Fatal work injuries: results from the 1992 national census

Highway accidents and homicides top the list of fatal work injuries, according to the Bureau of Labor Statistics first census of fatal incidents in 50 States and the District of Columbia

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During 1992, slightly more than 6,000 workers lost their lives because of injuries incurred on the job, according to information from the Bureau of Labor Statistics first nationwide Census of Fatal Occupational Injuries. This amounts to an average of nearly 17 workplace deaths each day of the year. Tragically, some of these deaths might have been avoided if workers and employers had known more about their risks associated with the jobs.

The Census of Fatal Occupational Injuries helps fill this information gap.The census counts and verifies all fatal work injuries, providing information on how the injury occurred and certain characteristics of the fatally injured person (for example, age, gender, and race). For the first time, the 1992 census covered the 50 States and the District of Columbia. (In 1991, only 32 States and New York City were covered.)

Some major findings from the 1992 Census of Fatal Occupational Injuries:

- men, the elderly (aged 65 and older), workers in farming and transportation-related occupations, and workers in agriculture, mining, and construction industries appear to have a higher risk of workplace fatalities relative to their share of employment;
- highway vehicle accidents were the leading fatal event for male workers, while on-the-job homicides were the leading fatal event for female workers;
- the average age of fatally injured workers was 42 years;
- whites accounted for 83 percent of the workers fatally injured; blacks, for 10 percent; and
- the self-employed and family members working in family businesses accounted for 20 percent of the workplace fatalities, although they represented only 9 percent of the total employed.

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Background for the census

BLS began collecting information on workplace safety and health in 1912 when it studied accidents in the iron and steel industry. This effort was followed by studies of worker injuries and illnesses in a variety of related industries (survey of health in the printing trades, and industrial poisoning, for example) during the next 25 years. In the late 1930's, BLS began an annual national survey, collecting data on fatal work injuries, permanent disabilities, and temporary disabilities resulting in days away from work.

The Occupational Safety and Health Act of 1970 provided new impetus for gathering information on job-related injuries and illnesses. The act authorized the Secretary of Labor to require that employers record their employees' work-related injuries and illnesses and submit data "needed for developing information regarding the causes and prevention of occupational accidents and illnesses." The Secretary delegated responsibility for

this information system to BLS. Since 1972, BLS, in cooperation with State agencies, has conducted an annual sample survey of about 280,000 to 600,000 private sector establishments. BLS has used the annual survey to compile and publish information on injury, illness, and fatality statistics in the workplace.

BLS analysts involved in safety and health statistics and experts in the safety and health field, however, believe that such relatively rare incidents as fatal work injuries cannot be measured accurately through a sample survey. Studies also have shown that traumatic occupational fatalities are often underreported. In this regard, fatality estimates made by different organizations vary greatly—from 3,000 to 11,000 deaths nationally per year.[1] Differences in coverage, in definitions of what constitutes a work fatality, and in estimation methodologies contribute to the variations. Most of these earlier surveys on workplace fatalities did not generate complete or accurate information describing the incident and its circumstances (for example, type of incident, location, and objects or machinery involved), characteristics of the deceased (for example, age, sex, and occupation), and characteristics of the employer (for example, industry and public versus private sector).

The National Academy of Sciences and the Keystone Dialogue Group—a nonprofit organization that facilitates consensus-building dialogues among business, labor, and government on public policy issues—evaluated work injury and illness statistics in the United States. They stressed the need for a comprehensive count of fatal occupational injuries, including work-related deaths of the self-employed, workers younger than 16 years, workers on small farms, and other worker groups commonly not reported in current statistical systems. In a 1987 report, a National Academy of Sciences panel "found it rather startling that an agreed upon method has not been devised to estimate a phenomenon as basic as traumatic death in the workplace."

The National Academy of Sciences panel recommended that BLS work with State agencies to compile complete rosters of occupational fatalities from administrative sources such as death certificates and workers' compensation reports.[2] Around the same time, the Keystone Dialogue Group emphasized the need to obtain detailed characteristics on fatal workplace injuries on a timely basis to develop and implement effective safety measures.[3] In addition, this group recommended the "development of a consensus method for counting work-related fatalities," stating that the "development of an accepted count of workplace deaths should mute controversy on this issue stemming from the variety of estimates coming from different sources."

In response to these and other recommendations, BLS designed the Census of Fatal Occupational Injuries as part of a broad redesign of its safety and health statistics program.[4] Besides fatalities of private wage and salary workers, the annual census counts include fatalities of public sector employees—both civilian and military—and of the self-employed.

