

# Chapter 9. Occupational Safety and Health Statistics

Data on safety and health conditions for workers on the job have been produced by the Bureau of Labor Statistics (BLS) since before World War I. The first report issued by BLS summarized industrial accidents in the iron and steel industries during the war period, presenting information on the frequency and severity of injuries, the occupation of the injured workers, and the nature of their injuries.<sup>1</sup> Work-related illnesses also were the subject of BLS studies conducted in the early 1900s, such as the pioneering research on lead poisoning in the workplace by Dr. Alice Hamilton.<sup>2</sup>

It was not, however, until the passage of the Occupational Safety and Health Act of 1970 that the Bureau was delegated responsibility for developing a comprehensive statistical system covering work-related deaths, injuries, and illnesses in private industry. In 1972, the Bureau, in cooperation with many State governments, designed an annual survey to estimate the number and frequency of work-related injuries and illnesses by detailed industry for the Nation and for States participating in the survey. This survey information continues to be of value to the safety community in allocating prevention resources among several hundred industries, across which workers' risks of injury and illness vary widely.

As originally designed, however, the survey had its shortcomings. Although it pinpointed dangerous work settings, the survey shed little light on the injury or illness characteristics of the incidents, for example, the manner in which they occurred and what occupations were involved.<sup>3</sup> The survey also failed to produce a comprehensive count of workers dying on the job or profiles depicting the victims' demographics and the circumstances surrounding their deaths.

In 1987, a National Academy of Sciences study recommended that these deficiencies be corrected by collecting detailed data on severe, nonfatal occupational injuries reported in the survey and by compiling complete rosters of

<sup>1</sup> *The Safety Movement in the Iron and Steel Industry*, Bulletin 234 (Bureau of Labor Statistics, 1918).

<sup>2</sup> *The White-Lead Industry in the United States*, Bulletin 95 (Bureau of Labor, 1911).

<sup>3</sup> Between the mid-1970s and early 1990s, a limited amount of data on worker and case characteristics was aggregated for selected States participating in the Supplementary Data System and Work Injury Reports. For a description of those programs, see *BLS Handbook of Methods*, Bulletin 2414 (Bureau of Labor Statistics, 1992), chapter 14.

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occupational fatalities from administrative records, such as death certificates and workers' compensation reports.<sup>4</sup> This critical review of the survey, which spotlighted longstanding deficiencies, provided the impetus for its redesign.

With congressional funding, technical support from the safety and health community, and assistance from some 40 participating States, the Bureau began a multi-year effort to redesign and test an improved safety and health statistical system, which was fully implemented in 1992. Beginning with that year, survey information on nonfatal incidents involving days away from work has been expanded to profile (1) the occupation and other demographics (age and gender, for example) of workers sustaining such inju-

<sup>4</sup> See E.S. Pollack and D.F. Keimig, eds., *Counting Injuries and Illnesses in the Workplace: Proposals for a Better System* (Washington, National Research Council, National Academy Press, 1987), pp. 103-06.

ries and illnesses, (2) the nature of these disabling conditions and how they occurred, and (3) the resulting time away from work. In addition, work-related fatalities are counted and profiled more accurately in a separate national BLS Census of Fatal Occupational Injuries. In 1995, the latest year for which data are available, the survey profiled about 3 million disabling incidents involving lost worktime in the private sector and the BLS census reported on about 6,200 fatal work injuries in the private and public sectors.

## Part I. Survey of Occupational Injuries and Illnesses

### Background

The current BLS survey of occupational injuries and illnesses evolved from annual BLS surveys first conducted in the 1940s, when injury recordkeeping standards became sufficiently uniform to permit the collection of nationwide work injury data. Spanning three decades, those nationwide surveys proved useful in measuring and monitoring injury frequency and severity, but they had two major limits. First, the survey data were compiled from and represented only employers who *volunteered* to record and report work injuries. Second, work injuries were limited to those resulting in death, permanent impairment, or temporary disability, defined as unable to perform regular job duties beyond the day of injury. Thus, survey estimates excluded, by definition, numerous cases that required medical treatment (beyond first aid) or restricted work duties but not lost worktime.

