treated in emergency departments provides much information on occupational injuries among older workers that is not available from other studies. Information is provided on the impact of the injuries, including health services utilization, injury sequelae, and compensation, which emphasizes the need and potential cost-savings of occupational injury prevention efforts among older workers. And, information on circumstances of the injuries, employment characteristics, and attitudes towards injury prevention suggest factors that may be important in designing prevention efforts.

In interpreting results from this study, it is important that factors associated with the surveillance system and study limitations be taken into consideration. It has been estimated that about 27% of work injuries among persons 55 years and older are treated in emergency departments [Layne and Landen, 1996]. And, it has been hypothesized that occupational injuries occurring to hospital employees and volunteers may be overrepresented because of easy access to the emergency department and hospital policies that require all occupational injuries to be seen and treated in the emergency department at the time of the injury [Layne and Landen, 1996]. Emergency departments tend to treat acute injuries, whereas chronic injuries are more likely to be diagnosed and treated in physicians' offices or clinics [Fingar et al., 1992]. None of the injuries in the present surveillance were attributed to repetitive motion. It is noteworthy, however, that while repetitive motion accounts for 4% of injuries and illnesses resulting in days away from work among workers of all ages based on the BLS annual survey [U.S. Department of Labor, 1996c], repetitive motion is not indicated as a common disabling event among workers 55 years and older [U.S. Department of Labor, 1996b].

Because of budget constraints, this study was conducted for a short time interval and unconventional age group. The circumstances of injuries included in the study may not be representative of emergency department-treated occupational injuries among older workers across the year. Surveillance data for the entire year suggest differences from survey respondents, with the most notable differences in age, gender, injury event and source of injury. Data not shown, but available from the author upon request, suggest differences in characteristics of injured workers and circum-

stances of injury between the study period and remainder of the calendar year. For example, 36% of the surveillance cases during the 4-1/2 month summer study period were aged 65–69 years compared to 47% during the remainder of the calendar year. Sixty-eight percent of cases during the study period were male compared to 54% of the cases in the remainder of the year. And, injuries resulting from falls were less common during the study period than the rest of the year. The relatively small sample size imposed by budget constraints also precluded many potentially informative analyses, such as examination of the relationship between task and the injury event or the type of injury that was sustained, and the relationship between filing of workers' compensation claims and nature and severity of injury.

Finally, in interpreting the data, it is important to recognize potential errors and biases that may have been introduced by the sample or survey nature of the study. Of particular concern are biases that may have resulted from the estimated 32% of cases represented by the surveillance system who were not interviewed. Numerical estimates from this study are conservative because the statistical weights assigned to each case were not adjusted to represent workers who were not interviewed.

The impact of occupational injuries among older workers has been measured in previous studies using lost work time [U.S. Department of Labor, 1996b; Ringenbach and Jacobs, 1995; Personick and Windau, 1995; Thomas et al., 1994], incidence of temporary and permanent disabilities [Mitchell, 1988; Doering et al., 1983], and workers' compensation costs [Root, 1981]. The present study provides supplementary contextual information. To fully appreciate the impact of the injuries, health and functional status prior to injury should be taken into account. More than 60% of the injured workers in this study worked more than 30 hr/week, and only 5% reported limitations in the type of work or length of time they could work prior to the injury. High levels of physical capability among older persons who continue to work are supported by data from the Supplement on Aging of the National Health Interview Survey [Kovar and LaCroix, 1987]. Information on physical abilities thought to be required for work (such as walking, stooping, reaching, grasping and lifting) were assessed for persons 55–74 years of age. Among those who were employed, 73% had no difficulty with any of the work-related activities, compared to 60% who were retired for nonhealth reasons, and 14% who retired because of health reasons.

Pain, physical limitations, and health services utilization are injury outcomes that are implicit from standard variables such as time away from work and workers' compensation costs, though they are typically not measured explicitly. Nearly 20% of the injured workers represented by this survey sustained pain, or were limited in their physical capacity, for at least two weeks post injury. More than two-thirds of the injured workers required at least one additional visit to a health care professional, beyond the emergency department treatment, for monitoring or treatment of the injury. Because many of the respondents continued to visit health care professionals and had not yet returned to work at the time of the interview, this study was limited in measuring the impact of the injuries. Future studies would optimally utilize a longitudinal cohort design [Rice and Max, 1996] in which the circumstances of the injury are captured shortly after the event to minimize problems with recall, and the respondents are queried over time until recovery to get an accurate assessment of the impact of the injury on quality of life, health services utilization, and return to work.

