

# Is the Apparent Decrease in Injury and Illness Rates in Construction the Result of Changes in Reporting?

LAURA S WELCH, MD, XIUWEN DONG, MS, FRANCOISE CARRE, PHD,  
KNUT RINGEN, DRPH

Injury rates in all industries and in construction in particular have been declining. Inconsistencies in the information suggest some of the apparent decrease may be due to changes in the ways injuries are treated, misclassification of employees, or underreporting. Lost-time injury rates for the largest construction employers declined by as much as 92% between 1988 and 1999. Yet the rate for cases with restricted work activity actually increased from 0.7 to 1.2 per 100 full-time workers between 1990 and 2000, and fatalities among construction workers remain high. In Massachusetts, at least 14% of construction employers misclassified workers as independent contractors, with the effect that injuries to these workers are not recordable. Studies that compare OSHA logs with other data sources find that the OSHA logs do not include a significant proportion of injuries and illnesses identified elsewhere. *Key words:* occupational injuries; occupational safety and health; construction; surveillance; OSHA; reporting systems.

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Injury rates in all industries, and injury rates in construction in particular, appear to have been declining. A decline in injuries occurs when work is being performed more safely, or hazardous tasks have been eliminated. But inconsistencies in the reported information about injuries and illnesses suggest that some of the decreases in injuries, and the apparent infrequent occurrence of occupational illnesses, may reflect changes in the ways injuries are treated, misclassification of employees, or underreporting, rather than actual reductions. Can we determine how much of the apparent overall decline is due to improvements in safety, and how much to these other factors?

Several studies have estimated significant underreporting of injury across all industries. Leigh et al. developed models suggesting the Bureau of Labor Statistics (BLS) Annual Survey missed from 0 to 70% of

the number of injuries it was designed to capture, and between 33% and 69% of all injuries.<sup>1</sup> A recent analysis by Rosenman et al.<sup>2</sup> matched the companies and individuals who reported work-related injuries and illnesses to the BLS in 1999, 2000, and 2001 in Michigan with companies and individuals reported in four other Michigan databases, workers' compensation, OSHA Annual Survey, OSHA Integrated Management Information System, and the Occupational Disease Report. They performed capture-recapture analysis to estimate the cases missed by the combined systems, and calculated that the current national surveillance system did not include up to 68% of the work-related injuries and illnesses that occurred annually in Michigan. Although some of the injuries were not required to be reported to the BLS, since they occurred among self-employed or government workers, underreporting could certainly play a role in the discrepancy.

## TRENDS IN FATAL AND NONFATAL INJURY RATES IN CONSTRUCTION

Nonfatal injury rates involving days away from work among construction workers declined steadily between 1992 and 2003, from 529.5 to 259.4 per 10,000 full-time equivalents (FTEs), respectively, a 51% decrease (Figure 1). The decline in injury rates was even greater for the largest and most experienced contractors. The 14 major contractors that belonged to the National Constructors Association saw their injury rates decline by 80% between 1988 and 1994. In a more recent data series reported by 17 large construction industry employers that are participants in the "Zero Accident Project" conducted at the Construction Industry Institute (CII) of the University of Texas, the composite lost-time injury rate declined from 0.8 cases per 100 FTEs to 0.27 between 1994 and 1999.<sup>3</sup> If we combine these two data series, we find that the reported lost-time injury rates for the largest employers declined by 92% between 1988 and 1999.

Paradoxically, it would appear that for the same periods that these marked declines in injury rates were reported, two specific types of injury indicators did not show such declines. The rate for cases with restricted work activity actually increased from 0.7 to 1.2 per 100 full-time workers between 1990 and 2000, and fatalities among construction workers remained high. Across all

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Address correspondence and reprint requests to: Laura S Welch, MD, Center to Protect Workers Rights, 8484 Georgia Avenue, Suite 1000, Silver Spring, MD 20910, U.S.A.