The census approach. The census approach to compiling data on fatal work injuries was initially tested in a BLS cooperative effort with the Texas Department of Health during 1988.[5] During the 1990–91 period, this approach was tested again in Texas and Colorado to determine whether the same kind of data could be obtained from multiple

Table 1. **Source documents used to compile information on fatal work injuries, 1992**

Source document	Fatalities	
	Number	Percent
Total[1]	6,083	100
Death certificates	5,633	93
State workers' compensation reports	2,434	40
Coroner, medical examiner, and autopsy reports	3,768	61
Occupational Safety and Health Administration (OSHA) reports[2]	1,926	32
News media	2,077	34
Followup questionnaires[3]	1,504	25
State motor vehicle reports	485	8
Other Federal reports[4]	328	5
Other reports[5]	2,033	33

[1] The total of source documents (20,188) exceeds the total of verified cases (6,083) because two or more source documents were used to substantiate each case. Note that some source documents were received only upon request. In general, these included autopsy, coroner, and medical examiner reports; followup questionnaires; and State motor vehicle reports.

The number of death certificates shown includes some death certificates initially not marked, "at work." Seventy-five percent of the death certificates that the States initially received were marked "at work."

[2] This figure is not a comprehensive count of fatalities reported to or investigated by OSHA, but represents the available OSHA reports used to identify or substantiate a work injury fatality in the Census of Fatal Occupational Injuries program.

[3] Includes telephone followup for missing data and for clarification of inconsistent data.

[4] Includes reports received from the Mine Safety and Health Administration, the Employment Standards Administration, the National Institute for Occupational Safety and Health's Fatal Accident Circumstances and Epidemiology program, the Department of Justice, the Department of Energy, and the National Transportation Safety Board.

[5] Includes reports received from other organizations, such as State farm bureaus, local police departments, and emergency medical services.

SOURCE: Census of Fatal Occupational Injuries, Bureau of Labor Statistics in cooperation with Federal and State agencies, 1992.

data sources on a current basis.[6] In 1991, the Census of Fatal Occupational Injuries was initially implemented in 32 States and New York City. In 1992, the census covered all 50 States and the District of Columbia.[7]

Collection methods

The Census of Fatal Occupational Injuries program is a cooperative venture in which the operating costs are shared equally between the State and Federal Governments. States are responsible for data collection, followup procedures, and coding. About 20 data elements, including the demographic characteristics of the decedent and circumstances of the fatal event, are coded according to standard instructions. Up to 10 additional data elements are coded, depending on the availability of information in the source documents. (Table 1 lists the source documents used to compile the 1992 data.) Included in the information collected for each reported fatality case are the industry of the employer, equipment or machines involved, activity the worker was engaged in at the time of the incident, and occupation of the worker.

States obtain information on fatal work injuries from death certificates, workers' compensation reports, and other reports provided by State administrative agencies. Additional information provided to States originates from Federal agencies, such as the Department of Labor's Occupational Safety and Health Administration, Employment Standards Administration, and Mine Safety and Health Administration. Overall, in 1992, State agencies collected 20,188 individual source documents or about an average of three documents from different sources for each fatality case. To avoid duplication, source documents are matched using the decedent's name and other information. (See table 1.)

To ensure an accurate count of fatal occupational injuries, the census program requires that for each case, the work relationship (that is, whether a fatality is work related) be substantiated by two or more independent source documents or a source document and a followup questionnaire. Followup questionnaires are either sent to the employer or to another contact that has knowledge of the incident. The followup questionnaire is also used to collect information that is missing from the source documents. Nonresponse to the questionnaire or inconsistent data results in further followup by telephone. At the end of the collection period, fatalities for which the State has only one source document are reviewed by BLS. The fatality is included in the National database only if the State and BLS agree that there is sufficient information on the source document to determine that the fatality is indeed work-related. (The appendix explains how cases with only one source document are processed.)

For a fatality to be considered within the scope of the program, the decedent must have been employed (that is, working for pay, compensation, or profit or in the family business) at the time of the event and engaged in a legal work activity[8] or present at the site of the incident as a requirement

Table 2. **Number and percent distribution of fatal occupational injuries by event or exposure, 1992**

Event or exposure[1]	Fatalities	
	Number	Percent
Total	6,083	100
Transportation accidents	2,441	40
Highway accidents	1,121	18
Collision between vehicles, mobile equipment	553	9
Noncollision accidents	292	5
Nonhighway accident (farm, industrial premises)	436	7
Aircraft accidents	350	6
Workers struck by a vehicle	342	6
Water vehicle accidents	110	2
Railway accidents	66	1
Assaults and violent acts	1,216	20
Homicides	1,004	17
Shooting	822	14
Stabbing	82	1
Self-inflicted injury	183	3
Contacts with objects and equipment	1,001	16
Struck by object	558	9
Struck by falling object	360	6
Struck by flying object	79	1
Caught in or compressed by equipment or objects	312	5
Caught in or crushed in collapsing materials	110	2
Falls	590	10
Fall to lower level	500	8
Fall on same level	60	1
Exposure to harmful substances or environments	593	10
Contact with electric current	334	5
Exposure to caustic, noxious, or allergenic substances	118	2
Oxygen deficiency	109	2
Drowning, submersion	76	1
Fires and explosions	167	3
Other events and exposures[2]	75	1

[1] Based on the 1992 BLS Occupational Injury and Illness Classification Structures.

