# Occupational Injury Mortality: New Mexico 1998–2002

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**Background** *The current study characterizes patterns of occupational injury fatalities in New Mexico for the 5-year period 1998–2002.*

**Methods** *The study applied methods developed by the Council of State and Territorial Epidemiologists/National Institute for Occupational Safety and Health (CSTE/NIOSH) Occupational Health Indicator Work Group and compared the relative strength and weakness of two different datasets (CFOI and NMVRHS) for occupational injury fatality surveillance.*

**Results** *Annual occupational injury mortality rates ranged from 4.4 to 7.6 per 100,000 employed persons aged 16 and over compared to annual US rates of 4.0–4.6 per 100,000. Risk factors for higher mortality rates included age over 65 years, self-employment, non-US citizenship, being African-American or Hispanic, and occurrence in rural counties. The top industry for fatality rate was mining followed by transportation, public utilities, agriculture, and construction.*

**Conclusions** *Applying CSTE/NIOSH Occupational Health Indicator protocol and using both CFOI and NMVRHS data improved the characterization of occupational injury mortality and the setting of priorities for prevention intervention.* Am. J. Ind. Med. 50:910–920, 2007. *© 2007 Wiley-Liss, Inc.*

***KEY WORDS: occupational; work-related; injury; mortality; surveillance; indicators***

## INTRODUCTION

Fatal occupational injuries remain a significant problem in the United States [Leigh et al., 1997; Herbert and Landrigan, 2000; NIOSH, 2004]. The Bureau of Labor Statistics (BLS) reported that 5,702 workers in private industry died as a result of work-related injuries with a rate of 4.0 per 100,000 workers in 2005 [Bureau of Labor Statistics, 2006]. The National Safety Council estimated that on-the-job injuries (both fatal and non-fatal) cost society $142.2 billion in lost wages and productivity, administrative expenses, health care, and other costs in 2004 [National Safety Council, 2006]. New Mexico has consistently been a state with a high-occupational injury mortality rate [NIOSH, 2004], and a recent study placed New Mexico in the top 10 states for highest cost per worker for both fatal and non-fatal cases [Waehrer et al., 2004].

In 2002, the New Mexico Department of Health (NMDOH) Office of Epidemiology, in partnership with the University of New Mexico Health Sciences Center's Program in Occupational and Environmental Health, received a grant from the National Institute for Occupational Safety and Health (NIOSH) to establish an occupational injury and illness surveillance system for the state of New Mexico. As

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part of the surveillance system, the New Mexico Occupational Health Registry (NMOHR) was established to utilize existing data sources in state and federal public health and labor agencies, public and private healthcare provider data systems, and academic institutions with the intent to create a single repository for combining these data into valid, reliable, and useful surveillance information. In August 2003, the NMDOH adopted regulations to include occupational illnesses and injuries in the list of reportable diseases in New Mexico [New Mexico Department of Health, 2003]. NMOHR was designated as the official entity to collect and maintain the reportable occupational illness and injury data and is authorized to access all health care records that would identify or establish the characteristics or outcomes of occupationally related illnesses and injuries.

In 1998, Council of State and Territorial Epidemiologists (CSTE) and NIOSH convened the NIOSH-States Occupational Health Surveillance Work Group (CSTE/NIOSH Work Group) to make recommendations on priority conditions that should be placed under a comprehensive state-based occupational health surveillance system [CSTE, 2001] and to develop Occupational Health Indicators [CSTE, 2004]. Since 2003, NMOHR has participated in the development and subsequent pilot testing of Occupational Health Indicators in collaboration with CSTE, NIOSH, and states conducting occupational health surveillance. Criteria for selection of indicators included: (1) the availability of easily attainable statewide data; (2) the public health importance of the occupational health effect or exposure to be measured; and (3) the potential for workplace interventional activities. The CSTE/NIOSH indicator project revealed a New Mexico occupational injury fatality rate on par with the national rate for the year 2000. The current study was conducted to characterize the patterns of occupational injury fatalities in New Mexico for a 5-year period (1998–2002), applying the methods developed by the CSTE/NIOSH Work Group, and to compare the relative strength and weakness of two different datasets for occupational injury fatality surveillance.

## MATERIALS AND METHODS

NMOHR pilot tested the CSTE/NIOSH Occupational Health Indicator project in 2003 and calculated the 19 health indicators [CSTE, 2005] and state employment demographics profile [Council of State and Territorial Epidemiologists, 2005] for the year 2000. The indicator of interest, ''Fatal Work-Related Injuries,'' was calculated from all fatal work-related injuries reported to the BLS Census of Fatal Occupational Injuries (CFOI). In 2000, 35 New Mexicans died on the job resulting in a fatality rate of 4.4 per 100,000 workers, which was equal to the US rate for 2000 (note: the US rate has since been revised to 4.3 [Bureau of Labor Statistics, 2005a]). Further investigation into New Mexico's occupational injury mortality rate was warranted, and a study of the fatalities from 1998 to 2002 was conducted.