These and other limitations were addressed in a landmark piece of safety legislation passed by the Congress: The Occupational Safety and Health Act of 1970. The 1970 act and its implementing regulations require that most private industry employers regularly maintain records (logs) and prepare reports on work-related injuries and illnesses, which include all disabling, serious, or significant injuries and illnesses, whether or not involving time away from work.<sup>5</sup>

Clearly, the 1970 act called for a wider statistical net to gather work injury and illness data and to measure their numbers and incidence rates. The current survey, with minor modifications, still meets the basic requirements of the 1970 act for counts and rates covering a broad spectrum of work injuries and illnesses in various work settings. Beginning with calendar 1992, moreover, the survey collects information on the characteristics of the most serious of its nonfatal cases—those involving lost worktime—and the traits of workers sustaining such injuries and illnesses.

### Survey Definitions

The following definitions of nonfatal occupational injuries and illnesses used in the annual survey are the same as

<sup>5</sup> See section 24(a) of the Occupational Safety and Health Act of 1970 (Public Law 91-596).

those used by employers to keep logs of such incidents throughout the survey (calendar) year. (See technical references for citations of instructional materials useful in understanding the types of cases recorded under current recordkeeping guidelines.)

*Nonfatal recordable injuries and illnesses are:* 1. Nonfatal occupational illnesses; or 2. Nonfatal occupational injuries which involve one or more of the following: Lost worktime, loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment other than first aid.

*Occupational injury* is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work-related event or from a single instantaneous exposure in the work environment.

*Occupational illness* is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that are used to classify recordable illnesses. Examples of each category are given. These are typical examples and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

*Occupational skin diseases or disorders.* Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflammations.

*Dust diseases of the lungs (pneumoconioses).* Examples: Silicosis, asbestosis and other asbestos-related diseases, coal worker's pneumoconiosis, byssinosis, siderosis, and other pneumoconioses.

*Respiratory conditions due to toxic agents.* Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung.

*Poisoning (systemic effects of toxic materials).* Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion and lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins.

*Disorders due to physical agents (other than toxic materials).* Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of ionizing radiation (isotopes, x rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn).

*Disorders associated with repeated trauma.* Examples: Conditions due to repeated motion, vibration, or pressure,

such as carpal tunnel syndrome; noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; and Raynaud's phenomena.

*All other occupational illnesses.* Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis.

*Lost workday cases* are those which involve days away from work, or days of restricted work activity, or both.

*Lost workday cases involving days away from work* are those which result in days away from work (not counting the day of injury or onset of illness), or a combination of days away from work and days of restricted work activity.

*Lost workday cases involving restricted work activity* are those which result *only* in restricted work activity, defined as follows:

- The employee was assigned to another job on a temporary basis; or
- The employee worked at a permanent job less than full time; or
- The employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The following case characteristics are used in the survey to profile injuries and illnesses involving days away from work from four different perspectives. The characteristics are based on definitions and rules of selection stipulated in the 1992 *BLS Occupational Injury and Illness Classification Manual*, cited among technical references at the end of this chapter.

*Nature of injury or illness* names the principal physical characteristic of a disabling condition, such as sprain/strain, cut/laceration, or carpal tunnel syndrome.

*Part of body affected* is directly linked to the nature of injury or illness cited, for example, back sprain, finger cut, or wrist and carpal tunnel syndrome.

*Source of injury or illness* is the object, substance, exposure, or bodily motion that directly produced or inflicted the disabling condition cited. Examples are a heavy box, a toxic substance, fire/flame, and bodily motion of the injured/ill worker.

*Event or exposure* signifies the manner in which the injury or illness was produced or inflicted, for example, overexertion while lifting or fall from ladder.

The *occupation* of the injured or ill worker was coded from job titles supplied by the employer, supplemented at times by employer descriptions of how the incident occurred. The 1990 Occupational Classification System, developed by the Bureau of the Census, was used to classify thousands of job titles supplied by employers into several hundred individual occupations, such as registered nurse, licensed practical nurse, or nursing aide/orderly. Each occupation is tied to 1 of 6 *major occupational groups*, for example, registered nurse belongs to the major group "managerial and professional specialty," licensed practi-

cal nurse, to the group "technical, sales, and administrative support," and nursing aide, to the group "service occupations." The other three major groups were "farming, forestry, and fishing," "precision production, craft, and repair," which includes construction trades; and "operators, fabricators, and laborers," such as textile sewing-machine operator, truckdriver, and stock handler/bagger.

## Survey Measures

The number of injuries and illnesses are reported nationwide and by industry for three basic types of cases:

- Lost workday cases,
- Days-away-from-work cases, and
- Nonfatal cases without lost workdays.