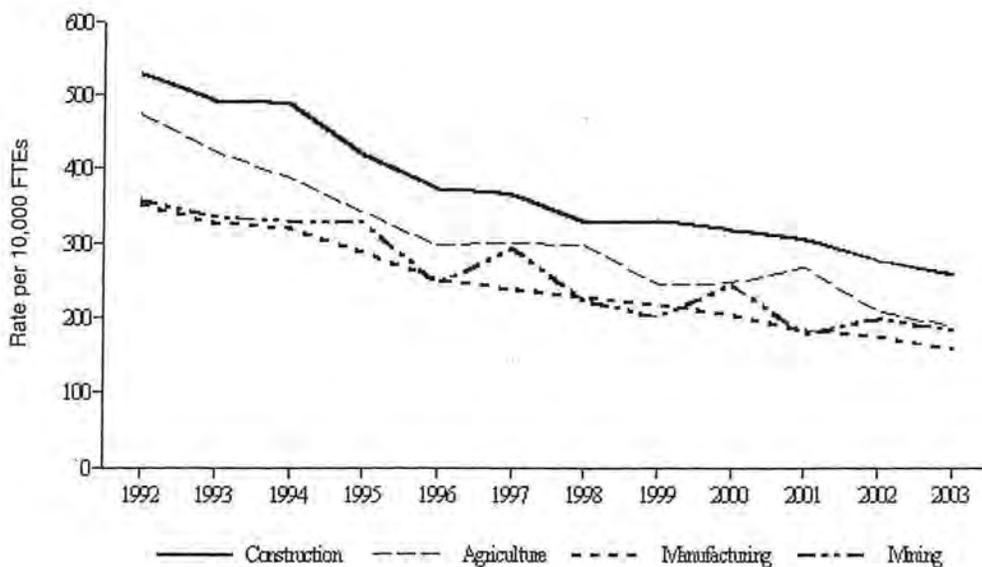


Figure 1—Rates of nonfatal injuries and illnesses with days away from work, by selected industry, 1992–2003. FTE = full-time equivalent, defined as 2,000 hours worked per year. Data cover private sector only and exclude self-employed workers. Source: Bureau of Labor Statistics, Annual Survey of Occupational Injuries and Illnesses.

industries, there was no change in the number of work-related injuries and illnesses treated in U.S. hospital emergency rooms from 1998 to 2003, even as injuries reported by the BLS decreased over the same period.<sup>4</sup>

The construction sector continues to account for a disproportionate share of work-related deaths in the United States. In 2004, construction workers were 7.7% of the U.S. workforce, but suffered 22.2% (1,268) of the nation's 5,703 reported work-related deaths. In comparison with the decline in nonfatal injuries, the death rates among construction workers remained relatively constant, with a decrease of 16% from 13.9 per 100,000 in 1992 to 11.7 in 2003 (Figure 2). In other words, the decline in fatality rates was only one third the decline in the reported rates of injuries with days away from work.

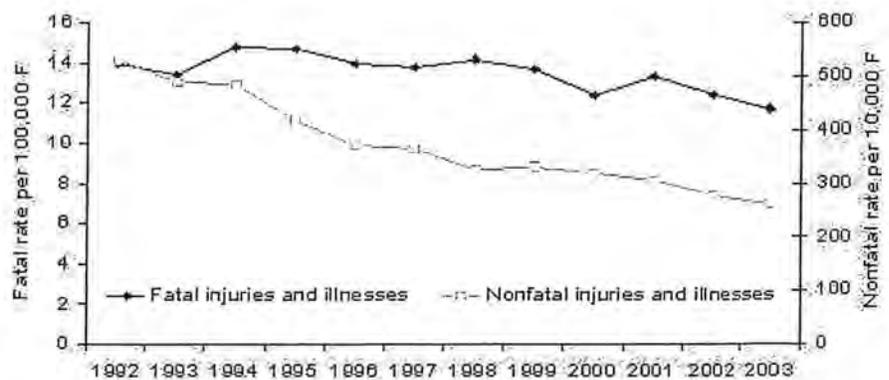
**Hispanic workers.** The same trends are apparent in the subgroup of Hispanic construction workers. In the last decade, Hispanic employment in the U.S. construction industry has increased dramatically. The number of Hispanic workers tripled between 1992 and 2003, and the proportion in the construction workforce increased from 9% in 1992 to 21% in 2003. In the blue-collar trades, Hispanic workers account for one third of all workers. During the same period, the number of work-related deaths among Hispanic construction workers more than doubled, from 108 to 263. Hispanic workers have had a consistently higher death rate than their non-Hispanic counterparts over time, although the rate of work-related deaths for Hispanic workers declined in recent years (Figure 3.) By contrast, nonfatal injury and illness rates for Hispanic construction workers were close to or even lower than rates for non-Hispanic construction workers during this period (Figure 4). This result contradicted some published reports. Bollini and Siem<sup>5</sup> found that Hispanic workers may be at a greater risk for occupational

injuries because of limited economic and political resources and poor living and working conditions. A community-based study of non-agricultural Latino/Hispanic workers reported that they have a higher risk of occupational injuries than other workers.<sup>6</sup> Clearly, more research is needed to explain the inconsistency.