A demographic profile of the state's worker population (Table I) was completed using the CSTE Employment Demographics Profile method [CSTE, 2004] for the years

**TABLE I.** Worker Demographic Profile: New Mexico 1998–2002

| | |
|---|---|
| NM population aged 16 years and older by work status[a] | |
| Civilian non-inst. population | 1,326,600 |
| Number in workforce | 838,000 |
| Number employed | 792,800 |
| Number unemployed | 48,000 |
| Percentage of civilian employment by worker characteristic[a] | |
| Males employed | 52.9 |
| Females employed | 47.1 |
| Unemployed | 5.5 |
| Self-employed | 8.9 |
| Employed aged 16–17 years | 2.1 |
| Employed aged 18–64 years | 94.7 |
| Employed aged 65 years or older | 3.1 |
| Part time workers | 19.3 |
| Percentage of civilian employment by race/ethnicity[b] | |
| White non-Hispanic | 51.7 |
| African-American | 1.8 |
| Native American | 8.7 |
| Hispanic White | 36.3 |
| Asian | 1.3 |
| Percentage civilian employment by industry[a] | |
| Services | 24.5 |
| Government | 21.8 |
| Trade | 20.0 |
| Construction | 6.1 |
| Finance/insurance/real estate | 4.1 |
| Transportation/communications/public utilities | 4.0 |
| Manufacturing—durable goods | 3.4 |
| Agriculture | 2.8 |
| Manufacturing—non-durable goods | 2.4 |
| Percentage civilian employment by occupation[a] | |
| Professional specialty | 15.9 |
| Service occupations | 15.9 |
| Executive/administrative/managerial | 13.6 |
| Administrative support/clerical | 12.9 |
| Precision production/craft/repair | 12.2 |
| Sales | 11.7 |
| Transportation/material moving | 4.4 |
| Handlers/equipment cleaners/laborers/helpers | 3.7 |
| Technicians and related support | 3.7 |
| Farming/forestry/fishing occupations | 3.3 |
| Machine operators/assemblers/inspectors | 2.7 |

[a]Source is BLS Geographic Profiles (1998–2002) as per CSTE Occupational Health Indicator/Employment Demographic Profile [CSTE, 2005].
[b]Source is US Census Bureau [US Census, 2005b].

1998–2002 and includes the number of employed in the civilian workforce, percentages of unemployed, self-employed, employed part-time, as well as percentages of employed workers by gender, age group, race, Hispanic origin, industry, and occupation.

The CSTE Occupational Health Indicator #16, ''Workers Employed in Industries and Occupations at High Risk for Occupational Mortality,'' [CSTE, 2004] was analyzed for 1998–2002. Indicator #16 defines ''high-risk industry'' as one with injury fatality rates higher than 10 deaths per 100,000 workers. In 1998, there were 27 high-risk industries representing approximately 17.2 million US workers (14% of the private sector employment) [CSTE, 2004]. Likewise, ''high-risk occupations'' are defined as occupations that have fatality rates higher than 20 deaths per 100,000 workers (24 occupations in 1998) [CSTE, 2004].

Data from CFOI [Bureau of Labor Statistics, 2003] were analyzed using the CSTE Indicator #3, ''Fatal Work-related Injuries,'' method [CSTE, 2004] to determine if the high fatality rate seen in 2000 represented a trend over the 5 years (1998–2002). Data in CFOI are reported in aggregate form, and summary counts include fatalities by age, race, ethnicity, gender, industry, occupation, place of injury (i.e., farm, industrial yard, highway), cause, event leading to death and part of body injured.

A separate analysis of the New Mexico Vital Records and Health Statistics (NMVRHS) death certificate data was conducted. NMVRHS data allowed for the additional analyses of citizenship and state of residence of the decedent and the county in which the death occurred. The analyzed NMVRHS dataset included all death certificates for the years 1998 through 2002 where the ''injury at work'' box had been checked. All deaths that occurred in New Mexico are included in NMVRHS data regardless of the residence of the worker. Variables in NMVRHS include age group, gender, country of citizenship, residence county and city of decedent, county and city in which death occurred, the manner of death (accident, assault, suicide, or undetermined), date of death (year, month, day), the underlying cause of death (1999–2002 by ICD-10 codes, 1998 by ICD-9 codes), National Center for Health Statistics industry and occupation codes [National Center for Health Statistics, 1988], citizenship status, and race/ethnicity (non-Hispanic White, African-American, American Indian, Asian/Pacific Islander, and Hispanic). The CSTE Indicator #3 methodology was applied to the NMVRHS dataset. Rates were calculated where denominator data were available.

Prior to 2000, CFOI race categories of White and African-American included Hispanic workers. After 2000, Hispanic workers were categorized separately. Therefore, it was not possible to compare Hispanic injury mortality rates for the 5 years utilizing CFOI data so rates by race and ethnicity were calculated from NMVRHS data only. Due to the unique racial/ethnic composition of New Mexico, a separate analysis of the deaths among New Mexican residents only was conducted with NMVRHS data to determine if out-of-state residents impact the race/ethnicity-specific rates.

Although it is not possible to accurately assess the number of non-US citizens who are actually employed in New Mexico, rough estimates were calculated using Immigration and Naturalization Service counts of legal immigrants plus an estimated count of non-legal immigrants as well as survey estimates from CPS microdata.