(Days-away-from-work cases, which may also involve restricted workdays, are a subset of lost workday cases, which include days-away-from-work cases and cases involving restricted work activity only.) For cases involving days away from work, the survey presents numeric and percent distributions by occupation and by the worker traits and four case characteristics defined in the preceding section. In addition, the survey includes two measures of severity for lost worktime cases: Median number of workdays lost and a percent distribution of days-away-from-work cases by their duration. The latter measures are presented nationwide, by industry, and for the aforementioned worker and case characteristics.

In addition to injury and illness counts, the survey also reports on the frequency (incidence rate) of such cases. Incidence rates permit comparison among industries and establishments of varying sizes. They express various measures of injuries and illnesses in terms of a constant, i.e., exposure hours in the work environment (for example, 200,000 employee hours or the equivalent of 100 full-time employees working for 1 year), thus allowing for a common statistical base across industries regardless of employment size of establishments. In this way, a firm with 5 cases recorded for 70 employees can compare its injury and illness experience to that of an entire industry with 12,000 cases for 150,000 employees. (The method of calculating incidence rates is discussed in a later section.)

Rates also are useful in evaluating the safety performance of a particular industry over time or in comparing State-to-State variations in an industry's safety record. Such comparisons are possible using the total case rate or the rate for lost workday cases, days-away from-work cases, or nonfatal cases that do not involve lost workdays. These measures are available for injuries only and for injuries and illnesses combined. For illnesses, rates are available for total cases and separately for the seven illness categories defined in the preceding section. Rates for days-away-from-work injuries and illnesses also are available for the various categories of the four case characteristics studied, for example, the incidence rates associated with carpal tun-

nel syndrome, back cases, injuries inflicted by health care patients, or disabling falls to a lower level.

## Scope of the Survey

The survey sample selected by BLS consists of approximately 250,000 units in private industry. Survey data are solicited from employers having 11 employees or more in agricultural production, and from all employers in agricultural services, forestry, and fishing; oil and gas extraction; construction; manufacturing; transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and services (except private households). Data for employees covered by other Federal safety and health legislation are provided by the Mine Safety and Health Administration of the U.S. Department of Labor and the Federal Railroad Administration of the U.S. Department of Transportation. Although State and local government agencies are not surveyed for national estimates, several States have legislation which enables them to collect these data. (Self-employed persons are not considered to be employees under the 1970 act.)

## State Participation

Federal grants covering a portion of the operating cost permit States to develop estimates of occupational injuries and illnesses and to provide the data from which BLS produces national results. National data for selected States which do not have operational grants are collected directly by BLS. The participating State agencies collect and process the data and prepare estimates using standardized procedures established by BLS to insure uniformity and consistency among the States. To further insure comparability and reliability, BLS designs and identifies the survey sample for each State and, through its regional offices, validates the survey results, and provides technical assistance to the State agencies on a continuing basis.

## Data Collection

State agencies mail report forms to selected employers in February to cover the previous calendar year's experience. For those States not participating in the program, reporting forms are mailed by BLS. Each employer completes a single report form which is used for both national and State estimates of occupational injuries and illnesses. This procedure eliminates duplicate reporting by respondents and, together with the use of identical survey techniques at the national and State levels, insures maximum comparability of estimates. (A copy of the reporting form and instructions is included at the end of the chapter.)

Summary information on the number of injuries and illnesses by type of case is copied directly from employer logs and entered in part 1 of the form. Part 1 also contains questions about the number of employee hours worked (needed in the calculation of incidence rates), the report-

ing unit's principal products or activity, and average employment to insure that the establishment is classified in the correct industry and employment-size class. Part 2 of the form requests detailed information on the worker and the injury or illness incident that resulted in the employee being away from work. State agency and BLS personnel edit the summary data (part 1) and code the characteristics of cases with days away from work (part 2), verifying apparent inconsistencies through phone calls, correspondence, or visits. The data are keypunched and mechanically edited. Reports which do not meet the computer screening criteria or senior staff review are verified with the employer.

By early fall, the active collection phase of the survey is completed and the preparation of data for both national and State estimates of occupational injuries and illnesses begins. Priority goes to processing the summary information on injury and illness counts by type of case, so that initial estimates of those data can be issued in mid-December. Coding and related processing of the characteristics of days-away-from-work cases continues through the following February, with initial estimates of injury and illness characteristics published in late April-early May.