[2] Includes the category "Bodily reaction and exertion."

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to total due to rounding.

SOURCE: Census of Fatal Occupational Injuries, Bureau of Labor Statistics in cooperation with Federal and State agencies, 1992.

Table 3. **Number and percent distribution of fatal occupational injuries by source of injury, 1992**

Source of injury[1]	Fatalities	
	Number	Percent
Total	6,083	100
Vehicles	2,421	40
Air vehicle	344	6
Aircraft—powered fixed wing	198	3
Aircraft—powered rotary wing	87	1
Highway vehicle, motorized	1,550	25
Automobile	457	8
Truck	887	15
Plant and industrial powered vehicles, tractors	322	5
Forklift	60	1
Tractor	243	4
Rail vehicle	40	1
Water vehicle	115	2
Structures and surfaces	600	10
Floors, walkways, ground surfaces	513	8
Machinery	593	10
Agricultural and garden	142	2
Construction, logging, and mining	188	3
Material handling (cranes, conveyers, jacks)	145	2
Parts and materials	399	7
Building materials—solid elements	113	2
Structural metal materials	46	1
Machine, tool, and electrical parts	211	3
Electric parts	180	3
Persons, plants, animals, and minerals	370	6
Animals and animal products	39	1
Nonmetallic minerals, except fuel	48	1
Plants, trees, vegetation—not processed	171	3
Trees, logs	160	3
Chemicals and chemical products	167	3
Tools, instruments, and equipment	144	2
Handtools—nonpowered	79	1
Containers	76	1
Other sources	1,313	22
Ammunition	949	16
Atmospheric and environmental conditions	146	2
Steam, vapors, liquids	101	2

[1] Based on the BLS Occupational Injury and Illness Classification Structures. The source of injury identifies the object, substance, or exposure that directly produced or inflicted the injury. For transportation accidents, the source identifies the vehicle in which the deceased was an occupant.

NOTE: Totals for major categories may include subcategories not included separately. Percentages may not add to totals due to rounding.

SOURCE: Census of Fatal Occupational Injuries, Bureau of Labor Statistics in cooperation with Federal and State agencies, 1992.

of his or her job. This definition allows the inclusion of all injury-related[9] fatalities that occur while a person is in a work status; it is generally broader than the criteria used by Federal and State agencies administering specific laws or regulations.

Partial information on fatal occupational illnesses (nontraumatic conditions such as asbestosis and occupational cancers) is compiled primarily from State workers' compensation reports. Because of the latency period of many occupational illnesses and the resulting difficulty associated with linking illnesses to work, it is difficult to compile a complete count of all fatal illnesses in a given year. Thus, information on illness-related deaths is excluded from the analysis in this article.[10]

A public-use fatality database will be available for safety and health researchers, policy officials, and others involved in promoting safety in the workplace.[11] Because census data are collected under a pledge of confidentiality, data elements identifying the deceased or the company are deleted from the database.

Experimental fatality rates

Fatal work injury rates measure how frequently fatalities occur within various worker groups. BLS has developed experimental rates using annual average employment estimates from the 1992 Current Population Survey. (See appendix for research notes on developing fatality rates.)

Census of Fatal Occupational Injury rates were calculated for major industry divisions, selected occupations, and other demographic characteristics. It should be noted that these rates do not measure the independent effect of a single characteristic, such as age, sex, industry, or occupation. Rates, however, are useful in identifying potential "high risk" groups for further study, such as older workers and the self-employed. Many safety experts consider aggregate totals of fatalities equally important in developing intervention strategies. For example, a single fatality in a rare occupation such as rattlesnake milking would result in a high fatality rate for the occupation, yet would pose a minimal hazard because there are few of these workers employed in this occupation.[12]

National profile of fatalities

The national data are aggregates of the combined State data. The aggregate data show that work-related fatalities are distributed nationally among all industries and occupations. They also show which specific groups of workers are at higher risks of a fatal incident. State profiles of fatally injured workers may differ from the corresponding national profile. Later in 1993, States are expected to release their individual fatality counts and fatality profiles.

Event and source of injury. Highway accidents and homicides were the major events accounting for approximately one-third of the 6,083 workplace injury fatalities during 1992. Highway vehicle accidents led all other event categories, accounting for 18 percent of the total. (See table 2.) Homicides, a close second, accounted for 17 percent of the fatally injured workers, and was the leading manner of fatal workplace fatalities for women. Falls to lower levels and being struck by objects or equipment each accounted for nearly 10 percent of the fatal work injuries.

The source of an injury identifies the object, substance, or exposure that directly produced or inflicted the injury. For transportation accidents, the source identifies the vehicle in which the decedent was an occupant. In more than 40 percent of the fatal incidents, either a highway motor vehicle or bullet was identified as the source of injury. (See table 3.)