The present study suggests that the majority of injuries resulting from falls among older workers required time away from work. The BLS reported that the median days lost from work among workers 55 years and older as a result of falls on the same level was 11 in 1993 [U.S. Department of Labor, 1996b]. Data from the 1984 Supplement on Aging of the National Health Interview Survey, a survey of noninstitutionalized persons 65 years and over, demonstrated that falls accounted for the most restricted activity days of any health condition among older persons, accounting for 6 of an average 31 restricted activity days [Kosorok et al., 1992]. Falls to the same level was the most frequent type of fall in this study. Efforts to prevent falls are important for all ages of workers, as falls to the same level are among the most frequent cause of occupational injuries, accounting for an estimated 240,000 injuries involving days away from work in 1992 [US Department of Labor, 1995b]. Efforts to prevent falls should be driven by the circumstances of falls occurring at individual work sites [Buck and Coleman, 1985]. Prevention measures may include good housekeeping, training in safe work practices, proper selection, care and maintenance of floors, and the selection of the most suitable shoe sole for the conditions in the workplace.

All 50 states have workers' compensation laws [US Chambers of Commerce, 1991]. Although the objective of workers' compensation is to provide coverage for all workers, for various reasons, no state law covers all forms of employment. Groups of workers who frequently are not covered under workers' compensation laws include: employees working for small businesses; farm labor; domestic servants, and casual employees. Many injured older workers in this study fall into these groups. Additionally, many states require a minimum number of days away from work before a claim can be filed. The present study suggests that about one-half of injured older workers seeking treatment in emergency departments do not miss any workdays. Thus, the low proportion of older injured workers filing claims in this study is not surprising. There are important societal implications, however. Among the basic objectives of workers' compensation laws are to provide prompt and reasonable income and medical benefits to victims of work-related injuries and illnesses or their dependents; and, to relieve public and private charities of financial drains from uncompensated work-related disabilities [US Chamber of Commerce, 1991]. Future studies should seek to assess the extent

to which workers' compensation systems compensate the most serious and consequently most costly injuries. Additionally, future studies should investigate the degree to which costs associated with work injuries are paid by the employer, other insurance schemes (e.g., private health or disability insurance, or Medicare), or are simply not compensated.

The potential for safety training to reduce work injuries among older workers deserves further investigation. Only about one-third of the injured older workers represented by this survey reported receiving training on how to prevent the injury they incurred. This estimate must be interpreted cautiously as the question inquiring about training was simplistic, and training is complex with multiple variants. For example, training can range from a worker being handed an information sheet or being required to watch a video on safe work practices; to a supervisor demonstrating safe work practices; to training in which the worker is provided with information on the rationale and justification for injury prevention efforts, and given supervised ''hands on'' practice with feedback on performance. Training can take place within minutes or days and occur at one point in time or be reinforced over time. Further, considerable numbers of the workers in this survey had substantial tenure with their employer and occupation, increasing the potential for negative recall bias. That is, not recalling training that had been received in the past. Nevertheless, the findings of low levels of safety training are consistent with other surveys of injured workers. Data from model programs suggest that comprehensive workplace safety training, which includes identification of knowledge and skills required for particular tasks, the development of goal-oriented training programs, and feedback, can reduce unsafe work practices and associated injuries [Johnston et al., 1994]. Although workplace safety training alone may not be an adequate prevention strategy, it can be an effective component coupled with efforts to remove or minimize workplace hazards.

The employment characteristics of older workers, and the injured in this survey, highlight the challenges that will be faced in implementing training efforts and other prevention strategies for older workers. In 1995, there were an estimated 922,000 self-employed workers aged 65 years and older, 25% of all employed workers 65 years and over [U.S. Department of Labor, 1996a]. An estimated 282,000 of these self-employed older persons worked in agriculture [U.S. Department of Labor, 1996a], an industry with high rates of death and injury, especially for older workers [Layne and Landen, 1996; Myers and Hard, 1995; Jenkins et al., 1993; Mitchell, 1988]. Reflecting employment patterns of older workers, an estimated 20% of the injured workers in this survey were self-employed. Inadequate resources for safety training and equipment, and lack of oversight and guidance of federal safety regulations have been postulated as characteristics of self-employment that increase the risk for fatal injury [Personick and Windau, 1995b]. These characteristics apply to small businesses as well. Over 40% of the injured workers in this survey worked for businesses employing 10 or fewer employees.