**Establishments or contractor size.** The construction industry is composed mainly of small establishments; more than 80% of construction establishments have fewer than ten employees.<sup>7</sup> Small establishments appear to suffer a disproportionate share of work-related deaths from injuries. Establishments having fewer than 20 employees reported 53% of construction deaths from injuries (CFOI) (Figure 5), while employing 39% of the wage-and-salary workforce in construction in 2002.<sup>7</sup> In 1992–2003, the numbers for establishments with ten or fewer employees alone showed 3,819 deaths, 43% of the construction deaths from injuries. (Data limitations prevented calculating death rates for these establishments.)

By contrast, however, nonfatal injury rates for small establishments (ten or fewer employees) were consistently lower than for those establishments having 50–249 employees (Figure 6). In fact, reported rates for small establishments have been declining continuously since 1994, when the BLS first reported injury rates by establishment size. In a detailed analysis of the BLS data across all industries, Oleinick looked at establishment size and risk of occupational injury. The BLS data had consistently reported that small establishments had lower injury rates than midsized ones. After looking at a range of possible explanations, the authors concluded that underreporting of injury from small establishments was a substantial possibility. The BLS results for the smallest establishments continue to be inconsistent with findings in Ontario, Canada, that show a consistent negative cor-

Figure 2—Rates of fatal and non-fatal injuries and illnesses in construction, 1992–2003. FTE = full-time equivalent, defined as 2,000 hours worked per year. Nonfatal data, with days away from work, private sector only, the self-employed excluded. Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries, Annual Survey of Occupational Injuries and Illnesses, Current Population Survey.



relation between establishment size and injury rate from 1995 through 2001.<sup>8,9</sup>

### COMPARISON OF BLS DATA ON INJURY WITH OTHER DATA SOURCES

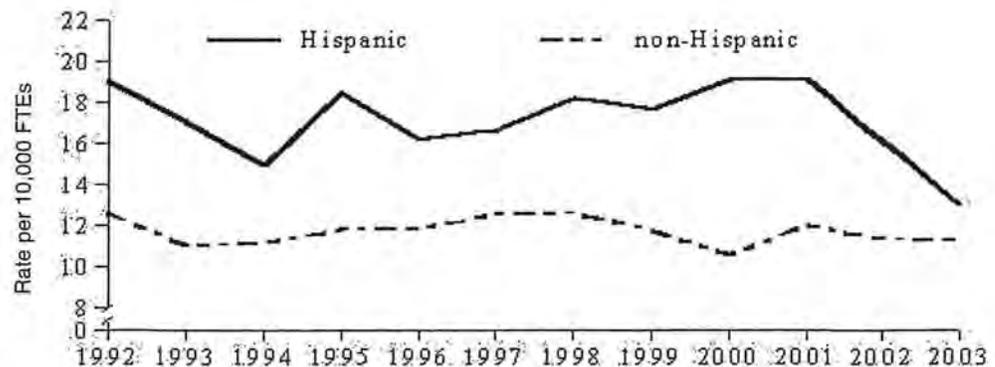
One of the authors (KR) compared workers' compensation claims data with BLS survey data in Washington State. Washington State has a state fund that provides workers' compensation coverage to all but a handful of self-insured employers. Under the state law governing workers' compensation, all injuries, even injuries of employees of the self-insured employers, are required to be reported to the state fund (RCW 51.28.020). The fund thus provides fairly complete data on injuries and illnesses reported by workers in the form of workers' compensation claims that are accepted. Given that the employers can and do challenge claims, it is reasonable to infer that the number of accepted workers' compensation claims represents one good measure of injuries and illnesses. For 1998, a comparison of the Washington State workers' compensation data with the BLS data on injury showed that workers' compensation recorded 10,000 more injuries among construction workers than the number reported by employers as injuries in the BLS survey. If we attribute this difference to underreporting by employers, 37% of injuries were not reported. If we look at lost-workday case reporting, workers reported 1,100 more cases than employers, a rate of underreporting of 16%. Lost-workday cases do not represent a fair

comparison, however, because under the state workers' compensation law, only cases involving four or more days away from work are included, while any injury involving any time away from work is supposed to be included in the BLS survey. If those cases with one to three days away from work were included in the workers' compensation data, the difference between reporting by workers and employers could double.

