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Work-related fatal motor vehicle traffic crashes: Matching of 2010 data from the Census of Fatal Occupational Injuries and the Fatality Analysis Reporting System

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ABSTRACT

Motor vehicle traffic crashes (MVTCs) remain the leading cause of work-related fatal injuries in the United States, with crashes on public roadways accounting for 25% of all work-related deaths in 2012. In the United States, the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) provides accurate counts of fatal work injuries based on confirmation of work relationship from multiple sources, while the National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS) provides detailed data on fatal MVTCs based on police reports. Characterization of fatal work-related MVTCs is currently limited by data sources that lack either data on potential risk factors (CFOI) or work-relatedness confirmation and employment characteristics (FARS).

BLS and the National Institute for Occupational Safety and Health (NIOSH) collaborated to analyze a merged data file created by BLS using CFOI and FARS data. A matching algorithm was created to link 2010 data from CFOI and FARS using date of incident and other case characteristics, allowing for flexibility in variables to address coding discrepancies. Using the matching algorithm, 953 of the 1044 CFOI "Highway" cases (91%) for 2010 were successfully linked to FARS. Further analysis revealed systematic differences between cases identified as work-related by both systems and by CFOI alone. Among cases identified as work-related by CFOI alone, the fatally-injured worker was considerably more likely to have been employed outside the transportation and warehousing industry or transportation-related occupations, and to have been the occupant of a vehicle other than a heavy truck.

This study is the first step of a collaboration between BLS, NHTSA, and NIOSH to improve the completeness and quality of data on fatal work-related MVTCs. It has demonstrated the feasibility and value of matching data on fatal work-related traffic crashes from CFOI and FARS. The results will lead to improvements in CFOI and FARS case capture, while also providing researchers with a better description of fatal work-related MVTCs than would be available from the two data sources separately.

1. Introduction

Millions of workers in the United States (U.S.) and around the world are at risk of motor vehicle traffic crashes (MVTCs) associated with the operation of motor vehicles for work purposes on public trafficways. Data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) indicate that in 2012, roadway incidents (involving a motorized land vehicle, and not including pedestrian-vehicle crashes) alone accounted for 25% of all fatal work injuries, representing a 5% increase from the previous year (Bureau of Labor Statistics, 2014a). Across all industries, roadway incidents involving motorized land vehicles consistently rank as one of the leading causes of work-related fatalities, with the highest frequencies in 2012 in the transportation and warehousing ($n = 408$), construction ($n = 124$), and wholesale and retail trade ($n = 123$) industries (Bureau of Labor Statistics, 2014b).

Work-related MVTCs pose a significant burden to employers and society. It is estimated that for the 1998–2000 period, on- and off-the-job motor vehicle traffic crashes cost employers in the

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U.S. $60 billion annually for medical care, legal expenses, property damage and lost productivity (National Highway Traffic Safety Administration, 2003). For crash-related injuries in 2010 requiring more than 6 days away from work, workers' compensation costs alone were estimated to be nearly $2 billion (Liberty Mutual Research Institute for Safety, 2012). Despite the large economic burden, no single database is able to identify fatal work-related MVTCs and provide sufficient detail about pre-crash circumstances, making it difficult to develop targeted prevention strategies (Pratt, 2003).

In the U.S., characterization of fatal work-related MVTCs is currently limited by data sources that lack either data on potential risk factors (BLS's CFOI), or work-relatedness confirmation and employment characteristics (the Fatality Analysis Reporting System [FARS], collected by the National Highway Traffic Safety Administration [NHTSA]). Linkage of existing databases has the potential to overcome these limitations, maximize the strengths of each data system, and provide a more comprehensive and detailed picture of the circumstances of work-related traffic crashes (Newcomb 1998). To date, research linking data on work-related MVTCs has been performed mostly in Australia (Boufous and Williamson, 2006; Stuckey et al., 2010a,b). In the U.S., data-linkage studies on work-related MVTCs have been limited to military personnel (Hooper et al., 2005) or a single state (Thygerson et al., 2011; Thomas et al., 2012).

The catalyst for the research reported in this paper was a data-sharing agreement implemented by BLS and NHTSA in recent years to improve case identification by CFOI. On average, an estimated 100 cases have been added to CFOI records annually since this program began. Under this agreement, no changes are made to the original FARS file, nor is the matching ever used to identify or obtain information on individual cases. Further, data-sharing agreements between BLS and individual states preclude the generation of publicly available datasets from any matching of CFOI with other data systems. This provision extends not only to the case-matching that has been used to identify potential new work-related cases for CFOI, but to any subsequent matching done for research purposes.