Age. The majority of the fatally injured workers were 25 to 54 years old; the average (mean) age at death was 42. About 700 workers died before their 25th birthday. Another 460 fatally injured workers were 65 years of age and older. The latter age group experienced the highest risk of workplace fatalities, compared with other age groups. (See table 4.)

Other worker characteristics. About 90 percent of the fatally injured workers were men, a high proportion in light of the fact that their share of the employed is a little more than half (55 percent). The self-employed and those working in the family business accounted for 20 percent of the total fatalities, compared with a 9-percent share of the total employed. (See table 4.)

Occupation. Distribution of fatalities by occupation highlights those workers facing the greatest danger of a fatal incident. This includes transportation and material moving operators (primarily truck and taxicab drivers) which accounted for nearly one-fifth of all fatal work injuries. Other occupational groups, each with about one-tenth of the 6,083 fatalities, were farming; construction trades; handlers, helpers, and laborers; and sales occupations. (See table 5.)

Industry. Fatally injured workers were employed in a wide variety of goods-producing and service-producing industries. Among industry groups reporting the largest number of fatal work injuries were agricultural crop production; special trade contractors (roofing and electrical work, for example); and trucking and warehousing. (See table 6.)

Experimental industry fatality rates. The risk of fatal work injury varied widely by industry. Fatality rates for mining (27 per 100,000 workers), agriculture (24), construction (14), and transportation and public utilities (13) were well above the national rate of 5 per 100,000 workers. However, rates in finance and services were less than half the national rate. The rate for manufacturing, at 4 per 100,000 workers, was below the national rate, even though manufacturing rates for nonfatal lost work time injuries rank among the highest of any industry group. (See table 6.)

Of special note, many of the fatalities involved workers *not covered* under the jurisdiction of Federal or State agencies engaged in consultation-related, prevention-related, or regulatory-related activities in safety and health. (See appendix for explanation of Federal/State agency coverage.)

Table 4. **Number, percent distribution, and experimental rate of fatal work injuries by selected characteristics, 1992**

Characteristics	Fatalities		Employment[1] (thousands)	Fatalities per 100,000 employed[2]
	Number	Percent		
Total	6,083	100	119,583	5
Employment status				
Wage and salary workers	4,876	80	108,802	4
Self-employed[3]	1,207	20	10,362	11
Sex and age				
Men	5,657	93	65,209	9
Women	426	7	53,955	1
Both sexes:				
Under 20 years	169	3	5,921	3
20 to 24 years	528	9	12,664	4
25 to 34 years	1,521	25	33,068	5
35 to 44 years	1,511	25	31,953	5
45 to 54 years	1,143	19	21,283	5
55 to 64 years	751	12	11,269	7
65 years and older	460	8	3,427	13
Race and Hispanic origin				
White	5,069	83	102,643	5
Black	608	10	12,252	5
Hispanic[4]	508	8	9,090	6
Asian or Pacific Islander	166	3	—	—
Other	240	4	—	—

[1] Employment is expressed as an annual average and is derived from the Current Population Survey, 1992. "Total" employment and "under 20 years" include an unpublished CPS estimate of workers 14–15 years of age (419,000), which is not included in the other employment categories. All employment categories include the military, based upon the CPS estimate for resident Armed Forces (1,566,000).

[2] The rate represents the number of fatal occupational injuries per 100,000 employed and was calculated as follows: (N/W) x 100,000, where N = number of fatal work injuries and W = employment. "N" was adjusted to maintain consistency with employment coverage (W) in the rate calculations. These rates are experimental. (See appendix.)

[3] Includes paid and unpaid family workers and may include owners of incorporated businesses, or members of partnerships.

[4] Persons identified as Hispanic may be of any race.

NOTE: Percentages and employment numbers may not add to totals because of rounding. Dashes indicate that data do not meet publication criteria.

SOURCE: Census of Fatal Occupational Injuries, Bureau of Labor Statistics in cooperation with Federal and State agencies, 1992.

Table 5. **Number, percent distribution, and experimental rate of fatal occupational injuries by occupation, 1992**