The Rosenman paper cited above<sup>10</sup> also has some construction-specific information. A detailed match could be performed only for those workers with more than seven days away from work. Among construction employers in Michigan, the authors estimated that the BLS included only 57% of the total cases from all sources, even for these more serious injuries. This estimate from Michigan is quite consistent with the estimate from Washington State, with both studies looking at lost-workday cases.

Welch et al.<sup>11</sup> compared injury statistics for one large construction project from three different sources: the site's first-aid records, the site's OSHA-recordable injuries, and emergency room visits for injured workers. They estimated from all the sources that only 27% of the injured construction workers seen in the emergency room with OSHA-recordable injuries were actually recorded on the OSHA log. Injuries not recorded on the OSHA log but noted in the first-aid records were frequently minor injuries that did not result in lost work time, due to an active return-to-work program on the site.

Figure 3—Rates of work-related deaths from injuries in construction, Hispanic vs non-Hispanic, 1992–2003. FTE = full-time equivalent, defined as 2,000 hours worked per year. Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries, Current Population Survey.



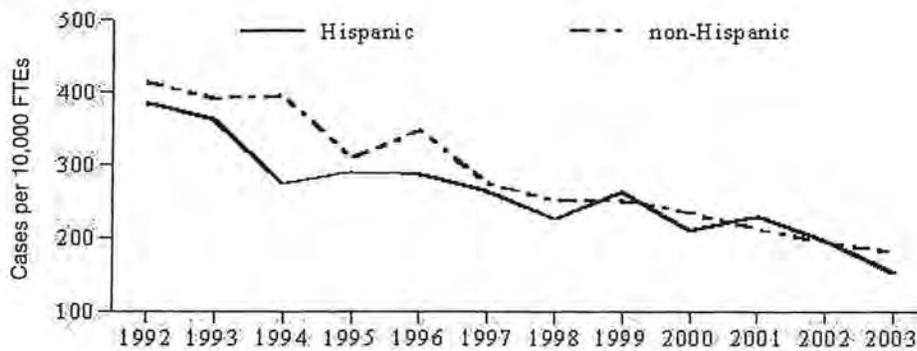


Figure 4—Rates of nonfatal injuries and illnesses resulting in days away from work in construction, Hispanic vs. non-Hispanic, 1992–2003. FTE = full-time equivalent, defined as 2,000 hours worked per year. Data cover private sector only and exclude self-employed workers. Source: Bureau of Labor Statistics, Annual Survey of Occupational Injuries and Illnesses, Current Population Survey.

Glazner et al., in the study of injury during the construction of the Denver International Airport, found that injury rates, as determined by reports to a single workers' compensation plan and an on-site medical clinic, were higher than those based on BLS data for the same site.<sup>12</sup> The difference was most marked for injuries that did not entail lost work time, when lost work time was defined as more than three scheduled work shifts. These authors reported an overall injury rate of 32.7/100 FTE workers for the construction SIC codes 15–17, using all workers' compensation cases as the numerator and hours worked as the denominator. The comparable rates from BLS data for all recordable injuries for these SIC codes during the same period ranged from 11.8 to 13. The rate for lost-work-time cases was 6.3/100 FTE workers on the Denver International Airport job, and 4.9–6.1 from BLS data. The rates are not strictly comparable, for a case in Glazner's records was defined by a payment from workers' compensation, and some of those cases are not recordable using the OSHA definition; this difference, however, cannot explain the great difference in reported injury rates from the two sources.

### EMPLOYEE MISCLASSIFICATION

Among the 80% of construction establishments that have fewer than ten employees,<sup>7</sup> many use other companies as subcontractors, or employ workers who are

classified as independent contractors. (The United States Internal Revenue Service defines someone as an independent contractor when the payer has the right to control or direct only the result of work, not how it will be done. If a person does work when the payer determines what will be done, and how it is done, he should not be classified as an independent contractor.) In some cases the employer classifies the worker as self-employed and issues a 1099 miscellaneous income form. In other cases work is compensated in cash with no 1099 reporting, what is called the "underground economy." Any increase in worker classification as an independent contractor would cause a decrease in reported injuries, for injuries to an independent contractor are not reported by the employer on an OSHA log, nor is that worker eligible for workers' compensation. One of the authors (FC) used audit data from the Massachusetts Division of Unemployment to determine the degree of misclassification among construction employers in Massachusetts, and concluded that at least 14%, and up to 24%, of construction employers misclassified workers as independent contractors. When an employer did misclassify workers, an estimated 40% of that employer's workforce was misclassified, indicating that misclassification was a common occurrence rather than an isolated incident. The prevalence of misclassification had increased 40% between 1995 and 2003.