Disseminating information on the elevated risk of injury and effective prevention strategies will need to employ novel outreach strategies for a substantial segment of the older workforce. Disseminating information to occupational safety and health professionals will not be adequate as many older workers will not work for companies with safety and health expertise or programs. Within agriculture, a national survey of older farmers suggested that the information format most often used in obtaining safety-related information were farm magazines, operator manuals, stickers or decals and one-on-one exchanges [Whitman and Field, 1995]. This information is likely relevant to older persons in nonagricultural industries as well. The extent to which lack of resources is a barrier to obtaining training and safety equipment, or machinery with safety features, should be investigated. Additionally, any prevention efforts involving the acquisition or use of safety equipment, or behavioral change, will need to address perceptions about safety [Whitman and Field, 1995].

Numerous studies have demonstrated that older workers are not necessarily predisposed to incur injuries. Persons who continue to work into their 60s and later are among the healthiest and most functional of older persons. However, older workers appear to have reduced tolerance for injuries. Efforts to reduce the injury incidence among older workers will result in costs savings to employers and avoidance of injury sequelae, which can be substantial among older workers.

REFERENCES

Agnew J, Suruda AJ (1993): Age and fatal work-related falls. Hum Factors 35:731–736.

Buck PC, Coleman VP (1985): Slipping, tripping and falling accidents at work: a national picture. Ergonomics 28:949–958.

Chamber of Commerce (1991): ''Analysis of Workers' Compensation—1991 Edition.'' Washington, DC: Chamber of Commerce.

Champion HR, Copes WS, Buyer D, Flanagan ME, Bain L, Sacco WJ: Major trauma in geriatric patients. Am J Public Health 79:1278–1282.

Cheadle A, Franklin G, Wolfhagen C, Savarino J, Liu PY, Salley C, Weaver M (1994): Factors influencing the duration of work-related disability: A population-based study of Washington State workers' compensation. Am J Public Health 84:190–196.

Cochran WG (1977): ''Sampling Techniques.'' 3rd Ed. New York: John Wiley & Sons.

Coleman PJ, Sanderson LM (1983): Surveillance of occupational injuries treated in hospital emergency rooms—United States, 1982. MMWR 32:31SS–37SS.

Doering M, Rhodes SR, Shuster M (1983): ''The Aging Worker: Research and Recommendations.'' Beverly Hills, CA: Sage Publications.

Fingar AR, Hopkins RS, Nelson M (1992): Work-related injuries in Athens County 1982–1986. J Occup Med 34:779–787.

Fullerton HN (1995): The 2005 labor force: Growing, but slowly. Monthly Labor Rev 118:29–44.

Giniger S, Dispenzieri A, Eisenberg J (1983): Age, experience, and performance on speed and skill jobs in an applied setting. J Appl Psychol 68:469–475.

Jenkins EL, Kisner SM, Fosbroke DE, Layne LA, Stout NA, Castillo DN, Cutlip PM, Cianfrocco R (1993): ''Fatal Injuries to Workers in the United States, 1980–1989: A Decade of Surveillance: National Profile.'' Cincinnati, OH: National Institute for Occupational Safety and Health, DHHS (NIOSH) No. 93-108.

Jensen R, Sinkule E (1988): Press operator amputations: Is risk associated with age and gender? J Safety Res 19:125–133.

Johnston JJ, Cattledge GTH, Collins JW (1994): The efficacy of training for occupational injury control. Occup Med 9:147–158.

Kosorok MR, Omenn GS, Diehr P, Koepsell TD, Patrick DL (1992): Restricted activity days among older adults. Am J Public Health 82:1263–1267.

Kovar MG, LaCroix AZ (1987): Aging in the eighties, ability to perform work-related activities. Data from the Supplement on Aging to the National Health Interview Survey, United States, 1984. Advance Data from Vital and Health Statistics, No. 136. Hyattsville, MD: National Center for Health Statistics, DHHS Publ No. (PHS) 87–1250.

