

An Evaluation of the Census of Fatal Occupational Injuries as a System for Surveillance

Greater dissemination of CFOI data may lead to better prevention of injuries

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The Census of Fatal Occupational Injuries (CFOI), a surveillance system administered by the Bureau of Labor Statistics (BLS), was established nationally in 1992. It is designed to collect information on all fatal occupational injuries in the United States. An evaluation of the system was conducted in 1994 using guidelines developed by the Centers for Disease Control and Prevention (CDC). Although the CFOI program meets its stated objective of providing comprehensive, timely, and verifiable fatality information, improvements could be made in the dissemination and use of CFOI data and reports. Specifically, the CFOI could be improved by using the data in analytic epidemiology studies and publishing them in peer-reviewed journals.

Background

In 1991, the CFOI began to track fatal occupational injuries and illnesses in 32 States, and in the remaining States the following year. In each of the first 2 years of national CFOI data collection, more than 6,000 fatal workplace injuries were reported, a rate of approximately 5 fatalities per 100,000 workers per year.^{1,2}

Since the majority of fatal occupational injuries occur in workers between 25 and 54 years of age, resulting in a high number of "years of potential life lost,"³ information from a surveillance system, such as the CFOI, can be used to identify high-risk occupations and activities within occupations and to develop workplace safety programs.

Systematic evaluation of a surveillance system can help determine whether the stated objectives are being met. Areas can then be identified in which improvements can be made. In 1994, the Illinois Department of Health conducted an evaluation of the fatal injury component of the CFOI pro-

gram, using guidelines established by the CDC for evaluating surveillance systems.⁴ The evaluation included a description of the system and its objectives, an assessment of the seven attributes of a surveillance system and its resource requirements, and finally, recommendations for the system.

Description of the system

The primary objective of the CFOI system is to collect information on fatal occupational injuries that is comprehensive, timely, and verifiable.⁵

The CFOI system is a passive surveillance system and is a cooperative venture between BLS and State agencies. The system is administered by the States, which collect, code, and verify fatality data. BLS provides reports from Federal agencies, such as the Occupational Safety and Health Administration (OSHA), the Mine Safety and Health Administration, and the Employment Standards Administration, to CFOI personnel in each State; collects data from each State; reviews each fatality; and assembles national data.

Fatality data are gathered by State personnel from workers' compensation reports, death certificates, news stories, and other sources. State CFOI personnel routinely review these to identify and collect information on workplace fatalities. They are trained by BLS in computer software use and coding of data elements for the CFOI program.

After receiving an initial fatality report, CFOI staff search for additional documentation to verify the fatality. This may include requesting reports from coroners and medical examiners or doing a follow-up questionnaire with the employer. The information is then coded and entered into a database. BLS receives final data on all fatalities in June of the following year. Following a review of the data, BLS compiles the national dataset.

To determine whether a fatality is work-related, State personnel use a case definition that stipulates that "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 or present at the site of the incident as a requirement of his or

¹ *Fatal Workplace Injuries in 1992: A Collection of Data and Analysis*, Bureau of Labor Statistics, Report 870, April 1994, pp. 1-92.

² Guy Toscano and Janice Windau, "The Changing Character of Fatal Work Injuries," *Monthly Labor Review*, October 1994, pp. 17-28.

³ C.A. Bell, N.A. Stout, T.R. Bender, C.S. Conroy, W.E. Crouse, and J.R. Myers, "Fatal Occupational Injuries in the United States, 1980-1985," *Journal of the American Medical Association*, 1990, vol. 263(22), pp. 3047-50.

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⁴ "Guidelines for Evaluating Surveillance Systems," *Morbidity and Mortality Weekly Report*, Centers for Disease Control, vol. 37(S-5), 1988.

⁵ *Census of Fatal Occupational Injuries State Operating Manual*, Bureau of Labor Statistics, February 1994.

her job.”⁶ Suicides and homicides meet the case definition if they occur at work. Fatalities that occur while traveling to and from work (commuting) are not considered work-related.

In general, each fatality must be verified by two source documents. In those instances where a second source document cannot be located, the fatality is included only if sufficient information exists from the first source to determine that the fatality was work-related.

Up to 30 injury data elements are included in the national CFOI dataset, including demographic information about the deceased, employer information, and data elements related to the circumstances of the injury. To preserve confidentiality, files released to researchers do not include personal identifiers, location (State of occurrence), source document information, or information on alcohol or drug testing results.

