



Q4 The construction FACE database – Codifying the NIOSH FACE reports☆

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ABSTRACT

Introduction: The National Institute for Occupational Safety and Health (NIOSH) has collected detailed information on select work-related fatalities through the Fatality Assessment and Control Evaluation (FACE) program since 1982. **Method:** Reports generated from the in-depth research-oriented FACE investigations contain rich information such as safety training, use of personal protective equipment (PPE), and others, which is crucial for injury prevention, but may not be available in other data sources. To facilitate usage of information included in FACE reports, the Construction FACE Database (CFD) was created by extracting data from the original text reports to allow for quantitative analyses of fatalities in the construction industry. This study describes the development of CFD and its major contents. The study also illustrates how to employ the CFD, and discusses database considerations and potential future uses for construction safety and health research.

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1. Introduction

The construction industry has the highest number of work-related fatal injuries in the United States. In 2015, 985 construction workers died at worksites, accounting for 20.4% of the overall work-related fatal injuries in the country (U.S. Bureau of Labor Statistics [BLS], 2016). These numbers are disproportionately high given that construction workers made up less than 7% of the overall total employment in 2015 (CPWR, in press). Accurate surveillance and examination of contributing factors are necessary for effective injury prevention (Bunn, Costich, & Slavova, 2006). However, few data sources contain information on detailed circumstances and situations leading up to and surrounding fatal injuries (Higgins, Casini, Bost, Johnson, & Rautiainen, 2001). Although the Census of Fatal Occupational Injuries (CFOI) provides a substantial amount of information on occupational fatalities, it does not collect information on safety training, use of personal protective equipment (PPE), whether a malfunction or unsafe design of machinery or tools were involved in an incident, and how to avoid similar incidents in the future.

To provide insight into work-related fatal injuries, the National Institute for Occupational Safety and Health (NIOSH) started the NIOSH

Fatality Assessment and Control Evaluation (FACE) program in 1982, and added the State FACE program in 1989 (<http://www.cdc.gov/niosh/face/brochure.html>). These programs target varying types of events for investigation over the years. For example, NIOSH is currently focusing FACE resources on investigating falls in construction, machinery, and foreign-born workers, particularly among states that do not have funding for the State FACE program. In addition to investigating NIOSH targets, individual states conduct a limited number of investigations of fatalities related to state-level targets. The FACE reports are the result of these extensive fatal injury investigations, combining information collected from the employer, coworkers, safety personnel, emergency response crews, and other witnesses. In addition to the decedents' demographic and employment information, FACE collects information on the decedents' employers, such as whether the employer had a safety program, provided safety training, PPE, and much more. Such information is crucial for understanding the mechanisms by which fatalities occur (Bunn, Slavova, & Hall, 2008). FACE reports also provide detailed recommendations on how to avoid such incidents based on information obtained during the investigations (Higgins et al., 2001). These recommendations and detailed incident descriptions can be critical for injury preventions and interventions, including safety policies and procedures, engineering controls, and other aspects of the safety climate (Menendez, Castillo, Rosenman, Harrison, & Hendricks, 2012).

Since the FACE program was established, a number of case studies have been generated from the FACE reports to highlight specific risks or policy implications (Hallman, Gelberg, & Hallisey, 2005; Morbidity and Mortality Weekly Report (MMWR), 2001, 2004, 2012; NIOSH, 1990, 2006, 2007, 2010, 2011a, 2014). For example, a FACE report

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about a fall from a “catch” platform in New Jersey led to an Occupational Safety and Health Administration (OSHA) *Letter of Interpretation*, stating that “catch” platforms must comply with OSHA’s Scaffold Standard (OSHA, 2009). Findings based on FACE reports also contributed to a Massachusetts law protecting the safety and health of floor finishing workers (NIOSH, 2011b). Several reports covered various aspects of the Minnesota agriculture industry as well (Brown, Parker, Seeland, Boyle, & Wahl, 1997; MMWR, 1993, 1996, 1998, 1999). In addition, a few studies have applied FACE findings more broadly. These topics include tractors (Bunn et al., 2008), motor vehicle collisions (Bunn & Struttman, 2003), electrocutions in construction (Zhao, Thabet, McCoy, & Kleiner, 2014), tree care operations (MMWR, 2009), younger workers (Higgins, Tierney, & Hanrahan, 2002), and homicides (Harrison & Gillen, 1996).

