

Characterization of Foreign-Born vs. Native-Born Worker Fatalities in Kentucky, 2001–2014

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Published online: 15 February 2017
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Abstract Information on foreign-born worker (FBW) and native-born worker (NBW) fatal injuries is scarce. The Kentucky Fatality Assessment and Control Evaluation program analyzed 2001–2014 worker fatality data. The Kentucky FBW fatality rate was double the US FBW and NBW rates, and 50% higher than the Kentucky NBW fatality rate. FBW average age at death was 38 years; NBW age was 47 years. FBW deaths occurred in construction (26%) and services (22%) industries, and transportation [28% (54% due to semi truck crashes)] and construction [26% (48% due to roofing, scaffolding, and ladder-related falls)] occupations; in contrast, NBW deaths occurred in services (22%), and transportation (18%) industries, and transportation (25%) and management (20%) occupations, and were due to exposures to inanimate mechanical forces (38%), and transport accidents (30%). Enhanced FBW cultural competent interventions and policies are needed to prevent FBW occupational injuries, and improve FBW workplace safety and health.

Keywords Foreign-born · Native-born · Transportation · Construction · Semi truck

Background

The percentage of foreign-born workers (FBWs) employed in the overall U.S. workforce has increased substantially

over the last decade. In 2015, FBWs represented 16.8% of the U.S. labor force, up from 14.8% in 2005; native-born workers (NBWs) accounted for 83.2% of the labor force [1]. The greatest share of fatal FBW injuries involve workers who were born in Mexico (40%) [2]. The fatal work injury rate is similar for both FBWs and NBWs (3.3 total worker deaths/100,000 workers for NBWs vs. 3.4/100,000 for FBWs) but the fatal injury patterns for FBWs and NBWs may differ [2].

Several studies have found that FBWs are at higher risk for fatal work-related injuries. Research conducted by the Centers for Disease Control and Prevention (CDC) reported that Hispanics and FBWs had the highest work-related fatal injury rates (4.4 deaths/100,000 workers, and 4.0/100,000, respectively) from 2004 to 2009 [3]. The most frequent types of events were transportation incidents followed by assaults, contact with objects or equipment, and falls. Homicides among Hispanics represented a higher proportion of total fatalities than for all workers [4]. FBWs experienced higher annual fatality rates than NBWs in sales occupations and handler, equipment cleaner, helper, and laborer occupations [5]. A study conducted by the Center for Injury Research and Policy found that while the non-fatal injury rate was lower among FBWs, the severity of their injuries was greater. A greater proportion of FBW injuries resulted in hospitalizations of 6 days or more of missed work compared to NBW injuries [6].

The foreign-born population in Kentucky increased from 0.9% of the total population in 1990 to 3.4% in year 2013. The authorized FBW percentage of Kentucky's total workforce was 4.5%, and the unauthorized FBW percentage was 1.2%, amounting to 5.7% of the total workforce [7]. FBWs contribute millions to the state's economy: over \$158 million was paid by foreign-born Latinos in Kentucky in 2013 for state/local taxes. There

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are higher FBW percentages in agriculture and extraction; education services; healthcare, and social services; manufacturing; and trade, transportation, and utilities industries in Kentucky compared to the overall U.S [8].

To our knowledge, a state-specific comparative peer-reviewed study of FBW and NBW patterns, as well as a comparative study of state and national FBW and NBW fatality rates has not been performed. The primary objective of this study was to (1) characterize the fatal injury patterns that may exist between FBWs and NBWs in Kentucky; (2) identify FBW industry populations at risk for fatal injuries; (3) identify protective risk factors for FBW fatal injuries; and (4) calculate FBW and NBW fatal injury rates and trends for Kentucky and the overall U.S.

Methods

Data Collection

Occupational injury fatality data was obtained from the Kentucky Fatality Assessment and Control Evaluation (FACE) program. National Institute for Occupational Safety and Health (NIOSH)-funded FACE programs conduct surveillance of all occupational fatalities in their respective states and perform onsite investigations of fatal incidents based on NIOSH- and state- determined priorities (e.g., high injury-risk industries and occupations identified through surveillance data) [9]. FBW worker deaths are a NIOSH-determined priority for incident investigation. FACE programs collect data from multiple sources on the pre-event, event, and post-event phases of the fatality to inform and enhance prevention policies and practices. Multiple information sources used to identify occupational fatality cases include review of applicable Occupational Safety and Health Administration (OSHA) reports; Mine Safety and Health Administration reports; police reports; death certificates; workers' compensation reports; coroner reports; media reports, and others.