Data elements that are collected must be applicable to all types of fatalities and are kept simple. Because of this, information that might be useful for particular areas of study may not be available. For example, when examining fatalities caused by motor vehicle crashes, it would be useful to have information on seatbelt use and the estimated speed of the vehicle at the time of the crash. However, this same type of information would not be useful for burns or falls. Even in cases where some information relevant to a particular type of injury, such as seatbelt use, may be included in a narrative description of the injury, this information may not be available for the majority of the fatalities in that category.

Evaluating the system

The seven major attributes of a surveillance system, according to the CDC guidelines, are simplicity, flexibility, acceptability, sensitivity, predictive value positive, representativeness, and timeliness.

Simplicity. The simplicity of a surveillance system involves both the structure and ease of operation. In the CFOI system, data entry is facilitated through the use of the CFOI State operating manual which provides clear information on coding of data elements. The data then are easily transferred electronically from the State to BLS. The national research file is easy to distribute because data for each year can fit on a standard diskette, which can be sent to individuals who have received approval to use the data for study.

The most complex part of the CFOI program is the wide variety of reporting sources that must be used to ascertain and verify all occupational fatalities and provide detailed information on the fatalities. Several studies have shown that no single data source can identify all occupational fatalities.⁷ In addition, one source document alone is usually insufficient to provide all the information needed to ad-

equately describe a fatality.⁸ In 1993, an average of three source documents were used to verify each fatality.⁹ Source documents, which varied from State to State, included death certificates (which identified 72 percent of fatalities in CFOI in 1992); medical examiner, coroner, or autopsy reports (62 percent); workers' compensation documents (40 percent); news clippings (34 percent); and OSHA reports (32 percent). Restricting the number or types of data sources used in the system might simplify its operation but would likely limit the system's ability to identify and report fatalities.

Flexibility. Flexibility in a surveillance system occurs when a system can easily adapt to changing information needs or operating conditions. The CFOI system has not been in existence long enough to assess its flexibility in a meaningful fashion. Some flexibility is evident, however, when sources for fatality data from States are examined. In 1992, "other" source documents were used to identify 33 percent of fatalities; in 1993, other sources were used to identify 61 percent of fatalities.^{2,10} This finding suggests that the system is evolving and that State CFOI personnel are becoming more familiar with accessing new source documents, such as farm bureau and highway reports, to identify fatalities. The CFOI should be evaluated in the future to assess its ability to adapt to changing work conditions, such as more individuals working at home.

Acceptability. The acceptability of a surveillance system means the number of individuals and organizations that willingly participate in the system. A measure of the CFOI system's acceptability is that all 50 States participate in the program, each State meets the data deadlines set by BLS, and the required data elements are virtually always furnished. (See Tables 1 and 2).

Sensitivity. Sensitivity measures the proportion of all occupational fatalities (using the case definition) that are detected by the CFOI system. While it was not possible to calculate sensitivity because the total number of occupational fatalities is unknown, the sensitivity of the CFOI system is probably high because multiple data sources are used to ascertain events. Comparatively, it is a more complete system than those which only use death certificate infor-

⁷ N. Stout, C. Bell, "Effectiveness of Source Documents for Identifying Fatal Occupational Injuries: A Synthesis of Studies," *American Journal of Public Health*, 1991, vol. 81(6), pp. 725-7. J. Russell, C. Conroy, "Representativeness of Deaths Identified Through the Injury-at-Work Item on the Death Certificate: Implications for Surveillance," *American Journal of Public Health*, 1991, vol. 81(12), pp. 1613-18. D.J. Murphy, B.L. Seltzer, and C.E. Yesalis, "Comparison of Two Methodologies to Measure Agricultural Occupational Fatalities," *American Journal of Public Health*, 1990, vol. 80(2), pp. 198-200.

⁸ D.M. Gute and J.P. Fulton, "Agreement of Occupation and Industry Data on Rhode Island Death Certificates with Two Alternative Sources of Information," *Public Health Reports*, 1985, vol. 100(1), pp. 65-72.

⁹ See *Fatal Workplace Injuries*, BLS Report 870.

¹⁰ Guy Toscano and Janice Windau, "The Changing Character of Fatal Work Injuries," *Monthly Labor Review*, October 1994, pp. 17-28.