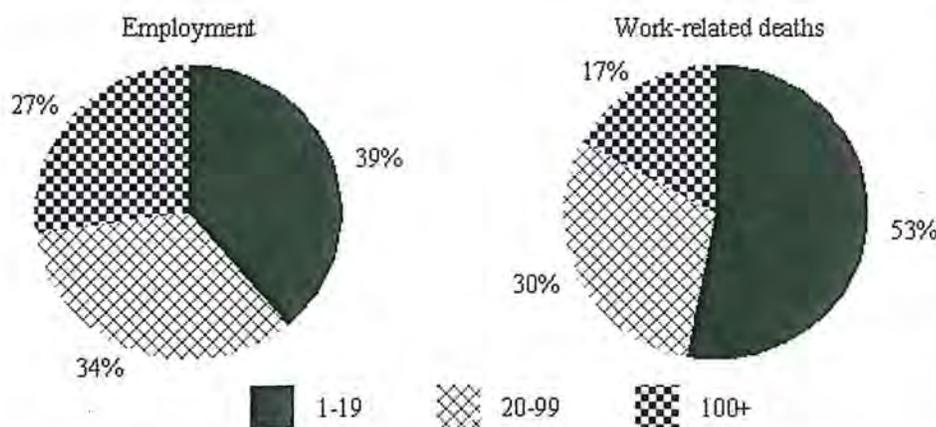
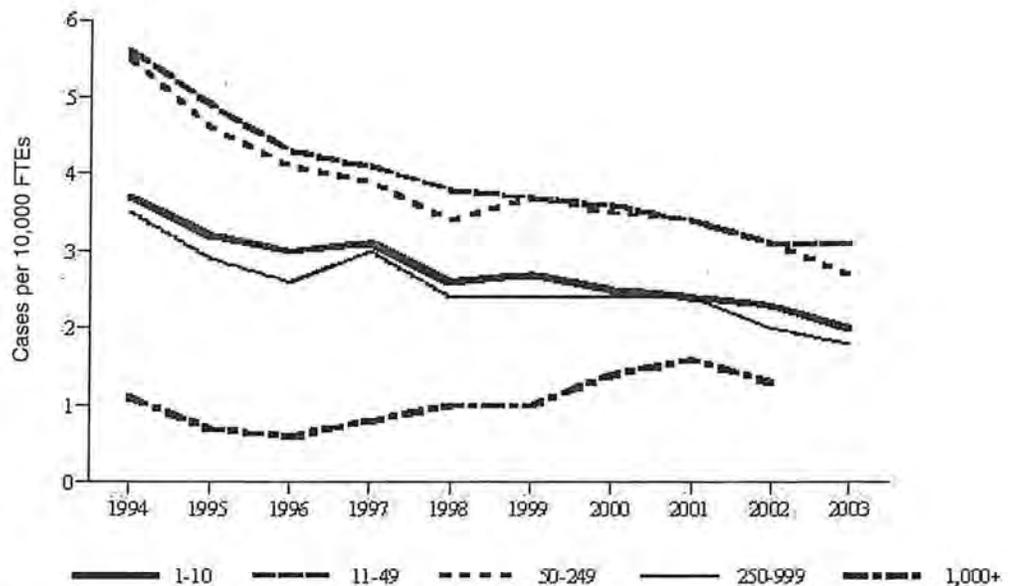


Figure 5—Distributions of construction employment and work-related deaths from injuries, by establishment size, 2002. Distributions of employment reported by the County Business Patterns exclude self-employed workers, and deaths reported without establishment-size information or self-employed workers were excluded from this calculation. CBP 2002 are the latest data. Sources: Census Bureau; County Business Patterns; Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Figure 6—Rates of non-fatal occupational injuries and illnesses in construction resulting in days away from work, by establishment size, 1994–2003. FTE = full-time equivalent, defined as 2,000 hours worked per year. Data not available for 1,000+ establishment nonfatal rate in 2003, data cover private sector only and exclude self-employed workers. Data by establishment are not available prior to 1994. Source: Bureau of Labor Statistics, Annual Survey of Occupational Injuries and Illnesses.