Occupation[1]	Fatalities		Employment[2] (thousands)	Fatalities per 100,000 employed[3]
	Number	Percent		
Total	6,083	100	119,583	5
Managerial and professional specialty	694	11	31,153	2
Executive, administrative, and managerial	437	7	14,767	3
Professional specialty	257	4	16,386	2
Technical, sales, and administrative support	814	13	36,808	2
Technicians and related support	199	3	4,253	5
Sales occupations	497	8	13,919	4
Administrative support occupations, including clerical	118	2	18,636	1
Service occupations	526	9	16,096	3
Protective service	273	4	2,096	13
Farming, forestry, and fishing	931	15	3,456	26
Farming occupations	680	11	3,287	20
Forestry and logging occupations	155	3	109	142
Precision production, craft, and repair	1,054	17	13,128	8
Mechanics and repairers	269	4	4,441	6
Construction trades	578	10	4,790	12
Supervisors	88	1	654	13
Carpenters	86	1	1,236	7
Electricians	83	1	663	13
Operators, fabricators, and laborers	1,882	31	16,957	11
Machine operators, assemblers, and inspectors	223	4	7,524	3
Transportation and material moving occupations	1,100	18	4,878	23
Motor vehicle operators	856	14	3,706	23
Truck drivers	685	11	2,694	25
Taxicab drivers and chauffeurs	106	2	214	50
Material moving equipment operators	163	3	1,009	16
Handlers, equipment cleaners, helpers, and laborers	559	9	4,556	12
Construction laborers	226	4	654	34
Other laborers	170	3	1,177	14
Military occupations (Resident Armed Forces)	[4]154	3	1,566	10

[1] Based on the 1990 Census of Population Occupational Classification System.

[2] Employment is expressed as an annual average and is derived from the Current Population Survey, 1992. "Total employment includes an unpublished CPS estimate of workers 14–15 years of age (419,000). The other categories include workers 16 years and older only.

[3] The rate represents the number of fatal occupational injuries per 100,000 employed and was calculated as follows: (N/W) x 100,000, where N = number of fatal work injuries and W = employment. "N" was adjusted to maintain consistency with employment coverage (W) in the rate calculations. These rates are experimental. (See appendix.)

[4] Includes 16 workers not reported as active duty military, but reported as working in a military occupation.

NOTE: Totals for major categories may include subcategories not shown separately. Percentages and employment numbers may not add to totals because of rounding. There were 28 fatalities for which there was insufficient information to determine an occupational classification.

SOURCE: Census of Fatal Occupational Injuries, Bureau of Labor Statistics in cooperation with Federal and State agencies, 1992.

State fatality profiles

California and Texas, two of the Nation's largest States, accounted for about one-sixth of the 6,083 fatal occupational injuries. Four States combined—Florida, New York, Pennsylvania, and Illinois—accounted for another one-sixth of the total. In contrast, half the States had fewer than 100 fatalities each. As mentioned earlier, participating State agencies are expected to release their individual State data later in 1993.

When comparing fatality rates among States, data users are cautioned to consider the States' industry mix. For example, a State with a large agricultural economy should not be compared with a State having a large manufacturing economy, as agriculture has one of the highest occupational fatality rates, and manufacturing has one of the lowest.

In addition, States participating in the first implementation year in 1991 have had an opportunity to develop their data collection methods beyond using the conventional sources: death certificates, workers' compensation reports, and Occupational Safety and Health Administration reports. Some States are now using up to 25 independent data sources to identify, substantiate, and code the circumstances of work-related fatalities. As States identify additional sources of occupational fatality information, their census counts may rise.

The number of fatalities and their characteristics, moreover, can markedly change from year to year, particularly for individual States. For example, the fire in the poultry processing plant in Hamlet, North Carolina was a tragic event that took the lives of 25 workers in 1991. This single event would affect the comparison of 1991 data with those of any other year at the State and national level in the poultry processing industry.

While comparisons of fatality counts and rates among States may be difficult to analyze, individual State data are useful for injury prevention. Individual States can use the census data to monitor and improve surveillance for occupational injury deaths, produce State publications on work-related fatalities, and provide educational information to workers for the purpose of promoting safety in the workplace.

Conclusion

It has been stated that "policy can be made without data but that better policy can be made with data."[13] Indeed, data are part of the solution for injury prevention.

Many safety experts regard fatal work injuries as sentinel events in that their occurrence indicates

Table 6. **Number, percent distribution, and experimental rate of fatal occupational injuries by industry, 1992**

SIC code[1]	Industry	Fatalities		Employment (thousands)[2]	Fatalities per 100,000 employed[3]
		Number	Percent		
	Total	6,083	100	119,583	5
	Private industry	5,384	89	99,493	5
01-02,07-09	**Agriculture, forestry, and fishing**	800	13	3,295	24
01	Agricultural production—crops	401	7	—	—
02	Agricultural production—livestock	164	3	—	—
07	Agricultural services	136	2	—	—
10-14	**Mining**	182	3	663	27
12	Coal mining	60	1	—	—
13	Oil and gas extraction	83	1	—	—
15-17	**Construction**	903	15	6,501	14
15	General building contractors	169	3	—	—
16	Heavy construction, except building	240	4	—	—
17	Special trades contractors	494	8	—	—
20-39	**Manufacturing**	751	12	19,841	4
20	Food and kindred products	93	2	—	—
24	Lumber and wood products	220	4	—	—
40-42,44-49	**Transportation and public utilities**	884	15	6,687	13
41	Local and interurban transit	124	2	—	—
42	Trucking and warehousing	443	7	—	—
45	Air transportation	93	2	—	—
49	Public utilities	86	1	—	—
50,51	**Wholesale trade**	244	4	4,757	5
52-59	**Retail trade**	710	12	19,490	4
54	Food stores	205	3	—	—
55	Auto dealers and gas stations	108	2	—	—
58	Eating and drinking places	187	3	—	—
60-67	**Finance, insurance, and real estate**	118	2	7,555	2
70-89	**Services**	725	12	30,704	2.2
73	Detective, guard, and other business services	200	3	—	—
75	Auto repair, services, and parking	73	1	—	—
91-97	**Government**[4]	699	11	19,671	4
	Federal	241	4	4,902	5
	State	112	2	4,769	2
	Local	338	6	9,996	3