## Sample Design

A two-stage selection process is applied to generate the survey estimates. The first stage is the sample selection of establishments (sample units). The second stage is the selection of the sample cases involving days away from work. These are derived from the establishments selected.

Because the survey is a Federal-State cooperative program and the data must meet the needs of participating State agencies, an independent sample is selected for each State. The sample is selected to represent all private industries in the States and territories. The sample size for the survey is dependent upon (1) the characteristics for which estimates are needed, (2) the industries for which estimates are desired, (3) the characteristics of the population being sampled, (4) the target reliability of the estimates, and (5) the survey design employed.

For the establishment selection process, the total number of lost workday cases is used as the base for the sample design. While there are many characteristics upon which the sample design could be based, lost workday cases is considered the most important.

The important features of the sample design employed are its use of stratified random sampling with a Neyman allocation and a ratio estimator. The characteristics used to stratify establishments are the State, the Standard Industrial Classification (SIC) code, and the employment size class. Because these characteristics are highly correlated with an establishment's number and rate of recorded injuries and illnesses, stratified sampling provides greater precision and, thus, results in a smaller sample size than simple random sampling. The Neyman allocation produces the minimum sample size which will provide an estimate with a fixed sampling variance. For the largest employment size



classes, the allocation procedure places all of the establishments of the frame in the sample; as employment decreases, smaller and smaller proportions of establishments are included in the sample. The certainty strata are usually the size groups with 100 employees or more. The precision of the sample is further improved, hence permitting a reduction in sample size, by using the ratio estimator which in turn uses employment data that are correlated with the characteristics which are to be measured.

The national sample is designed to produce data at the 2-digit SIC industry level in agriculture, forestry, and fishing; at the 3-digit level in oil and gas extraction; construction; transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; and services; and at the 4-digit level in manufacturing. States publish industry data at less detailed levels. Beginning with data for 1989, the *Standard Industrial Classification Manual*, 1987 edition, was used to classify industries.

The selection of the cases involving days away from work varies by sampled establishment. For each sample unit, an expected number of cases involving days away from work is calculated based on the industry and size class in which that establishment resides. If the expected number of cases is greater than 20, the establishment is requested to provide demographic traits, detailed case characteristics information, and the number of workdays missed for injuries and illnesses occurring at specified time intervals (e.g., certain days of the month or certain months). For those establishments with an expected case load less than or equal to 20, the employer is requested to provide case information for all cases involving days away from work occurring in the survey year. Either way, employers are permitted to attach supplementary forms they already have in hand that answer questions about individual days-away-from-work cases.

## Estimation Procedures

### Weighting

*Sample units.* By means of a weighting procedure, sample units are constructed to represent all units in their size class for a particular industry. The weight is determined by the inverse of the sampling ratio for the industry/employment-size class from which the unit was selected. Because a small proportion of survey forms are not returned, weights of responding employers in a sampling cell are adjusted to account for nonrespondents. The respondents are then shifted into the estimating cell determined by the reported employment. Data for each unit are multiplied by the appropriate weight and nonresponse adjustment factor. The products are then aggregated to obtain a total for the estimating cell.

*Lost worktime cases.* Each case involving days away from work is weighted by the sample unit weight with which it is associated and the industry benchmark (see below) in

which the associated sample unit resides. In addition, each case is weighted to adjust for case subsampling and case nonresponse for those establishments which did not provide information on all cases with days away from work which occurred in their establishment in the survey year.

### Benchmarking

Because the universe file which provides the sample frame is not current to the reference year of the survey, it is necessary to adjust the data before publication to reflect current employment levels. This procedure is known as benchmarking. In the annual survey, all estimates of totals are adjusted by the benchmark factor at the estimating cell level. The benchmarking procedure requires a source of accurate employment data which can be converted into annual average employment figures for the cell level in which separate estimates are desired. Because industry/employment-size data are required for national estimates, benchmark factors are applied to the size class “blow up” estimates.

### Incidence rate calculation

Incidence rates are calculated using the total obtained through the weighting and benchmarking procedures. The adjusted estimates for a particular characteristic, for example injury and illness cases involving days away from work, are aggregated to the appropriate level of industry detail. The total is multiplied by 200,000 (the base of hours worked by 100 full-time employees for 1 year). The product is then divided by the weighted and benchmarked estimate of hours worked as reported in the survey for the industry segment.