## UNDERREPORTING OF OCCUPATIONAL ILLNESS IN CONSTRUCTION

It is generally agreed that the BLS data system and workers' compensation capture a minority of occupational diseases.<sup>13-16</sup> Due to the long latencies of many occupational diseases, the employer at the time of exposure may no longer be in business, or it may be hard to determine which of many employers would be responsible. In addition, most occupational illnesses arise due to combinations of exposures and personal factors, making attribution to the workplace more complicated than a laceration or injury due to a fall. There is no information specific to the construction industry on underreporting of occupational disease, but we can examine the available information on underreporting for several diseases that are common among construction workers: musculoskeletal disease (MSDs), asbestosis, silicosis, noise-induced hearing loss, and lead poisoning.

### Musculoskeletal Disease

In the BLS data, MSDs comprise well over half of all reported occupational illnesses, yet several studies show that those reported are a minority of all the work-related MSDs. Morse<sup>17</sup> used capture-recapture analysis to estimate the annual rate of upper-extremity musculoskeletal disorders reported to workers compensation in Connecticut, and estimated that only 5.5–7.9% of MSD cases were reported; for the agriculture/mining/construction sector, 7.2% were reported.<sup>18</sup> Rosenman interviewed over 2,000 workers with work-related MSDs, and reported that only 25% has filed claims.<sup>15</sup> Among 4,800 cases of work-related carpal tunnel syndrome reported either by physicians to a state-based surveillance system or to the workers' compensation insurance carrier, only 6% were identified by both data sources.<sup>19</sup>

### Silicosis

Rosenman<sup>20</sup> used data from death certificates and a Michigan-based occupational disease surveillance system to estimate that there were between 3,600 and 7,300 cases of newly recognized silicosis cases per year in the United States between 1987 and 1996. For the same period, BLS data included 2,700–3,500 cases of silicosis, asbestosis, and coal-workers' pneumoconiosis per year combined; silicosis is likely to be a small proportion of this total. Detailed case investigation of the 577 cases of silicosis reported to the Health Department in Michigan for the same period found that these cases had relatively severe disease; only 45% had applied for workers' compensation.<sup>21</sup>

### Asbestosis

In the United States from 1940 to 1979, 27.5 million workers were occupationally exposed to asbestos in shipyards, manufacturing operations, construction work, and a wide range of other industries and occupations; 18.8 million of these were thought to have had high levels of exposure.<sup>22</sup> As noted above, BLS data report 2,700–3,500 cases of silicosis, asbestosis, and coal-workers' pneumoconiosis combined per year between 1987 and 1996. NIOSH recently reported there were 13,000 hospital discharges with the diagnosis of asbestosis in 1996 alone, and 90,000 between 1987 and 1996.<sup>23</sup>

### Noise-induced Hearing Loss

In Washington State from 1987 to 1998, road construction had the second-highest rate of noise-induced hearing loss (NIHL) claims, second only to logging. Daniell found that claims to the Washington State Department

of Labor and Industries for NIHL increased 12-fold over that period; although he could not determine the precise reasons for the increase, some of it was clearly due to more active screening among noise-exposed groups.<sup>24</sup> The age of the claimants increased over this time, with almost half the claims in 1998 coming from workers over the age of 65; this also suggests there were many prevalent cases that had not been previously detected. Since there is no reason to think that the true incidence of NIHL increased 12-fold over a decade, these data suggest significant underreporting of NIHL. Reilly and colleagues used a range of data sources to estimate that 86,000 workers in Michigan would have NIHL, and reported that between 1992 and 1997 approximately 2,000 cases were reported each year.<sup>25</sup> Through follow-back interviews they determined that a large number of noise-exposed workers were not receiving medical examinations.

