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Estimates from the National Health Interview Survey on occupational injury among older workers in the United States

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Several studies have reported lower rates of occupational injury for older workers than for younger ones (1—6). There are some data to suggest, however, that older workers sustain more severe injuries and experience more disability related to injury. A study of claims filed with state workers' compensation departments reported that the risk of fatal and permanently disabling injuries was greater for older workers (1). Another study examined workers' compensation claims from sawmills in Maine and found a curvilinear relationship with age, with the largest number of days lost from work among the youngest and the oldest workers (7).

Since only part of the working population in the United States (US) is covered by workers' compensation, rates of occupational injury generated from compensation claims are not representative of the US work force. The present study was undertaken to describe rates and consequences of work-related injury among workers over the age of 50 years in the US, using data from a national probability sample of the population. Injuries to older workers were compared with injuries to workers in the age range of 30—49 years.

Methods

The National Health Interview Survey is a continuous multistage survey of the health of civilians residing in households in the US (8). In 1988, data on occupational health were collected in a supplemental interview (the 1988 Occupational Health Supplement). One person who was employed or had worked within the previous year was selected from each household interviewed in the National Health Interview Survey (if such a person resided in the household). Households were selected with a known probability that allowed computation of national estimates from the survey data.

A total of 30 074 persons was interviewed. Each respondent reported on injuries at work during the year preceding the interview. Injuries were those for which the respondent had (i) sought medical attention, (ii) been unable to perform some work activities, (iii) lost consciousness, or (iv) transferred to another job. Respondents reported up to five work-related episodes of injury (accidents) per year and up to five specific injuries per episode. In this analysis, we have considered only the first injury reported for each episode of injury. Approximately 95% of the cases reported only one injury per episode.

Data were analyzed using the SUDAAN (survey data analysis) program (9). This program computes population estimates and their standard errors for data from complex multistage sample surveys. Rate estimates were obtained by calculating the numerator (episodes of injury) and denominator (average annual employment) separately and dividing the numerator by the denominator. The occupation used in estimating the numerator was that occupation in which the respondent reported employment at the time of each injury episode. The denominator (average annual employment) was estimated with the use of the current occupation of respondents at the time of interview. The standard error for the rate was calculated from the variance and covariance of the numerator and the denominator with a first-order Taylor series expansion (10).

Recall bias has been shown to be a factor in the reporting of nonoccupational injuries (11, 12). To evaluate the effect of recall bias on work-related injury rates, we stratified cases reporting injuries by recall period (ie, the time in weeks between injury and date of interview). We then estimated the annual injury rate from recall periods of 2, 4, 13, 26, 39, and 52 weeks. Decline in the estimated rate of injury with longer recall periods was assumed to reflect recall bias. A similar method of estimating the effect of recall bias in the Survey has been described previously (11); it is feasible because each weekly sample in the Survey is a random national sample.

We adjusted the injury rates for recall by fitting a log-linear model to the data. The models were fit separately for all injuries, lost workday injuries, and nonlost-workday injuries by age-gender groups and occupational class. The models for all injuries by age-gender groups are shown in figure 1.

Differences in injury rates, adjusted for recall bias, were evaluated between the age groups (30—49 and $\geq$50 years) by gender and occupational class (white-collar and blue-collar). Occupational class was defined as workers in the following occupational groups of the

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Bureau of Census (13): white-collar: executive, administrative and managerial, professional specialty, technicians and related support, sales, and administrative support including clerical; blue-collar: precision product craft and repair, machine operators, assemblers and inspectors, transportation and material moving, handlers, equipment cleaners, helpers, and laborers (except farm).

The proportion of those injured who reported specified effects of their injuries, such as job changes and restriction in activity, was also estimated. There were no significant differences in the estimates of the proportions with each specified effect by recall period, and therefore we did not adjust for recall bias in this portion of the analysis.

Results

The injury rates changed significantly with recall period, and the log-linear model fit the data well (figure 1). The decline in estimated injury rates with increasing recall period was less for lost workday injuries than for nonlost-workday injuries; this finding indicated that recall was better for the more severe injuries. For the women aged 30—49 years, there was no significant decrease in the estimated rate of lost workday injuries with increasing length of recall period. To estimate the lost workday injury rate for this group, we did not fit a model for recall bias, but instead estimated the injury rate directly from the survey data.

The rates of injury adjusted for recall bias are shown in table 1. For all injuries, injuries with no lost workdays, and injuries with one or more lost workdays, the men over 50 years of age had significantly lower rates of injury than the men aged 30—49 years. Among the women, there was no significant decline in the rate of injury with age.

For all occupational groups combined, the rate of all injury for the women aged 30—49 years was significantly less than that for the men of the same age. Among the workers over 50 years of age, there was no significant difference in injury rates between the genders.

For the men within each occupational class, the rate of all injury was lower for those over 50 years of age than for those aged 30—49 years. For the female white-collar workers, there was no difference in injury rates between the age groups. Among those working in blue-collar occupations, however, women over 50 years of age had a higher rate of injury than either women aged 30—49 years or men over 50 years of age.