⁶ See *Fatal Workplace Injuries*, BLS Report 870.

mation. Surveillance systems which use only one source of fatality information, such as death certificates, have been shown to miss fatalities.¹¹

Predictive value positive. Predictive value positive (PVP) is the proportion of events identified by CFOI as occupational fatalities that actually met the case definition for occupational fatalities. It is not possible to measure PVP directly because of the confidentiality of source documents. Approximately three-quarters of the cases reported to CFOI have a death certificate as one of their source documents; and in a previous study of Indiana work-related fatalities, death certificates alone were found to give a false positive rate of only 3 percent.¹² For CFOI case reports not based on death certificate reporting, double-source reporting may be effective in maintaining a high PVP.

Representativeness. The CDC guidelines for evaluation of surveillance systems define representativeness as accurately describing a health event over time and in describing the distribution of the population by place and person. Because of its reliance on multiple data sources, the CFOI system is probably the most representative surveillance system for fatal occupational injuries. The system is comprehensive in its coverage of certain groups of workers, including workers younger than 16 years of age, workers not covered by the Occupational Safety and Health Act, workers on small farms, and government employees. In addition, illegal aliens should be represented in the system, since death certificates are issued for anyone dying in the United States. However, it may underestimate fatalities of self-employed workers, who are not represented in workers' compensation or OSHA reports.

Timeliness. Timeliness of a surveillance system reflects the delay between steps in the system. The national CFOI research file is available for use about 13 months after the reference year. This amount of time is needed to permit States to revise reports of individual fatalities with newly available information and to allow BLS to review information on each fatality.

Resources for the program

Both Federal and State funds are used to operate the CFOI program. Nationally, the CFOI system costs \$1.2 million; the States contribute another \$1.2 million for the illness and injury component of the CFOI program.

¹¹ See Stout and Bell, "Effectiveness of Source Documents for Identifying Fatal Occupational Injuries;" Russell and Conroy, "Representativeness of Deaths Identified Through the Injury-at-Work Item on the Death Certificate: Implications for Surveillance;" and Murphy, Seltzer, and Yesalis, "Comparison of Two Methodologies to Measure Agricultural Occupational Fatalities," *American Journal of Public Health*.

¹² See Toscano and Windau, "The Changing Character of Fatal Work Injuries" for information on source documents used to compile the 1993 national fatality data. Also see, "An Evaluation of Certificates of Death as a Source of Data on Fatal Work Injuries: The Indiana Experience," in *Fatal Work Injuries in 1991: A Collection of Data and Analysis*, Bureau of Labor Statistics, Report 845, April 1993, pp. 30-33.

Usefulness of the system

The CFOI program produces a news release approximately 8 months after the reference year and an annual report of occupational fatalities, with periodic reports appearing in other BLS publications.¹³ The annual report provides descriptive statistics on the percent of fatalities by State and within demographic groupings, as well as selected State and regional reports. Several States and BLS regional offices also publish fatality data.¹⁴ When possible, fatality rates are calculated for various industries. Investigators use the data for descriptive studies of industry-specific fatality rates, for studies on the various causes of fatalities stratified by sex, and for comparison of occupational fatality rates in self-employed versus other workers. Although such findings may be insufficient to directly target specific prevention measures, they do provide information that can be useful in monitoring trends in occupational fatalities and in bringing focus to particularly high-risk occupations or industries.

Conclusions

The high levels of acceptability, timeliness, and representativeness of the CFOI system represent an improvement over other occupational fatality recording systems. Multiple reporting sources may contribute to high sensitivity and predictive value positive, although neither of these could be directly calculated. The flexibility of the system can be better evaluated after the system has been in operation longer. Although the simplicity of the system is affected by the use of multiple source documents, this approach allows for the most complete collection of fatalities possible.

One area in which CFOI can improve its surveillance system is in dissemination of information. While CFOI publications are sent to more than 5,000 organizations, the distribution of information to the general medical and injury prevention audience has been somewhat limited. In the future, a wider dissemination of both CFOI data files and CFOI printed information could lead to increased use of the system for prevention purposes. Currently, BLS publishes an annual CFOI report, which includes reprints of

¹³ See *Fatal Workplace Injuries*, BLS Report 870 and Toscano and Windau, "The Changing Character of Fatal Work Injuries."