Death certificates in New Mexico have been coded to International Classification of Disease -10 (ICD-10) codes since 1999; and before 1999 to ICD-9. In grouping the codes, deaths were classified as being transportation-related or non-transportation and were analyzed according to the state of residence of the decedents. The BLS Current Population Survey dataset was used for the denominator in the fatality rate calculations for both the CFOI and NMVRHS datasets with the exception of county injury fatality rates, which used BLS Quarterly Census of Employment and Wages [Bureau of Labor Statistics, 2005b].

The CFOI and NMVRHS datasets were compared, and the NMVRHS is expressed as a ratio of the CFOI for the compared measures. The individual measures were also ranked according to the frequency in the respective datasets. The comparison between the two datasets was expressed as percent change, which is the absolute value of CFOI data minus NMVRHS data divided by CFOI data $\times$ 100.

Data analysis was performed using Excel for Windows software (Microsoft) and STATA Intercooled Statistical Software, version 9.1. Confidence intervals for fatality rates were calculated at the 95% level using Wilson's method for binomial variables.

## RESULTS

### Worker Population Characteristics

New Mexico worker population characteristics, summarized in Table I, show that for the 5-year period New Mexico's civilian non-institutional population 16 years of age and older had an average annual growth rate of 1% [Bureau of Labor Statistics, 2005c] (Table I). The average population of the civilian workforce aged 16 years and older in New Mexico was 838,000 with an average of 792,800 workers employed per year [Bureau of Labor Statistics, 2005c] (Table I). The average annual percentage of workers by gender was 53% male and 47% female [Bureau of Labor Statistics, 2005c] (Table I).

Approximately 16% of all New Mexico workers were employed in high-risk industries (i.e., agriculture, mining, construction, transportation) [CSTE, 2005] for occupational fatality and over 7% of NM workers were employed in high-risk occupations (including machine operators, construction

trade workers, i.e., roofers, electricians, structural metal workers; miners, agricultural workers, truck drivers, taxi cab drivers) [Bureau of Labor Statistics, 2005c; CSTE, 2005].

According to the US 2000 Census, the population of New Mexico is comprised of 44.7% non-Hispanic White, 42.1% Hispanic, 8.9% American Indian, 1.7% African-American, 1.0% Asian, and 2.1% identified as some other race [US Census Bureau, 2005a]. In regard to the NM workforce, Hispanic workers of any race comprised 37.5% of all workers of which 36.3% were Hispanic Whites. Non-Hispanic Whites made up 51.7% of all workers; African-Americans 1.8%, Native Americans 8.7%; and Asian/Pacific Islanders 1.3% [Bureau of Labor Statistics, 2005d] (Table I).

## Analysis of CFOI Dataset

The BLS CFOI data revealed 244 fatal occupational injuries in New Mexico from January 1998 to December 2002, a range from 4.4 per 100,000 employed person 16 years and older in 2000 to 7.6 per 100,000 in 2002 compared to the total annual US rates of 4.0–4.6 per 100,000 (Fig. 1). While there was a gradual decline in the annual US rate over the 5 years, New Mexico experienced a slight decline from 1998 to 2000, then an increase in 2001 and 2002 (Fig. 1).

## Fatality Rates by Demographics and Employment Status

Analysis of occupational injury mortality by age (Table II) revealed New Mexican workers aged 65 years and older have a fatality rate of 13.1 per 100,000 workers. This rate is twice that of any other age group, except 25–34 year olds who have a fatality rate of 7.0 per 100,000. Deaths due to occupational injury among males (n = 228) resulted in a fatality rate of 10.9 per 100,000 workers in comparison to a rate of 0.9 per 100,000 for females (n = 16; Table II). Workers in New Mexico who were self-employed had approximately a one-third higher average annual mortality rate (8.8 per 100,000) than wage and salary workers (5.9 per 100,000; Table II).

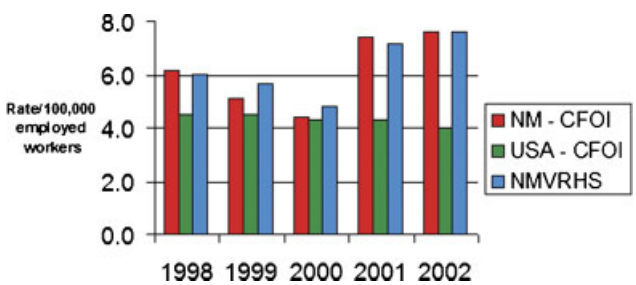


**FIGURE 1.** Occupational injury fatality rates, New Mexico and United States, 1998–2002. Comparison of Bureau of Labor CFOI and New Mexico NMVRHS data. Note: Rate is fatalities per 100,000 employed workers. Abbreviations: NMCFOI, New Mexico Census of Fatal Occupational Injuries; USCFOI, United States Census of Fatal Occupational Injuries; NMVRHS, New Mexico Vital Records and Health Statistics.

## Fatality Rates by Occupation and Industry

Workers employed in transportation and material moving occupations, such as truck drivers, refuse workers, and airplane pilots, had an injury fatality rate of 37.5 per 100,000 workers. The occupation group with the next highest rate was farming (19.9 per 100,000), followed by protective service workers (e.g., law enforcement officers and fire fighters; 17.2 per 100,000; Table II). The top industry for fatalities was mining with an average annual fatality rate of 24.5 per 100,000; followed by transportation and public utilities (19.3 per 100,000); agriculture (17.8 per 100,000); and construction (14.0 per 100,000; Table II). The transportation and utilities industry had the highest rates for men (35.1 per 100,000 male transportation workers) followed by mining (26.6 per 100,000), agriculture (23.0 per 100,000), and construction (15.5 per 100,000). The fatality rate among female transportation and utilities workers was the highest rate for women and is twice that of women working in the retail trade (3.4 per 100,000 vs. 1.5 per 100,000).