The formula for calculating the incidence rate at the lowest level of industry detail is:

$$\text{Incidence rate} = \frac{(\text{Sum of characteristic reported}) \times 200,000}{\text{Sum of the number of hours worked}}$$

Incidence rates for higher levels of industry detail are produced using aggregated weighted and benchmarked totals. Rates may be computed by industry, employment size, geographic area, extent or outcome of case, and case characteristic category. Rates for illnesses and rates for case characteristic categories are published per 10,000 full-time employees, using 20,000,000 hours instead of 200,000 hours in the formula shown above. Rates per 10,000 workers can be converted to rates per 100 workers by moving the decimal point left two places and rounding the resulting rate to the nearest tenth.

## Reliability of Estimates

All estimates derived from a sample survey are subject to sampling and nonsampling errors. Sampling errors occur because observations are made on a sample, not on the entire population. Estimates based on the different possible samples of the same size and sample design could

differ. The relative standard errors, which are a measure of the sampling error in the estimates, are calculated as part of the survey's estimation process. Both the estimates and the relative standard errors of the estimates (or statistical models for approximating those relating to worker and case characteristics) are published in appendix A to the annual BLS bulletin, *Occupational Injuries and Illnesses: Counts, Rates, and Characteristics*.

Nonsampling errors in the estimates can be attributed to many sources, e.g., inability to obtain information about all cases in the sample, mistakes in recording or coding the data, definitional difficulties, and so forth. Although not measured, nonsampling errors will always occur when statistics are gathered. To minimize the nonsampling errors in the estimates, the completed forms are edited and apparent inconsistencies are checked with the employer, who is encouraged to respond fully and accurately to all survey elements. A small fraction of the sample does not submit usable data. To account for this missing information, nonresponse adjustment factors are applied at the appropriate industry and size class level.

## Publication Guidelines

The estimating procedure generates occupational injury and illness estimates for approximately 900 SIC codes. Industry estimates are *not published* if one of the following situations occurs.

1. Estimates for the industry are based on reports from fewer than three companies or the industry had fewer than 6 employees. Or, if three or more companies report data for the industry, one firm employs more than 60 percent of the workers.
2. Average employment for the industry was fewer than 10,000 in the survey year. However, data for an industry with an annual average employment of less than 10,000 are publishable if the majority of the employment was reported in the survey.
3. The relative standard error on total lost workday cases for the industry exceeds a specified limit.
4. Benchmark factor for the industry is less than 0.90 or greater than 1.49.
5. Publication might disclose confidential information.

Data for an unpublished industry are included in the total for the broader industry level of which it is a part. Also, selected items of data are suppressed for publishable industries if the sampling error for the estimate exceeds a specified limit, typically 60 percent at a national level.

For the case characteristics and demographic data, items of data are suppressed at a national level if one of the following situations occurred:

1. The number of cases is fewer than five.
2. The number of cases is greater than 5 and less than or equal to 20 and the sampling error for the estimate is greater than 60 percent.
3. The number of cases is greater than 20 and the

sampling error is greater than 40 percent.

## Presentation

Each year, BLS publishes a comprehensive bulletin covering national results. Selected national data also are published in two news releases (one on counts and rates and the other on injury and illness characteristics), a detailed industry summary on counts and rates, and periodically in articles published in two BLS journals—*Monthly Labor Review* and *Compensation and Working Conditions*. The data are also available on BLS data diskettes and on the Internet. The data are published in private safety and trade journals and in the President's *Annual Report on Occupational Safety and Health to the U.S. Congress*. In addition, State data through 1987 are available on microfiche from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. A list of States (including telephone numbers) which can provide more current State data, is available from the Bureau's Office of Safety, Health and Working Conditions at (202) 691-6175.

## Uses and Limitations

National and State policymakers use the survey as an indicator of the magnitude of occupational safety and health problems. The Occupational Safety and Health Administration uses the statistics to help determine which industries clearly need to improve safety programs and to measure the effectiveness of the 1970 act in reducing work-related injuries and illnesses.

Both labor and management use the estimates in evaluating safety programs. Other users include insurance carriers involved in workers' compensation, industrial hygienists, manufacturers of safety equipment, researchers, and others concerned with job safety and health.

Many factors can influence counts and rates of injuries and illnesses in a given year. These include not only the year's injury and illness experience but also the employer's understanding of which cases are work related under current recordkeeping guidelines of the U.S. Department of Labor. The number of injuries and illnesses reported in a given year also can be affected by changes in the level of economic activity, working conditions and work practices, worker experience and training, and the number of hours worked.