[1] From *Standard Industrial Classification Manual*, 1987 edition.

[2] Employment is expressed as an annual average and is derived from the Current Population Survey, 1992. "Total" employment includes an unpublished CPS estimate of workers 14–15 years of age. The other categories include workers 16 years and older only.

[3] The rate represents the number of fatal occupational injuries per 100,000 employed and was calculated as follows: (N/W) x 100,000, where N = number of fatal work injuries and W = employment. "N" was adjusted to maintain consistency with employment coverage (W) in the rate calculations. These rates are experimental and were calculated only for division level industries. (See appendix.)

[4] Also includes fatalities to workers employed by governmental organizations in other SIC's.

NOTE: Totals for major categories may include subcategories not shown separately. Percentages and employment numbers may not add to totals because of rounding. There were 67 fatalities for which there was insufficient information to determine an industry classification. Dashes indicate that rates were not calculated for these industries.

SOURCE: Census of Fatal Occupational Injuries, Bureau of Labor Statistics in cooperation with Federal and State agencies, 1992.

a failure in preventive practices.[14] Unfortunately, the safety and heath community has lacked the basic information needed to assess the full scope of these tragic events.

The wealth of information compiled by the Census of Fatal Occupational Injuries will yield vital insights that may aid in preventing fatal on-the-job injuries. The national database will assist users in generating fatality profiles for specific industries and populations (for example, the self-employed or female workers) and in studying fatalities involving certain types of machinery (such as farm equipment) or events (for example, work activities at the time of contact with an electric current). These studies can help identify existing workplace standards that require revision and highlight areas where intervention strategies need to be developed. □

Footnotes

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[1] The BLS Survey of Occupational Injuries and Illnesses estimated that there were 2,900 work-related fatalities during 1990. For the same year, the National Safety Council estimated 10,500 work-related fatalities. The National Institute for Occupational Safety and Health's (NIOSH) National Traumatic Occupational Fatality program estimated 5,700 work-related deaths for 1989, the latest year for which data from that program are available.

Besides estimates of occupational fatalities, the BLS survey produces national estimates of nonfatal occupational injuries and illnesses from a sample of about 280,000 private sector establishments. Estimates of occupational fatalities derived from the survey data are lower than other estimates, due to the exclusion of various workers from survey coverage: the self-employed, public sector employees, and employees of private households. The estimates from the survey also exclude fatalities for workers in establishments with fewer than 11 employees. Deriving figures for occupational fatalities—a relatively rare event—from a sample survey is believed to play a part in the low figures. See *Occupational Injuries and Illnesses in the United States by Industry, 1990*, Bulletin 2399 (Bureau of Labor Statistics, April 1992).

National Safety Council estimates cover unintentional (homicides and suicides are excluded) injury-related deaths of persons in the civilian work force, 14 years and older, except for private household workers. See *Accident Facts: 1991 Edition* (National Safety Council, 1991).

The NIOSH estimates cover traumatic injuries (intentional and unintentional) of persons 16 years and older identified on the death certificate as occurring "at work." While death certificates cover all deaths occurring in the State, only those death certificates identifying a fatal injury as one that occurred "at work" are used to compile the number of fatal occupational injuries. Some fatal work injuries, particularly those resulting from motor vehicle accidents, may not be considered work related by persons completing the death certificate. See *National Traumatic Occupational Fatalities: 1980–1985* (National Institute for Occupational Safety and Health, March 1989).

State and Federal workers' compensation reports also fail to capture a census of fatal occupational injuries. The self-employed, employees of small farms, private households, and railroads as well as seasonal employees are generally excluded from workers' compensation coverage. See Nancy Stout and Catherine Bell, "Effectiveness of Source Documents for Identifying Fatal Occupational Injuries: A Synthesis of Studies," *American Journal of Public Health*, June 1991, pp. 725–28.

[2] See National Research Council, *Counting Injuries and Illnesses in the Workplace: Proposals for a Better System* (Washington, National Academy Press, 1987).

[3] See the Keystone Center's final report, "Keystone National Policy Dialogue on Work-Related Illness and Injury Recordkeeping," January 1989.