## Fatalities by Event or Exposure

Over one-half of the occupational injury deaths in New Mexico involved vehicular transport (51%), followed by contact with objects and equipment (17%), assaults and violent acts (11%), falls (8%), exposure to harmful substances or environments (7%), and fires and explosions (5%). Transportation was the primary manner in which fatal injury occurred in 50% of the deaths in men and 69% of deaths among women. While assaults and violent acts caused 10% of deaths among men, 31% of deaths among women were due to an assault or violent act.

When looking at transportation-related deaths by age, workers aged 65 and older were observed to die twice as often in transportation-related events (6.4 per 100,000) compared to those aged 64 years and younger (3.2 per 100,000).

## Analysis of NMVRHS Dataset

There were 248 death certificates marked "death at work" between 1998 and 2002 in the NMVRHS data. The NM annual fatality rate ranged from a low of 4.4 per 100,000 employed persons 16 years and older to 7.6 per 100,000 (Fig. 1).

## Fatalities by Race, Ethnicity, Residency, and Citizenship

Analysis of total fatalities (n = 248) revealed that the racial/ethnic group with the highest occupational fatality rate

**TABLE II.** Occupational Injury Fatality Counts and Average Annual Fatality Rates Per 100,000 NM Workers Age 16 Years and Older, as Reported by CFOI, 1998–2002

| | Fatalities 1998–2002 | # Workers (5 year average) | Annual rate/ 100,000 workers | 95% Confidence interval |
|---|---|---|---|---|
| Total | 244 | 793,000 | 6.2 | 5.4–7.0 |
| Gender | | | | |
| M | 228 | 419,400 | 10.9 | 9.6–12.4 |
| F | 16 | 373,600 | 0.9 | 0.5–1.4 |
| Employment status[a] | | | | |
| Wage & salary workers | 213 | 725,500 | 5.9 | 5.1–6.7 |
| Self-employed | 31 | 70,500 | 8.8 | 6.2–12.5 |
| Age group | | | | |
| 16–17 | — | 19,117 | — | — |
| 18–19 | 5 | 30,873 | 3.2 | 1.4–7.6 |
| 20–24 | 20 | 82,485 | 4.9 | 3.1–7.5 |
| 25–34 | 58 | 165,637 | 7.0 | 5.4–9.1 |
| 35–44 | 57 | 209,579 | 5.4 | 4.2–7.1 |
| 45–54 | 61 | 188,259 | 6.5 | 5.1–8.3 |
| 55–64 | 26 | 86,226 | 6.0 | 4.1–8.8 |
| 65+ | 16 | 24,466 | 13.1 | 8.1–21.3 |
| Industry | | | | |
| Mining | 24 | 19,625 | 24.5 | 16.4–36.4 |
| Transportation/public utilities | 56 | 58,170 | 19.3 | 14.8–25.0 |
| Agriculture | 21 | 23,658 | 17.8 | 11.6–27.1 |
| Construction | 41 | 58,642 | 14.0 | 10.3–19.0 |
| Trade—wholesale | 14 | 24,299 | 11.5 | 6.9–19.3 |
| Public administration | 23 | 53,099 | 8.7 | 5.8–13.0 |
| Services | 25 | 126,384 | 4.0 | 2.7–5.8 |
| Manufacturing (durable + non-durable goods) | 10 | 52,025 | 3.8 | 2.1–7.1 |
| Trade—retail | 21 | 153,077 | 2.7 | 1.8–4.2 |
| Finance/insurance/real estate[b] | — | 32,654 | — | — |
| Occupation | | | | |
| Transportation/material moving | 66 | 35,199 | 37.5 | 29.5–47.7 |
| Farming/forestry/fishing | 26 | 26,174 | 19.9 | 13.6–29.1 |
| Precision production/craft/repair | 51 | 96,859 | 10.5 | 8.0–13.8 |
| Handlers/equipment cleaners/helpers/laborers | 14 | 29,528 | 9.5 | 5.7–15.9 |
| Technicians and related support | 13 | 29,532 | 8.8 | 5.2–15.1 |
| Machine operators/assemblers/inspectors | 8 | 21,535 | 7.4 | 3.8–14.7 |
| Service occupations | 23 | 126,503 | 3.6 | 2.4–5.5 |
| Sales | 14 | 93,666 | 3.0 | 1.8–5.0 |
| Executive/administrative/professional | 12 | 108,750 | 2.2 | 1.3–3.9 |
| Professional specialty | 11 | 127,143 | 1.7 | 1.0–3.1 |
| Administrative support incl. clerical[b] | — | 102,885 | — | — |

[a]Denominator for employment status only available for years 1999–2002.
[b]Number suppressed in CFOI data.

was African-Americans at 12.5/100,000 workers (n = 100), followed by Hispanics (6.4 per 100,000, n = 92) and non-Hispanic Whites (6.4 per 100,000, n = 131), Native Americans (3.7 per 100,000, n = 13), and Asian/Pacific Islanders (n ≤ 5; rate not calculated). In a separate analysis of the fatalities among workers with a NM residence (n = 174), the rate was 7.5 per 100,000 among African-Americans (n = 6), followed by Hispanics (5.2 per 100,000, n = 75), non-Hispanic Whites (4.0 per 100,000, n = 83), Native Americans (2.6 per 100,000, n = 9), and Asian/Pacific

Islanders ($n \leq 5$; rate not calculated). When comparing the ethnic/racial background of all fatalities versus fatalities among NM residents, the fatalities among African-Americans and non-Hispanic Whites, 60 and 63%, respectively, were NM residents compared to fatalities among Hispanics, of whom 81% were NM residents.