Each year, the survey measures the number of new work-related illness cases which are recognized, diagnosed, and reported. But some conditions, for example, long-term latent illnesses caused by exposure to carcinogens, often are difficult to relate to the workplace and are not adequately recognized and reported. These long-term latent illnesses are believed to be understated in the survey. In contrast, the overwhelming majority of the reported new illnesses are those which are easier to directly relate to workplace activity (e.g., contact dermatitis or carpal tunnel syndrome).

## Part II. Census of Fatal Occupational Injuries

No program of injury statistics would be complete without a comprehensive count of work-related deaths and descriptive data on their circumstances. Beginning with 1992, the Census of Fatal Occupational Injuries (CFOI) of the Bureau of Labor Statistics collects and publishes such information annually. The CFOI counts are especially accurate because the BLS census culls multiple data sources (e.g., death certificates, State workers' compensation records, news media) to try to identify all fatal work injuries that are work related. Complete and credible counts of fatal work injuries and how they occurred enable the safety and health community to identify and track specific life-threatening hazards, such as work-related homicides in retail stores and construction workers struck and fatally injured by highway vehicles and equipment. In 1994-95, several groups of safety experts, including the National Safety Council and the National Center for Health Statistics, have endorsed the BLS Census of Fatal Occupational Injuries as the official count of work-related fatalities, in preference to other, less comprehensive measures.

### Background

Since 1992, data from the Census of Fatal Occupational Injuries supplants the limited kinds of information on fatalities that had been available since 1972 from the BLS Survey of Occupational Injuries and Illnesses. The BLS fatality census covers not only private wage and salary workers in the BLS survey but also workers on small farms, the self-employed and family workers, and public sector workers not covered by the survey. Unlike BLS census data, the survey's fatality estimates covered only establishments with more than 10 employees and, for purposes of statistical reliability, were combined into a 2-year average before a distribution of fatalities by the associated event or exposure could be published.

The seeds for the BLS census were sown by the National Academy of Sciences and other safety and health organizations in the late 1980s, when they recommended obtaining complete counts and detailed characteristics on fatal workplace injuries on a timely basis so that policymakers could develop and implement safety initiatives more effectively. Some of those expert recommendations mentioned using multiple data sources such as death certificates and workers' compensation reports to identify and profile fatal work injuries for *all* workers. More specifically, the Keystone Dialogue Group recommended the development of a consensus method for counting work-related fatalities,<sup>6</sup> stating that the "development of an ac-

<sup>6</sup> See the Keystone Center's final report, "Keystone National Policy Dialogue on Work-Related Illness and Injury Recordkeeping," (Keystone, CO, January 1989). For an account of various attempts to count fatalities at work, see Dino Drudi, "The evolution of occupational fatality statistics in the United States," *Compensation and Working Conditions*, July 1995, pp. 1-5.

cepted count of workplace deaths should mute controversy on this issue stemming from the variety of estimates coming from different sources." In this regard, fatality estimates made by different organizations at that time varied greatly from 3,000 to 11,000 deaths nationally per year.<sup>7</sup>

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. That study, which collected fatality data retrospectively for 1986, highlighted the need for multiple data sources and the feasibility of matching fatalities and their characteristic data across those sources.<sup>8</sup> During 1990 this approach was tested again in Texas and Colorado, with results confirming that the same kind of data could be obtained from multiple data sources on a current basis.<sup>9</sup> In 1991, the Census of Fatal Occupational Injuries was initially implemented in 32 States and New York City. And in 1992 the census was expanded to cover all 50 States and the District of Columbia.

### Census Definitions

For a fatality to be included in CFOI, the decedent must have been employed (that is, working for pay, compensation, or profit) at the time of the event, engaged in a legal work activity, and present at the site of the incident as a job requirement. These criteria are generally broader than those used by Federal and State agencies administering specific laws and regulations. Fatalities that occur during a person's commute to or from work are excluded from the census counts.

An occupational injury is any intentional or unintentional wound or damage to the body resulting from acute exposure to energy, such as heat or electricity; from the resultant kinetic energy of a crash; 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. Included are open wounds, intracranial and internal injuries, heatstroke, hypothermia, asphyxiation, acute poisoning resulting from a short-term exposure limited to the worker's shift, suicides and homicides, and work injuries listed as underlying or contributory causes of death. 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 ill-

<sup>7</sup> See BLS Survey of Occupational Injuries and Illnesses(1972-91); the National Safety Council *Accidents Facts*; and the National Institute for Occupational Safety and Health's National Traumatic Occupational Fatality Study A *Decade of Surveillance, 1980-1989*.