### *Lead Toxicity*

Lead exposures and elevated blood lead levels (BLLs) are frequent among construction workers. Using information from NHANES III, Yassin<sup>26</sup> estimated the prevalence of elevated BLLs > 25 µg/dL to be 7.3% among construction laborers, compared with 0.23% for all U.S. workers, during the period 1988 to 1994. The highest prevalence of BLLs > 10 µg/dL was also among construction laborers (12.5%), and prevalence was 6.2% among construction trades overall. However, most lead toxicity is not reported to state registries or captured through the ABLES reporting system. In a study of radiator-repair workers in Washington State, Whittaker<sup>27</sup> estimated that only 11% of those with elevated BLLs are identified through the surveillance programs. Although we do not have specific information for the construction industry, there is no reason to believe this sector would have better surveillance programs than other industrial sectors.

## DISCUSSION

Information presented here from many sources suggests that underreporting of occupational injuries and illnesses in the U.S. construction industry is a substantial problem. Safer workplaces should decrease fatalities as well as injuries, but the fatality rate in construction has not declined, and the largest reduction in injuries is for those that do not entail days away from work. Studies that compare OSHA logs with first-aid logs or workers' compensation records find that the OSHA logs do not include a significant proportion of injuries found in the other sources. Misclassification of workers as self-employed, documented as a significant problem in Massachusetts, also leads to underreporting of injuries. These findings occur in the context of a business climate that rewards construction companies

with injury rates below average, and a period in which OSHA reduced inspections for record-keeping violations and targeted inspections based on injury reporting. Certainly changes in reporting practices could affect injury rates, even without a violation of the OSHA record-keeping requirements. There are many incentives to employers to reduce injury rates, ranging from decreasing the likelihood of an OSHA inspection to saving money on workers' compensation through a better experience-modification rating. There is some evidence that corporate and facility safety incentives have an indirect, but significant, negative influence on the proper reporting of workplace injuries by workers in an industrial setting.<sup>28</sup>

The dramatic decline in injury rates in the construction industry is associated with three changes that began almost simultaneously in the late 1980s. For one, major construction owners in areas such as the pharmaceutical and petrochemical industries, and government agencies such as the Army Corps of Engineers, began to pre-qualify bidders, with safety and health performance as one criterion. At the same time, workers' compensation costs began to grow at 15–20% per year, and experience rating became an important concern to construction industry employers. Although risk factors for fatal injuries and nonfatal injuries are not necessarily the same, several factors could contribute to the apparent underreporting of nonfatal injuries (and illnesses), including employers' desire to avoid increases in workers' compensation premiums tied to reported injuries.<sup>9</sup>

Disease reporting is less subject to these changes in business climate, but certainly there is no financial incentive for employers to increase detection and reporting of occupational illnesses. Many studies document that most occupational diseases go unreported. Understanding the extent of these conditions is important in assessing the efficacy of exposure controls, the need for medical surveillance, and other important public health actions, but the task of improving disease reporting is a daunting one.

An active injury-management program can obviate the need to report many injuries on an OSHA log, and so reduce reported injuries while still allowing an employer to be in full compliance with OSHA record-keeping requirements. The latest OSHA record-keeping standard clarified some ambiguities in the prior standard, and reduced the number of injuries that need to be recorded as having restricted duty. Employers are now required to record cases as restricted work cases when the injured or ill employee works partial days only or is restricted from performing "routine job functions," defined as work activities the employee regularly performs at least once weekly. Return-to-work programs and on-site first aid can convert an injury that was recordable to one that is not.

There is a clear advantage to knowing the entire spectrum of injuries on a construction site. Lowery et

al.<sup>29,30</sup> reported that contractors whose employees had minor injuries during the construction of the Denver International Airport were more likely to report a major injury; those with more than one injury that did not entail lost-work-time were four times as likely to have a lost work time injury. An active injury-prevention program can be successful by focusing on minor injuries as opportunities for early intervention; recording these injuries is essential to this process.

Is this underreporting important? Do safety and health performance data matter to the industry to such an extent that they should be reliable? If not, why collect and report them at all? If they are important, and if we are to continue to rely on employer reporting, is there any way to assure more honest reporting? Or should we find other ways to measure industry-wide safety and health performance? There is no doubt that there have been very significant improvements in safety and health performance in the last decade. It has long been recognized that there were deficiencies in the BLS data reported by employers, but this was not a major impediment to use of the data as long as these deficiencies were stable over time. It now appears that somewhere in the go-go economy of the 1990s, injury and illness reporting in construction went astray; it is in everyone's interest to find a way to bring it back on track. Employer reporting certified by chief executive officers, with rigorous OSHA inspection of such reporting, seems the most realistic approach.

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