Thirty percent of occupational injury fatalities occurred among non-residents. Work-related travel through the state appears to be of risk for work-related travelers as 47% of transportation-related deaths occurred among out-of-state residents.

Nine percent of worker deaths in New Mexico occurred among non-US citizens; of these, 6% were among Mexican Nationals. The estimated fatality rate of non-US citizens ranged from 10.3 per 100,000 to 10.7 per 100,000 workers [US Immigration and Naturalization Service, 2005; U.S. Census Bureau, 2004].

## Geographic Distribution of Fatalities

Twenty of New Mexico's 33 counties have population densities of less than 10 people per square mile [U.S. Census Bureau, 2005b]. Many of the counties with the highest occupational injury fatality rates (13.5 per 100,000 workers or above) fall into this low-density population category including Union, Rio Arriba, Cibola, Hidalgo, Luna, Torrance, and Lincoln counties (Fig. 2). NM has three major interstate highways; I-25, I-40, and I-10 (Fig. 2). Nationally, interstate travel at high speeds often account for motor vehicle fatalities. However, only three NM counties with an interstate highway reported deaths due to transportation that was greater than six (numbers not shown). The highest occupational injury fatality rates were in counties with only secondary roads.

## CFOI—NMVRHS Comparisons

There were four more deaths in the NMVRHS data than in the CFOI data ($n = 248$ vs. $n = 244$) but the rank orders by year and sex were identical (Table III). Comparisons of the rank orders of the remaining variables indicated primarily moderate differences. NMVRHS fatalities by age group represented more deaths in the younger and older worker categories ($\leq 19$ and $\geq 65$ years) and fewer deaths in the middle (25–54 years) age range than CFOI data (Table III). The comparison of the industry categories showed the largest differences between the two datasets with only two of the nine industry categories ranked in the same relative positions (Table III). There was more agreement in ranking in the occupation category with five out of seven in the same relative positions. The largest difference was in military occupations with NMVRHS recording more deaths than CFOI data (nine vs. four deaths; Table III).

## DISCUSSION

Occupational health surveillance is the keystone in prevention of work-related injuries and fatalities. An occupational health surveillance system must be able to gather data on all cases of injury, disease, and workplace exposures then analyze the data, disseminate results, and intervene to correct workplace conditions. Prior to the establishment of the

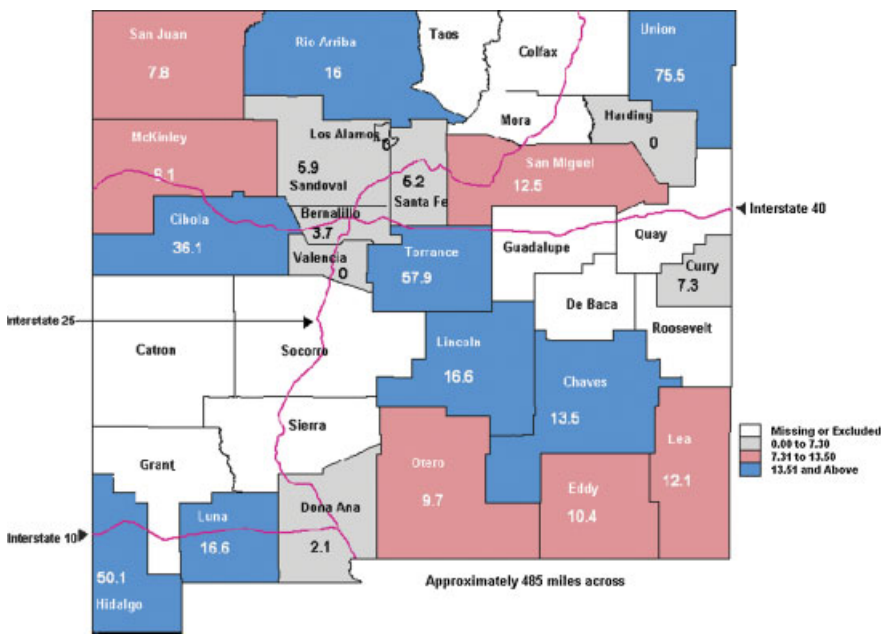


**FIGURE 2.** Occupational injury mortality rate per 100,000 workers by county in New Mexico, 1998–2002.

**TABLE III.** Number, Distribution, and Comparison of Fatal Occupational Injuries by Selected Characteristics and Dataset. New Mexico 1998–2002