Laflamme L, Menckel E, Lundholm L (1996): The age-related risk of occupational accidents: The case of Swedish iron-ore miners. Accid Anal Prev 28:349–357.

Landen DD, Hendricks SA (1992): Estimates from the National Health Interview Survey on occupational injury among older workers in the United States. Scand J Work Environ Health 18(suppl 2):18–20.

Layne LA, Landen DD [1996]: Nonfatal occupational injuries to older workers: An examination by age, gender, type of injury event, and industry division. In press, J Occ Env Med.

Leigh (1986): Individual and job characteristics as predictors of industrial accidents. Accid Anal Prev 18:209–216.

Marker D, Waksberg J, Branden J [1988]: ''NEISS Sample Update: Final Report.'' Washington, DC: U.S. Consumer Product Safety Commission, CPSC-C-87-1144.

Mitchell OS (1988): The relation of age to workplace injuries. Monthly Labor Rev 111:8–13.

Myers JR, Hard DL (1995): Work-related fatalities in the agricultural production and services sector, 1980–1989. Am J Ind Med 27:51–63.

Office of Management and Budget (1987): ''Standard Industrial Classification Manual, 1987.'' Washington, DC: U.S. Government Printing Office.

Palmore EB, Burchett BM, Fillenbaum GG, George LK, Wallman LM (1985): ''Retirement: Causes and Consequences.'' New York: Springer.

Personick ME, Windau JA (1995a): Characteristics of older workers' injuries. ''Fatal Workplace Injuries in 1993: A Collection of Data and Analysis.'' Washington, DC: US Department of Labor, Bureau of Labor Statistics, Report 891.

Personick ME, Windau JA (1995b): Self-employed individuals fatally injured at work. Fatal Workplace Injuries in 1993: ''A Collection of Data and Analysis.'' Washington, DC: US Department of Labor, Bureau of Labor Statistics, Report 891.

Rice DP, Max W (1996): Annotation: The high cost of injuries in the United States. Am J Public Health 86:14–15.

Richardson S, Schulman A (1994): Texas study finds older workers at relatively high risk of fatal occupational injury. Compensation and Working Conditions, 46:1–8.

Ringenbach KL, Jacobs RR (1995): Injuries and aging workers. J Safety Res 26:169–176.

Root N (1981): Injuries at work are fewer among older employees. Monthly Labor Rev 104:30–34.

Rossignol M (1994): The case-fatality rate of occupational injuries: The effect of aging. Am J Public Health 84:1696–1697.

Thomas SA, Browning CJ, Greenwood KM (1994): Rehabilitation of older injured workers. Disabil Rehabil 16:162–170.

U.S. Consumer Product Safety Commission [1994]: ''National Electronic Injury Surveillance System Coding Manual.'' Washington, DC: U.S. Consumer Product Safety Commission.

U.S. Consumer Product Safety Commission [Revised, 1992]: ''The NEISS Sample (Design and Implementation).'' Washington, DC: U.S. Consumer Product Safety Commission, Division of Hazard and Injury Data Systems.

U.S. Consumer Product Safety Commission [1988]: ''National Electronic Injury Surveillance System (NEISS): Estimated Generalized RelativeSampling Errors.'' Washington, DC: U.S. Consumer Product Safety Commission.

U.S. Department of Labor (1996a): ''Employment and Earnings 43(1).'' Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics.

U.S. Department of Labor (1996b): ''Older Workers' Injuries Entail Lengthy Absences from Work.'' Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, Summary 96-6.

U.S. Department of Labor (1996c): ''Characteristics of Injuries and Illnesses Resulting in Absences from Work, 1994.'' Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, News Release May 8, 1996.

U.S. Department of Labor (1995): ''Employment and Earnings 42 (1).'' Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics.

U.S. Department of Labor (1994a): ''Occupational Injury and Illness Classification Manual.'' Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics.

U.S. Department of Labor (1994b): ''Work Injuries and Illnesses by Selected Characteristics, 1992.'' Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, USDL-92-213.

Whitman SD, Field WE (1995): Assessing senior farmers' perceptions of tractor and machinery-related hazards. J Agric Safety Health 1:199–214.

Zwerling C, Sprince NL, Wallace RB, Davis CS, Whitten PS, Heeringa SG (1995): Occupational injuries among agricultural workers 51 to 61 years old: A national study. J Agric Safety Health 1:262–272.