FACE reports are categorized by major industry on the NIOSH website. Since 1982, the NIOSH and State FACE programs have investigated hundreds of work-related fatal injuries in the construction industry, providing detailed information on the circumstances and recommendations to protect construction workers from similar incidents occurring again. In order to efficiently explore specific information in the FACE reports for the construction industry, the Construction FACE Database (CFD) was developed using all NIOSH and State FACE reports in construction posted to the NIOSH FACE website as of June 30, 2015. Since FACE programs are ongoing and the annual counts are subject to change, reports posted on the NIOSH FACE website after the cutoff date are not covered by the CFD. To assist safety and health professionals to use the CFD, this study describes the development and major contents of the CFD, and provides examples of how to employ the CFD for construction safety and health research. Considerations of the CFD and future research applications are also discussed.

2. Materials and methods

Selected data from each construction-related FACE report were manually entered into the CFD, including information on decedents, their employers, type of injury, environment, and recommendations (Appendix A). Information on safety equipment, safety programs, and training was also included. The selected data items were coded using coding systems available in 2000 when the CFD was first created. Occupation and industry were coded using the 1990 Census Occupational Classification System (U.S. Department of Commerce, 1999) and the 1987 Standard Industrial Classification System (Office of Management and Budget (OMB), 1987), respectively. The fatal incident details were classified according to the BLS’ Occupational Injury and Illness

Classification System (BLS, 2007). While these classification systems have been updated in recent years, changes related to the construction industry have been relatively minor. In order to maintain consistency and ease usage of the CFD, the coding systems have remained the same since inception.

A key element of the CFD is the compilation of FACE recommendations. Since a corresponding classification system is not available, codes were created to categorize the narrative recommendations included in FACE reports (Appendix B). A two-digit classification schema was developed to capture major categories as well as finer details for each recommendation. The first digit designates the main categories: Personal Protective Equipment (PPE; coded 1×), Equipment (2×), Training (3×), Organizational (4×), and Violations (5×). The second digit classifies more specific recommendations within each of the major categories (e.g., 14 – Provide functional Personal Fall Arrest System (PFAS); or 42 – Conduct Job Safety/Hazard Analysis). Detailed recommendation codes are displayed in Appendix B.

The CFD was created in Microsoft Excel, and can be easily imported to other statistical packages, such as SAS. Examples of analyzing the CFD using SAS (version 9.4) and descriptive statistics from the analyses are reported below.

3. Results

3.1. Trend analysis

The CFD includes 768 construction-related fatal injuries reported by FACE, covering the fatalities that occurred from 1982 through 2014 (Fig. 1). While some investigations involved multiple fatalities, for analysis purposes, the CFD uses an individual death as the unit. According to the CFD, about one-third (270) of the fatalities were reported by the NIOSH internal FACE program and the remainder (498) by the State FACE programs. The NIOSH FACE program peaked in 1988 with 38 fatalities. The highest number (53) reported by State FACE programs was in 1998; making that year the highest reported total (64) for all FACE programs.

State FACE programs were reduced shortly after 1998, leading to fewer active State FACE programs. Since then, the number of annual FACE reports has decreased. In June 2015, nine states were conducting FACE programs – California, Iowa, Kentucky, Massachusetts, Michigan, New Jersey, New York, Oregon, and Washington, and 13 other states previously participated in the FACE program (Fig. 2).

FACE data collection has improved significantly in many respects over the years. For example, while age was only collected in 44% of

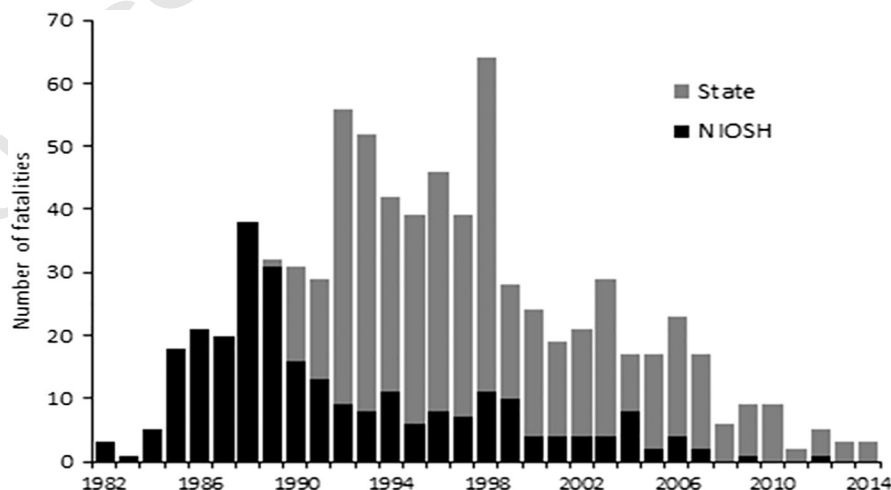


Fig. 1. NIOSH and State FACE reports in construction, by year.
(Source: NIOSH and State FACE Reports for Construction.)

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