| | NMVRHS (N) | Rank order | CFOI (N) | Rank order | Difference % \|NMVRHS-CFOI\|/CFOI*100 |
|---|---|---|---|---|---|
| Total | 248 | — | 244 | — | 1.6 |
| Year of death | | | | | |
| 2002 | 63 | 1 | 63 | 1 | 0.0 |
| 2001 | 57 | 2 | 59 | 2 | 3.4 |
| 1998 | 47 | 3 | 48 | 3 | 2.1 |
| 1999 | 43 | 4 | 39 | 4 | 10.3 |
| 2000 | 38 | 5 | 35 | 5 | 8.6 |
| Sex | | | | | |
| Male | 230 | 1 | 228 | 1 | 0.9 |
| Female | 18 | 2 | 16 | 2 | 12.5 |
| Age | | | | | |
| ≤19 years | 8 | 7 | 6 | 7 | 33.3 |
| 20–24 years | 23 | 6 | 20 | 5 | 15.0 |
| 25–34 years | 55 | 2 | 58 | 2 | 5.2 |
| 35–44 years | 55 | 3 | 57 | 3 | 3.5 |
| 45–54 years | 55 | 1 | 61 | 1 | 9.8 |
| 55–64 years | 29 | 4 | 26 | 4 | 11.5 |
| 65 years and over | 23 | 5 | 16 | 6 | 43.8 |
| Industry | | | | | |
| Transportation & public utilities | 66 | 1 | 56 | 1 | 17.9 |
| Construction | 43 | 2 | 41 | 2 | 4.9 |
| Mining | 28 | 3 | 24 | 4 | 16.7 |
| Agricultural production—livestock & crops | 27 | 4 | 21 | 7 | 28.6 |
| Services | 25 | 5 | 25 | 3 | 0.0 |
| Public administration | 24 | 6 | 23 | 5 | 4.3 |
| Retail trade | 18 | 7 | 21 | 6 | 14.3 |
| Manufacturing | 5 | 8 | 10 | 9 | 50.0 |
| Wholesale trade | 4 | 9 | 14 | 8 | 71.4 |
| Occupation | | | | | |
| Operators, fabricators, and laborers | 82 | 1 | 88 | 1 | 6.8 |
| Precision production, craft, & repair | 44 | 2 | 51 | 2 | 13.7 |
| Managerial & professional specialty | 29 | 3 | 23 | 5 | 26.1 |
| Technical, sales, & administrative support | 26 | 4 | 27 | 3 | 3.7 |
| Farming, forestry, & fishing | 26 | 5 | 26 | 4 | 0.0 |
| Service occupations | 17 | 6 | 23 | 6 | 26.1 |
| Military occupations | 9 | 7 | 4 | 7 | 125.0 |

NMOHR in 2002, the state of New Mexico had limited capability to track occupational injuries and no ability to gather data on occupational illnesses. Without the capacity to conduct occupational health surveillance, a state such as New Mexico is unable to correctly identify the areas in need of intervention and prevention in occupational health.

The overall rate for occupational injury fatalities has declined in the US from 5.2 per 100,000 full-time workers in 1992 to 4.0 per 100,000 in 2002 [NIOSH, 2004]. In NM, there was a downward trend from 1998 to 2000, but this was followed by a subsequent increase (Fig. 1). Historically, New Mexico has had a higher rate than the US. In a previous study of New Mexican occupational injury mortality, Fullerton et al. [1995] noted, that the death rate was 7.9 per 100,000 employed workers (n = 613 deaths) in New Mexico from 1980 to 1991 in comparison to the US rate of 6.0 per 100,000. Our study confirms that NM injury mortality rates have remained high when compared to the US.

According to the 2000 US Census, the African-American population is 1.7% of the total NM population

and that African-Americans comprised 1.8% of New Mexico's working population [US Census Bureau, 2005a; Bureau of Labor Statistics, 2005d]. However, analysis of NMVRHS data shows that African-Americans accounted for the highest fatality rate of any racial and ethnic groups (12.5 per 100,000 workers for all deaths, and 7.5 when calculating the rate of New Mexico residents only). Loomis and Richardson [1998] reported that the occupational fatality rate among African-Americans in North Carolina was 30–50% higher than the rate among non-Hispanic White workers from 1977 to 1991. A study of fatal agricultural injuries in North Carolina found that the crude fatality injury rate among African-Americans was 1.5 times higher than non-Hispanic Whites [Richardson et al., 1997]. The explanation of the racial disparity has been that African-American workers were often segregated into lower paying and more dangerous jobs with little advancement [Loomis and Richardson, 1998], placing them at higher risk for occupational injury fatality and occupational illnesses [Kipen et al., 1991; Taylor and Murray, 2000]. One limitation of our study is that the small numbers involved in African-American worker fatalities preclude definite conclusions that this group of workers is experiencing the highest fatality rate in the state; however, this group remains important for targeting injury prevention activities.

In addition to the fact that the CFOI data for race and ethnicity rates included Hispanics in the White and African-American categories from 1998 to 2000, 50 of the occupational fatalities (n = 244) reported in the CFOI data had no identified race or ethnicity reported, limiting the current study. CFOI presents a disclaimer that data are not reported when they do not meet publication criteria, though it is difficult to determine from the tables which criteria are not being met. CFOI records data from two or more sources for each incident, and it may be that the corroborating record contains race or ethnicity data that conflicts with the death certificate. The lack of reporting of race and ethnicity of 50 cases may lead to an underestimate the fatality rate in any one specific racial/ethnic group. The use of the NMVRHS data to calculate rates of occupational injury mortality among the different racial and ethnic groups was possible; however, the number of injury fatality cases among Asians and Pacific Islanders was small, limiting confidence in determining the true fatality rate for the Asians/Pacific Islander group.