These limitations notwithstanding, matching of the CFOI and FARS databases also offers the opportunity to provide much richer detail on each work-related MVTC fatality than is available through each individual database, allowing detailed analysis of these events and development of improved prevention and policy recommendations. Crash prevention strategies can be developed for industry and occupational groups whose crash risks may have previously not been recognized. In addition, road safety actions by employers can have positive effects on driving behaviors among workers' family member and in the larger community (Murray and Watson, 2010; Pratt et al., 2014).

In this paper we describe the process of matching data from FARS to CFOI for fatal work-related MVTCs, using 2010 data files; provide a detailed account of the methodology; compare and contrast matched cases identified as at-work by both systems with those identified as at-work only by CFOI; and provide a descriptive analysis of the FARS and CFOI cases that remained unmatched. Finally, we discuss strengths and limitations of using merged data in advancing current knowledge of fatal work-related MVTCs and discuss future directions in the analysis of these data.

2. Methods

2.1. Data sources

2.1.1. The Census of Fatal Occupational Injuries (CFOI)

CFOI is a Federal-State cooperative program that produces comprehensive, accurate, and timely annual counts of all fatal work injuries occurring in the U.S. (Bureau of Labor Statistics, 2012). Information about each fatal injury—including demographic and employment characteristics of the decedent and detailed circumstances of the event—is obtained by cross-referencing multiple sources, such as death certificates, workers' compensation reports, and Federal and State agency administrative reports. In order to be included, each case must meet program definitions for both a traumatic injury and work relationship (Bureau of Labor Statistics, 2012). To ensure that fatal injuries fit these criteria, each case must be substantiated with two or more independent source documents, or a source document and a follow-up questionnaire.

For MVTCs specifically, BLS has instituted a special process through a data-sharing agreement with NHTSA to identify potential additional cases from the FARS file. BLS evaluates all FARS cases with a death certificate marked at-work for possible inclusion in the annual CFOI count. BLS also uses its own algorithm to identify FARS cases that are potentially work-related, regardless of whether FARS has identified them as such. Each FARS case identified for potential addition to the CFOI file undergoes independent review and verification of work relationship using multiple source documents.

2.1.2. CFOI data: highway incidents

The starting point for case-matching was a subset of CFOI cases classified as "highway incidents" (referred to hereafter as 'CFOI Highway'), which were identified using the *event* variable (code = 41) as defined by the 2007 Occupational Injury and Illness Classification System (OIICS) (Bureau of Labor Statistics, 2007). "Highway incidents" is the OIICS *event* that denotes work-related MVTCs. Highway incidents are defined in OIICS as "accidents to vehicle occupants occurring on that part of the public highway, street, or road normally used for travel as well as the shoulder and surrounding areas [. . . where] at least one vehicle was in regular operation, and the impact was caused by a traffic accident or forward/backward travel of the vehicle" (Bureau of Labor Statistics, 2007). CFOI for 2010 contains 1044 such cases. The "highway incidents" category does not include non-highway incidents (i.e., motor vehicle crashes (MVCs) involving vehicle occupants in areas such as parking lots, construction sites, or farm property), incidents in which the only decedent was a pedestrian or non-passenger, or falls from moving vehicles. It does, however, include incidents that occurred partly on a public roadway.

2.1.3. Fatality Analysis Reporting System (FARS)

FARS is a yearly nationwide census of fatal motor vehicle crashes (National Highway Traffic Safety Administration, 2014). FARS is based on police-reported traffic crashes, with annual data compiled by state-level partner agencies and transmitted to NHTSA. FARS includes data at vehicle, incident, and person level for all qualifying fatal MVTCs within the 50 States, the District of Columbia, and Puerto Rico. To fulfill FARS case criteria, a crash must involve a motor vehicle traveling on a trafficway customarily open to the public, resulting in the death of a motorist or a non-motorist within 30 days of the crash (National Highway Traffic Safety Administration, 2014). FARS cases are only considered to be work-related if there is a positive response to the "injury at work" item on the death certificate. NHTSA does, however, perform a data check designed to identify potential work-related cases. For example, if a fatal injury occurred to a driver or passenger of a vehicle with a *body type* of medium or heavy truck (code = 60–67, 71–72, or 78–79), NHTSA concludes that it should be indicated as a fatal injury at work in FARS. Unlike CFOI, which consists of one record per fatally-injured worker, FARS is a hierarchical data system that provides data at three levels (accident, vehicle, and person [drivers, vehicle occupants, and non-motorists]), along with numerous supplementary files covering topics such as distracted driving and alcohol. FARS includes detailed information for each individual involved in