For both the injured men and women, a significantly smaller proportion of workers over the age of 50 years than workers aged 30—49 years reported a permanent change in work activity as a result of their injury (figure 2). For both genders, there was no significant difference between the age groups in the proportions assigned light-duty work in their usual job, temporarily

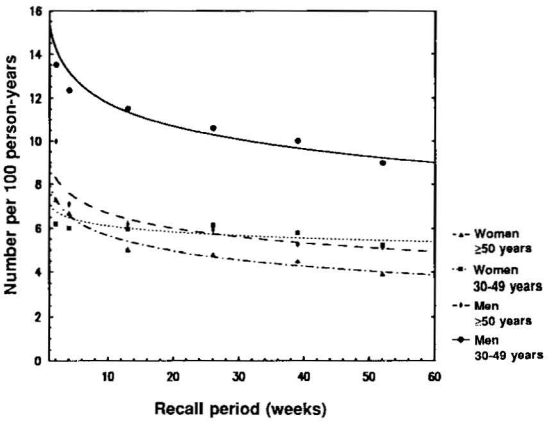

Figure 1. Estimated annual rates of occupational injury, based on recall periods of 2—52 weeks from date of injury to date of interview, by age and gender — data from the Occupational Health Supplement of the National Health Interview Survey of 1988. The fitted curves represent a log-linear model of the change in estimates with increasing time between injury and interview.

Table 1. Rates of episodes of injury by age, gender, and occupation, taken from the National Health Interview Survey, Occupational Supplement, 1988. Rates have been adjusted for recall. (95% CI = 95% confidence interval)

	Injury rate per 100 person-years	95% CI
Injuries with no lost workdays		
Men		
Aged 30—49 years	8.42	7.66—9.17
Aged ≥50 years	5.33	3.74—6.91
Women		
Aged 30—49 years	4.39	3.10—5.68
Aged ≥50 years	4.31	3.61—5.00
Injuries with lost workdays		
Men		
Aged 30—49 years	5.78	4.65—6.91
Aged ≥50 years	2.65	1.92—3.37
Women		
Aged 30—49 years	2.32	2.24—2.40
Aged ≥50 years	2.90	1.99—3.82
All injuries		
Men		
Aged 30—49 years		
White-collar	7.19	5.78—8.60
Blue-collar	21.19	16.90—25.48
All occupations	14.23	12.02—16.44
Aged ≥50 years		
White-collar	4.10	3.08—5.10
Blue-collar	10.05	4.92—15.18
All occupations	8.25	6.78—9.72
Women		
Aged 30—49 years		
White-collar	4.24	2.71—5.76
Blue-collar	12.26	8.96—15.56
All occupations	6.76	5.01—8.50
Aged ≥50 years		
White-collar	3.70	1.69—5.72
Blue-collar	24.81	16.24—33.38
All occupations	7.27	6.02—8.53

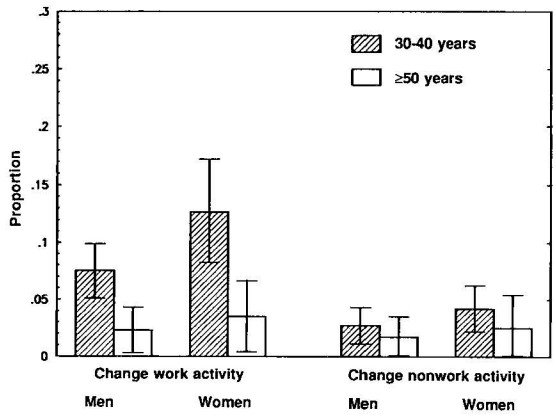

Figure 2. Proportion of those injured at work who experienced permanent changes in work or nonwork activity by age and gender — data from the Occupational Health Supplement of the National Health Interview Survey of 1988. The 95% percent confidence intervals are indicated by the vertical bars.

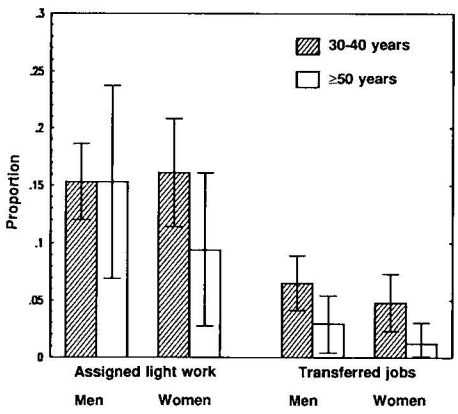

Figure 3. Proportion of those injured at work who were assigned light duty work in their usual job or temporarily transferred to another job by age and gender — data from the Occupational Health Supplement of the National Health Interview Survey of 1988. The 95 % confidence intervals are indicated by the vertical bars.

transferred to another job, or experiencing a permanent change in off-the-job activities (figures 2 and 3).

Discussion

In this study of occupational injury in the US, we found that rates of injury for workers over the age of 50 years were generally lower than rates for workers aged 30—49 years. Women working in blue-collar occupations were an exception; the injury rates among the older female blue-collar workers were higher than those for either the younger group of women or men over the age of 50 years. We cannot explain this finding; it presents an area for further research.

Studies of trauma patients have shown that the ability to withstand the effects of injury declines with age. For injuries of standardized severity, patients over 54 years of age have a higher probability of mortality (14); patients over 65 years of age also have longer hospital stays and higher complication rates (15). Thus it is somewhat surprising that a smaller proportion of older workers than workers aged 30—49 years had adverse effects from their injuries.

Both the lower rate of injury among the older workers and the lower proportion of adverse effects may be due to less frequent exposure to energy hazards in the work environment among older workers. This is a possibility because workers with seniority can often choose jobs in safer environments. Alternatively, older workers may represent a selected group of "healthy workers" who have survived in the work force because of their ability to perform their jobs safely. Safe work performance may also improve with age and experience.

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