When comparing 1998–2002 data to the previous study by Fullerton et al. [1995], the rate of occupational injury fatality by race/ethnicity has declined for both Hispanics and non-Hispanic Whites; however, the decline has been greater for non-Hispanic Whites, from 8.8 per 100,000 in 1980–1991 to 6.4 per 100,000 in 1998–2002, (a 27% decline) compared to Hispanics with a rate of 7.3 per 100,000 in 1980–1991 to 6.4 per 100,000 in 1998–2002, (a 12% decline).

New Mexico's Hispanic population consists of primarily two groups. The first group is descendant of the Conquistador settlement from 1598 to 1658, and the second group is more recent immigrants from Central America and Mexico. The overall growth rate of the Hispanic population in New Mexico increased 1.1% from 1990 to 2000 [US Census Bureau, 2005a]. Although there was an increase in the number of undocumented immigrants (mostly from Mexico) from 1990 to 2000, the percentage of unauthorized immigrants to the total population, remained stable at 0.6% growth for the 10-year period [US Immigration and Naturalization Service, 2005]. The BLS Geographic Profile of Employment and Unemployment for 2000 shows that New Mexico had the highest percentage of employed Hispanic workers (37.5%) when compared to all other states in the United States. In 2001, the BLS reported that the fatality rate of male Hispanic workers was 6.0 per 100,000 worker-years in comparison to 4.2 and 3.8 for non-Hispanic White and African-American workers, respectively [Bureau of Labor Statistics, 2002]. A 2004 study of fatal occupational injury rates in southern and non-southern states [Richardson et al., 2004] noted that the fatal occupational injury rates from 1994 to 1997 for Hispanic male workers had exceeded the rates for all non-Hispanic workers in the southern states, had reached parity with non-African-American men, and had exceeded the rates for African-American men in non-southern states. A study of construction workers in 2004 [Dong and Platner, 2004] noted that the risk of fatal occupational injury was significantly greater for Hispanic construction workers when compared to non-Hispanic construction workers.

When considering the rate of deaths among Hispanic New Mexican workers, this study notes that the rates are second highest after African-Americans (7.5 vs. 5.2). Because of the overall growth rate of Hispanic workers (native and immigrant Hispanics) in New Mexico, this ethnic group will continue to be important to target for injury prevention. Nine percent of the deaths were among non-US citizens with the majority (6%) coming from Mexico. This percentage is close to that reported in a previous study where 10% of occupational injury fatalities occurred in immigrants nationwide [Windau, 1997]. A recent study [Pransky et al., 2002] noted a relatively high risk for severe occupational injuries among urban immigrant Latino workers when compared to US workers as a whole in similar jobs.

For Hispanic and immigrant workers, cultural and language barriers, lack of health insurance including workers compensation, inadequate safety training [Ciesielski et al., 1991; Corvalan et al., 1994; Pransky et al., 2002], and a concentration into high-risk industries and occupations contribute to the high-injury mortality rate. Pransky et al. [2002] had noted in their study of immigrant Latino workers that almost 60% of the cases did not file a workers' compensation claim for the most severe work injuries. A study of acutely injured trauma patients in Massachusetts

[Haas and Goldman, 1994] noted that the uninsured were more likely to die in a hospital (OR = 2.15, 95% CI = 1.44, 3.19) when acutely injured. In 2000, only 81.8% of workers in New Mexico eligible for Workers' Compensation were covered [Mont et al., 2004]. With almost 20% of workers in New Mexico not covered under Workers Compensation, it is not clear whether the lack of access to health insurance and health care is a major factor to the high-fatality rate or not. Further study may help to determine if the lack of access to workers' compensation is an important cause for the high-fatality rate among this group of workers.

New Mexico has a rural, geographically dispersed population. Forty percent of the population of 1.8 million lives in the Albuquerque Metro area while the rest of the population is sprinkled throughout a region of over 115,000 square miles [U.S. Census Bureau, 2005b]. Twenty of New Mexico's 33 counties have a population density of less than 10 people per square mile [U.S. Census Bureau, 2005b]. Due to the rural nature of the state, many New Mexicans have limited access to emergency health care. There is only one level 1 trauma center in the state located in the center of the state at the University of New Mexico Health Sciences Center, Albuquerque, NM. This trauma center is at least 4–6 hr by ground ambulance and 1–2 hr by air ambulance from distant parts of the state. A study limitation is that it is unknown if the higher death rate for occupational injuries in NM may be related to the rural nature of the state and to the time from injury site to a trauma treatment center. In New Mexico, only 38.4% of the population had access to a Level I and II trauma centers within 45 min and increased to only 59% for 60 min [Branas et al., 2005]. In addition, rural areas in New Mexico rely on volunteer EMS systems that have been shown in previous studies to have inadequate equipment and training [Grossman et al., 1997; Rogers et al., 1997] and may be a factor in contributing to the higher death rates in rural counties.