<sup>8</sup> 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. The study also found that, for verification purposes, timeliness is important in maximizing respondents' recall and in reducing the number of those failing to respond because they have relocated.

<sup>9</sup> 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.

ness-related deaths is excluded from the basic fatality count.

Over 20 data elements are collected, coded, and tabulated in the BLS fatality census, including information about the worker and the circumstances surrounding the fatal incident. Following is a list of the elements collected:

- Age
- Continent of foreign birth
- Employee status (wage and salary, self-employed, family business)
- Establishment employment size
- Event or exposure
- Gender
- Geographic code
- Hispanic origin
- Industry of employer (1987 SIC codes)
- Length of time with employer
- Location type (farm, street, warehouse, etc.)
- Narrative of how incident occurred
- Nature of injury
- Occupation (1990 Census Bureau codes)
- Ownership (private sector or state, local, or Federal Government)
- Part of body affected by fatal injury
- Race
- Source of injury
- Time of incident (month, day of week, time of day)
- Usual lifetime occupation/industry
- Worker activity (e.g., driving, tending a store)
- Year of death

### 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. Each year, States are responsible for data collection, followup, and coding on a timely basis. For the 1995 BLS fatality census, for example, States processed and submitted information on all 1995 fatalities they identified by July 1, 1996. Data elements are coded according to standard CFOI instructions.

States obtain information on fatal work injuries from death certificates marked injury at work, 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, State agencies collect about 20,000 individual source documents each year or about an average of three documents from different sources for each fatality case. To avoid duplication of fatalities in the counts, source documents are matched using the decedent's name and other information.

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.

### Census Measures

The BLS census provides numeric and percent distributions of its fatality totals for worker and case characteristics. Frequencies indicate the magnitude of a particular problem, or the number of injuries of that type that could be prevented. Following is a percent distribution of the 6,588 workers who were fatally injured in 1994 by selected traits of the deceased and by major fatal event or exposure categories:

Percent of fatality total .....	100
<i>Employee status:</i>	
Wage or salary worker .....	81
Self-employed or family worker .....	19
<i>Sex:</i>	
Men .....	92
Women .....	8
<i>Age:</i>	
Under 25 years .....	11
25 to 54 years .....	68
55 years and over .....	21
<i>Race and Hispanic origin:</i>	
White .....	82
Black .....	11
Other or unspecified .....	7
Hispanic (any race) .....	9
<i>Event or exposure:</i>	
Transportation incident .....	42
Highway incident .....	20
Assaults and violent acts .....	20
Homicide .....	16
Contact with object or equipment .....	15
Struck by object .....	9
Fall .....	10
Fall to lower level .....	9
Exposure to harmful substance or environment .....	10
Contact with electric current .....	5
Fire, explosion .....	3

Fatality counts from the BLS census are combined with annual average employment from the Current Population Survey (CPS) to produce a fatal work injury rate.<sup>10</sup> Fatality

<sup>10</sup> Because neither hours nor employment are collected in the BLS census, fatality rates are calculated using annual average employment estimates from the Current Population Survey, conducted for BLS by the Census Bureau. Employment-based fatality rates measure the incidence of a



rates depict the risk of incurring a deadly injury faced by all or a subgroup of workers, such as workers in a certain occupation or industry. The formula for calculating a fatality rate is:

$$(N/W) \times 100,000,$$

where:

N = the number of fatally injured workers, 16 years and older; and

W = the number of employed workers, 16 years and older.

In computing the 1994 national fatality rate, for example:

N = 6,588 - 25 workers under age 16 = 6,563 (from 1994 CFOI); and

W = 124,469,000 (from CPS, 1994 annual averages, plus resident military figures derived from Census Bureau data).

Fatality rate =  $(6,563/124,469,000) \times 100,000 = 5$  deaths per 100,000 workers.

## Presentation

Summary information for the major traits of workers fatally injured and for key fatality characteristics (event/exposure, occupation, and industry), along with overall fatality counts, are included in a national news release issued about 8 months after the end of the reference period. Supplementary tables containing fatality rates and special profiles of specific fatal events (e.g., highway incidents and homicides) also are available with the news release. Besides national data, State-specific data on workplace fatalities are available from participating State agencies. A list of them along with their telephone numbers are available from BLS at (202) 691-6175.