[4] See Guy A. Toscano, "The BLS Census of Fatal Occupational Injuries," *Compensation and Working Conditions*, June 1991, pp. 1-2.

[5] The study, which collected fatality data retrospectively for 1986, showed that (1) multiple data sources, including, at times, a followup questionnaire, are needed to produce a comprehensive and accurate count of fatal occupational injuries; (2) matching individual fatalities across data sources is feasible; (3) for each incident, characteristics of the worker and circumstances are commonly available from various administrative reports; and (4) timeliness is important in maximizing respondents' recall for verification purposes and in reducing the number of those who fail to respond because they have relocated. See Janice Windau and Donna Goodrich, "Testing a census approach to compiling data on fatal work injuries," *Monthly Labor Review*, December 1990, pp. 47–49.

[6] This study, which was conducted in cooperation with the Texas Workers' Compensation Commission and the Colorado Department of Health, was successfully concluded on May 1, 1991. The test also confirmed the importance of using multiple data sources, because no single system captures all fatal work injuries. See Guy Toscano and Janice Windau, "Further testing of a census approach to compiling data on fatal work injuries," *Monthly Labor Review*, October 1991, pp. 33–36.

[7] See "Fatal Workplace Injuries in 1991: A Collection of Data and Analysis," Report 845 (Bureau of Labor Statistics, April 1993).

[8] Work is defined as duties, activities, or tasks that produce a product or result; that are done in exchange for money, goods, services, profit, or benefit; and that are legal activities in the United States. Fatalities that occur while commuting to and from work are excluded from the counts in the Census of Fatal Occupational Injuries.

[9] A traumatic injury is any unintentional or intentional wound or damage to the body resulting from acute exposure to thermal, mechanical, electrical, chemical, or other form of energy or from the absence of such essentials as heat or oxygen caused by a specific event, incident, or series of events within a single workday or shift.

[10] A total of 1,361 fatal occupational illness cases were collected and coded in 1992. These cases were primarily heart attacks that occurred at work. For a more complete discussion of the difficulties involved in capturing information on occupational illnesses, both fatal and nonfatal, see Harvey J. Hilaski, "Understanding statistics on occupational illnesses," *Monthly Labor Review*, March 1981, pp. 25–29.

[11] The 1992 research database of the Census of Fatal Occupational Injuries containing both injury and illness data, will be available for public use in February 1994. For information on placing an order for the diskette, contact Cheong Underwood at (202) 606–7789.

[12] Mark Purschwitz and John Shutske, "Agricultural Injury Denominator Data." Paper presented at the American Society of Agricultural Engineers meeting, Spokane, Washington, June 1993.

[13] Garland Land, "Using Data to Influence Health Policy," Presentation at the 1993 AVHRS/VSCP annual meeting, San Antonio, Texas.

[14] Scott J. N. McNabb, Centers for Disease Control and Prevention, presentation at the CFOI national conference, Washington, D.C., September 9, 1992.

APPENDIX: Measurement techniques and limitations

Identification and verification of work-related fatalities. Because some State laws and regulations prohibit enumerators from contacting the next-of-kin, it was not possible to independently verify work-relationship (whether a fatality is work related) for 381 fatal work injuries in 1992; however, the information on the initiating source document for these cases was sufficient to determine the circumstances of the incident. Data for these fatalities, which primarily affected self-employed workers, are included in the Census of Fatal Occupational Injuries counts. An additional 73 fatalities submitted by States were not included because the initiating source document had insufficient information to determine work relationship, which could not be verified by either an independent source document or a followup questionnaire. These fatalities were primarily identified in motor vehicle accident reports and by death certificates. Traffic accident reports usually cannot be used to verify work relationship because they do not contain information on the purpose of the travel; for example, driving to a business meeting, running an errand for a business, commuting to work, or running a personal errand. Death certificates provide the medical cause of death, for example, died of "embolism due to broken leg" but sometimes do not contain information on how the accident occurred or simply state "personal activity." These cases would require substantiation of work relationship before being included in the census.

Fatalities occurring on farms are also difficult to verify. The analyst must differentiate between fatalities that are work related from fatalities that are merely associated with rural lifestyles, such as hunting or fishing on farm property for pleasure. Personal recreational activities are generally excluded from the census counts unless the activity is required by the employer as a condition of employment.

As the census collecting methods improve, fatal work injury counts may increase. States will, no doubt, find additional sources of information for these fatalities beyond the conventional sources used: death certificates marked "at work," workers' compensation reports, and Occupational Safety and Health Administration (OSHA) reports.