Previous studies have shown that rural injury death rates are related to motor vehicle crashes [Baker et al., 1987; Peek-Asa et al., 2004] and traumatic occupational injuries in construction [Zwerling et al., 1996], mining [National Safety Council, 2006], and agriculture [National Safety Council, 2006]. The previous study on NM occupational injury mortality had also noted that rural populations in New Mexico were more likely to die from occupational injuries (63.7% of the deaths) when compared to urban populations [Fullerton et al., 1995]. The current and previous studies [Fullerton et al., 1995] both note that most of the rural deaths occurred in high-risk industries such as mining, agriculture, and oil and gas exploration and among transportation workers.

Transportation-related fatalities contributed to the majority of the work-related injury fatalities in New Mexico (51%) from 1998 to 2002. NIOSH reported that occupational deaths due to motor vehicle incidents were the leading contributor to occupational injury fatalities from 1980 to 1998 [NIOSH, 2004] and that occupational highway fatalities increased by 18.5% between 1992 and 2000. Forty-seven percent of transportation-related deaths in NM in the current study occurred in out-of-state residents (36% ground transportation, 10% air transportation) compared to 30% of total injuries occurring in NM among out-of-state residents. One case study [Bunn and Struttmann, 2003] characterizing fatal occupational motor vehicle collisions in Kentucky had also noted that more than half of the occupational motor vehicle fatalities were among individuals who resided outside of Kentucky.

Fatigue, driver distraction (i.e., cell phone use), and age-related factors (young drivers and older drivers) have been linked to the increased risk for occupational motor vehicle crashes. As previously stated, the current study concluded that the fatality rate for older drivers was twice that of drivers under the age of 65 in NM. Age does not explain the increased risk among out-of-state residents driving in NM. Some specific factors of NM highways such as the rural nature of most of the roadways, the extensive number of miles of straight roads and dark roadways, the high speed limits (75 mph), and unusual weather conditions may contribute to some of the increased risk. The National Center for Statistics and Analysis showed that driving at fast speeds on straight roads at night were major factors in vehicle crashes in rural areas [NHTSA, 2004]. Out-of-state residents may overestimate their ability to drive safely on unfamiliar straight, rural, dark roadways at high speeds with unpredictable local weather conditions such as dust storms.

A higher percentage of New Mexicans are self-employed when compared with the US average (9.2 vs. 7.3% civilian employed workers) [CSTE, 2005]. These workers are less likely to be covered under private medical insurance and/or Workers' Compensation insurance. In this study, the self-employed had approximately a one-third higher average annual mortality rate (8.8 per 100,000) than wage and salary workers (5.9 per 100,000). This finding was consistent with previous studies among the self-employed [Feyer et al., 2001; Mirabelli et al., 2003]. Lack of access to medical care, working in high-fatality rate industries such as agriculture or high-homicide rate industries such as the retail trade and taxicab service, and working unaccompanied with no witnesses to the injury may contribute to higher fatality rate of this group of workers.

New Mexican workers aged 65 years and older have a fatality rate (13.1 per 100,000) at least twice that of any other age group except 25- to 34-year-old age group. This finding has been shown in a previous study where workers 65 years or older had a workplace fatality rate 2.6 times the rate of workers aged 16–64 years [Kisner and Pratt, 1997]. NIOSH has reported that the leading cause of occupational fatalities for older workers aged 55 years and older in the US was roadway crashes [NIOSH, 2005]. Nearly 3,200 workers aged

55 years and older died in motor vehicle crashes between 1992 and 2002 [NIOSH, 2005]. The current study concluded that the fatality rate for older drivers was twice that of drivers under the age of 65. Since the American workforce is aging, older workers will remain an important group for prevention intervention [Hartley and Biddle, 2001].

CFOI data is considered the "gold standard" for occupational injury fatality analysis due to the use of multiple data sources (death certificates, OMI reports, newspaper clippings) [Biddle and Marsh, 2002]. Because of the investigative nature of CFOI, the dataset provides particularly detailed information on the circumstances surrounding the fatal injury, such as the nature of injury and the work being performed during the time of injury. Personal identifying information is not available through CFOI and it was not possible to directly compare fatalities from the two datasets (CFOI and NMVRHS). However, some indirect comparison was useful in helping to complete the picture of the populations at risk. Comparing the CFOI and NMVRHS datasets reveals that there are differences between coding systems for the two datasets for variables such as cause of death, occupation, and industry. This may be due to the assignment of the main occupation and industry of the decedent on death certificates, rather than the occupation and industry associated with the fatality, which would be more likely reported in CFOI. A previous comparison of the NIOSH National Traumatic Occupational Fatalities (NTOF) surveillance system, which is based on death certificates and CFOI, showed that New Mexico was one of seven states where fatality counts were within 93–100% agreement.

Analyzing both datasets (CFOI and NMVRHS) was important to adequately characterize occupational injury mortality in New Mexico as each dataset supplied different information. Analysis of racial and ethnic characteristics, citizenship status, state of resident, and county in which the fatality occurred were important variables available through NMVRHS but unavailable through CFOI. Important information on specific subsets of workers (such as self-employed and immigrant workers) by using both data systems enabled a better characterization of occupational injury mortality and priority setting for prevention intervention.

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