Articles and detailed tables containing both national and State data are published regularly in the Bureau's quarterly publication, *Compensation and Working Conditions*, and occasionally in the *Monthly Labor Review*. Much of this information also appears in yearly fatality reports compiled by BLS, which are referenced at the end of this chapter. A research file useful for safety researchers, policy officials, and others involved in promoting safety in the workplace can be obtained through a letter of agreement with BLS to protect the confidentiality of data.<sup>11</sup>

fatal injury for all workers in the group regardless of exposure time. Such measures are experimental 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.

<sup>11</sup> The research file is available on diskette upon request. Because census data are collected under a pledge of confidentiality, data elements identifying the deceased or the company they worked for are deleted from the database. For information on the file, contact: oshstaff@bls.gov or by telephone at Area Code (202) 691-6175.

## Uses and Limitations

The BLS Census of Fatal Occupational Injuries helps safety and health experts to monitor the number and kinds of deadly work injuries over time and to focus on work settings having particularly high risks, such as robbery-related homicides in retail stores, construction-related fatalities, and drownings in the commercial fishing industry.<sup>12</sup> The CFOI database can generate fatality profiles for specific worker groups (the self-employed or female workers, for example), for certain types of machinery (such as farm equipment), and for specific fatal circumstances (for instance, work activities at the time of fatal contact with electric current). Such profiles help identify existing work standards that may require revision and highlight safety problems where intervention strategies need to be developed.

Although States are using about two dozen independent data sources to identify and substantiate work-related fatalities, there are some fatal injuries at work that are missed by the BLS census. Some unidentified work-related fatalities undoubtedly occur on farms, at sea, and on highways, to cite three examples. States continue to search out new ways of verifying work-related fatalities to make their census counts as complete as possible. In that regard, States have up to 1 year to update their initial published counts with fatalities that were verified as work-related after data collection had ended for a given census. Since 1992, the updates have averaged less than 1.0 percent of each year's total that was initially published.

The BLS census facilitates the exchange of information by States on fatalities resulting from similar work hazards, such as construction falls or workers being struck by vehicles or equipment on or near roadways. Individual States, moreover, can use the census data to provide information to employers and their workers to promote safety in the workplace. Users need to exercise caution in State-to-State comparisons, however. For example, one probably should not compare the overall fatality rate of a State with a large agricultural economy to one having a large industrial base; agriculture has one of the highest fatality rates, and manufacturing has one of the lowest. In addition, the number of fatalities and their characteristics can vary markedly within a State from one year to the next, in part reflecting single incidents involving multiple deaths such as airplane crashes and natural disasters.

<sup>12</sup> See, for example, Guy Toscano and William Weber, "Violence in the workplace," and Scott Richardson and Rene Reyes, "Fatal work injuries in construction in Texas, 1991-93," *Compensation and Working Conditions*, April 1995, pp. 1-18; and Letitia K. Davis, et al., "Data sources for fatality surveillance in commercial fishing: Massachusetts, 1987-91," *Compensation and Working Conditions*, July 1994, pp. 7-13.

## Technical References

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- Evaluating Your Firm's Injury and Illness Record.* Guides to assist employers in comparing their injury and illness experience to others with similar size workforces in the same industry.
- Fatal Workplace Injuries: A Collection of Data and Analysis.* Reports issued annually containing topical articles prepared by several States and BLS staff as well as detailed tables from the BLS census.
- Occupational Injury and Illness Classification Manual,* December 1992. Detailed BLS coding structures used to classify the characteristics of workplace injuries and illnesses resulting in death or lost worktime. Available on the Internet, along with explanatory article, at <http://stats.bls.gov:80/oshoiics.htm>
- Occupational Injuries and Illnesses: Counts, Rates, and Characteristics.* Bulletins issued annually. (Prior to 1992, *Occupational Injuries and Illnesses in the United States by Industry.*)
- "Older Workers' Injuries Entail Lengthy Absences From Work," BLS Summary 96-6. One of several short papers on worker safety published under *Issues in Labor Statistics*, a continuing BLS series highlighting major trends of American workers and consumers.
- Survey of Occupational Injuries and Illnesses.* Summary of counts and rates by detailed industry, issued annually a few months after news release, "Workplace injuries and illnesses."
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