Experimental fatality rates. A fatal work injury incidence rate represents the number of persons in a worker group who sustain a fatal work injury divided by the total number at risk per unit of time. There are different ways of calculating fatality rates to measure the incidence of a fatal work injury for groups of workers. An hours-based rate would measure the fatality risk per standardized length of exposure; an employment-based rate, by contrast, measures the fatality risk for those employed during a given period of time. Thus, a fatality rate can be produced for a group of workers, for example, by hours of exposure or for those employed during a given day, week, month, or year. Each type of rate has a different purpose. An employment-based fatality rate measures the incidence of a fatal injury for all workers in the group regardless of exposure time. It does not account for the fact that part-time workers may incur fewer fatalities than full-time workers because of their reduced hours exposed to the work environment. An hours-based fatality rate does account for the different exposure duration among workers. Hours-based measurements are especially useful in industry and occupational comparisons, in which the number of workers at risk can vary greatly among industry or occupational groups for the given period.

Fatality counts from the Census of Fatal Occupational Injuries can be combined with information on employment or hours at work to produce a fatal work injury rate. Because neither hours at work nor number of persons employed are collected in the BLS census, the fatality rates in the tables were calculated using the employment estimates from the Current Population Survey (CPS)—a household survey conducted for the Bureau of Labor Statistics by the Bureau of the Census. The CPS annual average employment estimates are based on the number of workers employed during the week of the 12th each month.

The fatality rates in the tables relate the total number of workplace deaths in 1992 to the annual average number of workers facing that risk. These measurements are developmental and do not reflect the movement of persons into and out of the labor force, the length of their work week or work year, or the effect of multiple jobholders. BLS will continue its research on fatality rates by exposure hours as well as by various employment series.

The census rates presented in the tables are calculated as follows:

(N/W) x 100,000, where

N = the number of fatally injured workers in a particular group, for example, in the construction industry; and

W = the annual average number of workers employed in that group. Annual average employment data from the 1992 CPS were used for W.

The ratio N/W is multiplied by 100,000 so that the rate can be expressed as a whole number and represents the number of fatal work injuries per 100,000 workers.

Because the total CPS employment estimates exclude workers under 14 and the detailed CPS employment estimates exclude workers under 16, adjustments were made to the fatality counts so that the numerator and denominator represent the same group of workers. The following fatalities were subtracted from the census counts in preparing the numerator used in the rate calculations:

— total fatality rate: 14 fatalities of workers under 14 years old, and

— all other rates: 27 fatalities of workers under 16 years old.

As an example, a total of 800 work injury fatalities occurred in agriculture, forestry, and fishing; 16 of them occurred among persons under the age of 16. These 16 fatalities were excluded from the numerator in the fatality rate calculation to keep the numerator and the denominator consistent. The 1992 CPS estimated annual average employment for workers 16 or older in agriculture, forestry, and fishing is 3,295,000. Thus:

N = number of fatalities (16 years and older) = 800 – 16 = 784;

W = number of workers (16 years and older) = 3,295,000;

(N/W) x 100,000 =784/3,295,000 x 100,000 = 24 fatalities per 100,000 agricultural workers.

Note that the "number" and "percent" columns in the text tables include all fatalities for that characteristic, regardless of the age of the decedent. Adjustments were made only to the number of fatalities used to calculate the fatality rates.

The CPS employment data used to calculate rates are estimates that are based upon a sample of persons employed rather than a complete count. Therefore, the employment estimates and the fatality rates have sampling errors; that is, they may differ from figures that would have been obtained if it had been possible to take a complete census of employed persons. See Explanatory Notes on Household Data in the January 1992 issue of the BLS publication *Employment and Earnings* for an explanation of CPS sampling and estimation procedures and standard error tables. Because the relative sampling error of a fatality rate is approximately equal to the relative sampling error of the CPS employment used in the calculation of the rate, the sampling error tables can be used for constructing confidence intervals for both the CPS employment and the fatality rates.

Federal/State agency coverage. Several Federal and State agencies have jurisdiction over workplace safety and health. OSHA and affiliated agencies in States with approved safety programs probably cover the largest portion of America's workers. However, accidents occurring in several industries, such as coal, metal and nonmetal mining and transportation on water, rails or in the air, are excluded from OSHA coverage because they are covered by other Federal agencies, such as the Mine Safety and Health Administration, the U.S. Coast Guard, the Federal Railroad Administration, and the Federal Aviation Administration. Fatalities occurring in industries regulated by Federal agencies other than OSHA accounted for about 11 percent of the fatal work injuries for 1992.

Fatalities occurring among several other groups of workers are generally not covered by any Federal or State agencies. These groups include self-employed and unpaid family workers, who accounted for about 20 percent of the fatalities; laborers on small farms, accounting for about 5 percent of the fatalities; and State and local government employees in States without OSHA-approved safety programs, about 4 percent. (About one-half of the States have approved OSHA safety programs which include State and local government employees in their coverage.)

The Census of Fatal Occupational Injuries includes data for all fatal work injuries, whether they are covered by OSHA or other Federal or State agencies, or are outside the scope of regulatory coverage. Thus, any comparison between census counts and those released by other agencies must carefully evaluate the coverage and definitions being used.