¹⁴ *Census of Fatal Occupational Injuries, New Jersey-1992*, Division of Epidemiology, Environment and Occupational Health Services, New Jersey Department of Health, February 1994, pp. 1-26. *Missouri Monthly Vital Statistics-Focus*, The Census of Fatal Occupational Fatalities, Missouri Department of Health, 1993. *Report of Occupational Injuries in Maine, 1992*, Maine Department of Labor, 1993, BLS 672, pp. 1-7. *Massachusetts Traumatic Deaths at Work, 1992 Update*, Massachusetts Department of Public Health, 1994. *Census of Fatal Occupational Injuries in Arkansas, 1992*, Arkansas Department of Labor, pp. 1-15. *Fatal Occupational Injuries in Washington State, 1992: Results of the 1992 Census of Fatal Occupational Injuries*, Washington State Department of Labor and Industries, March 1994, pp. 1-41. *Census of Fatal Occupational Injuries for the State of Wisconsin, 1992*, Workers' Compensation Division, Department of Industry, Labor and Human Relations, Wisconsin, December 1993, pp. 1-10. *Census of Fatal Occupational Injuries: Results for North Dakota, 1992*, Bulletin R-1027, Bureau of Labor Statistics (Kansas City regional office), U.S. Department of Labor, pp. 1-11. *Census of Fatal Occupational Injuries, Fatal Work-related Injuries Arizona, 1991 & 1992*, Industrial Commission of Arizona, July 1994, pp. 1-13.

articles using CFOI data. Broader distribution of CFOI publications and data to those who need the information—such as injury researchers, industry and business leaders, worker and union groups, and manufacturers of workplace equipment—would be an important improvement in the CFOI system. In turn, this might influence individuals and groups to focus additional research on particular high-risk occupations, to incorporate changes in the manufacturing of equipment, or to institute new regulations and rules concerning workplace safety. Broader distribution could be achieved by publishing reports in peer-reviewed journals or the CDC's *Morbidity and Mortality Weekly Report*, which have a wider readership than the annual CFOI publication.

In the future, as more data are collected, analytic epidemiologic studies should be performed to identify risk factors for specific types of occupational fatalities. These studies can be performed by epidemiologists working in the States, in universities, or at the National Institute for Occupational Safety and Health. The results of these studies could be submitted for publication to appropriate peer-reviewed journals such as the *American Journal of Public*

Health, American Journal of Industrial Medicine, Scandinavian Journal of Work and Environmental Health, Journal of Occupational Medicine, and Accident, Analysis, and Prevention.

Subsequent evaluations of the CFOI system after several more years of operation may reveal additional areas in which refinements can be made. Overall, the CFOI system meets its objectives of providing timely, comprehensive, and verifiable occupational injury data and it provides this information at a relatively low cost, \$300 per fatality reported.¹⁵ However, the ultimate usefulness of a surveillance system for fatal occupational injuries should be determined by its effectiveness in preventing or controlling fatalities. In the coming years, this may be the area in which BLS should concentrate its efforts to improve the CFOI system.

¹⁵ Reported fatalities include some fatal occupational illnesses such as asbestosis and occupational cancers and other conditions, such as heart attacks and strokes that occur at work. Information on illness-related deaths are generally not included in published fatality Census counts because of the difficulties in compiling a complete count.

Table 1. Completeness of reporting demographic and employer characteristics, 1992

Data element ¹	Required (R) or Optional (O)	Percent complete
Demographic information		
Age	R	100
Race	R	100
Hispanic	O	90
Gender	R	100
Foreign birth	O	10
Region	R	100
Employer information		
Ownership	R	99.9
Establishment size	R	32
Industry code	R	98.9
Occupation code	R	99.5
Employee status	R	100
Length of time with employer	O	33

¹Three data elements—record number, reference year, and whether the incident was an injury or illness were excluded from the tables.

Table 2. Completeness of reporting data on the fatal incident, 1992

Data element ¹	Required (R) or Optional (O)	Percent complete
Month/day of the week of injury	R	100
Rural or urban	O	100
Days survived	R	100
Body part affected	R	98.6
Source of injury	R	100
Secondary source	O	59
Event or exposure	R	100
Nature of injury	R	99.6
Cause of injury	O	36
Worker activity code	R	86
Location type	O	92
Time of occurrence	O	83
Narrative of how injury occurred	R	100

¹Three data elements—record number, reference year, and whether the incident was an injury or illness—were excluded from the tables.