Interviews of employers, witnesses, and others with knowledge of the fatal incident are conducted in FACE fatal incident investigations. Examination of the work site and equipment also is performed. Since FACE programs do not have workplace right of entry, if the fatal incident occurred on company property, employer permission is sought to examine the work site and conduct coworker interviews; if employer permission is not granted, a fatal incident investigation is not performed. This study was

approved by the University of Kentucky Institutional Review Board; no consent was required.

Inclusion and Exclusion Criteria

Work-related fatality inclusion criteria required that the fatal injury occur in Kentucky and that the person was performing work tasks at the time of the fatal injury. The study excluded Kentucky resident worker fatalities where the fatal injury occurred outside the state of Kentucky.

Definitions

FBW

Using the Bureau of Labor Statistics (BLS) definitions, foreign-born refers to persons who reside in the U.S. but were not born in the U.S. or they were born outside the country or one of its outlying areas like Puerto Rico or Guam to parents who were not U.S. citizens. Foreign-born typically includes legally admitted immigrants, refugees, temporary residents such as temporary workers, and undocumented immigrants [10].

NBW

Native -born refers to persons born in the United States, or in one of its outlying areas like Puerto Rico or Guam, or who were born abroad to a least one U.S. citizen parent.

Data Elements

North American Industry Classification System (NAICS) codes were used to identify the employment industry at time of fatal injury [11]. This is the standard used by Federal agencies to classify business establishments. The Standard Occupational Classification System (SOC) was used to code and classify occupation at time of fatal injury [12]. Industries with low cell values were merged into the “other industries” category that included mining, oil and gas extraction, public safety, healthcare and trade industries. Occupations including computer, engineering, science, education, legal, community service, arts and media, healthcare practitioners and technical, sales and related, office and administrative support, and military were merged into the “other occupations” category. International Classification of Diseases, Tenth Revision, (ICD-10) was used to code external causes of mortality [13]. Top injury scenarios for the FBW transportation and construction occupations were derived from review of individual case narrative text.

Analysis

Worker fatality narratives and incident investigation reports were reviewed. Demographic characteristics examined were age, gender, race, ethnicity, education, marital status, primary language and country of origin. Also, industry and occupation at time of death, and external cause of injury were analyzed. A Chi square analysis using SAS 9.3 software was performed to identify differences between FBW and NBW injury fatality groups.

Fatality rates for the U.S. and for Kentucky were calculated for three time periods and plotted to compare FBW and NBW injury fatalities. All annual injury fatality rates were calculated per 100,000 employed workers. To determine the U.S. fatality rates for FBWs and NBWs, fatality numerators were identified using BLS Census of Fatal Occupational Injuries (CFOI) data [14]. The CFOI, similar to FACE program data, compiles annual counts of all fatal work-related injuries that occurred in the U.S. Using various state, federal, and other data sources to identify and verify fatal work injuries, the CFOI collects information on decedent demographics, incident characteristics, and employment information including occupation and industry. The source for the Kentucky rate numerators was FACE data. Employment data for the U.S. and the Kentucky rate denominators were derived from the BLS Current Population Survey (CPS) [15]. The CPS is a monthly household survey that collects information on labor force employment characteristics such as type, employment vs. unemployment status, hours of work, etc. Average annual rates of FBW and NBW injury fatalities were calculated by dividing the number of fatalities by the total employed population for three time periods: years 2001–2005, 2006–2010, and 2011–2014.

Results

From 2001 to 2014, there were 1448 total worker fatality cases in Kentucky. Of the total worker fatality cases, 87 were FBWs (6%) and 1,361 (94%) were NBWs. Kentucky FBW fatal injury rates were double (or nearly double) the U.S. FBW fatal injury rates, and U.S. and Kentucky NBW fatal injury rates over the study period (Fig. 1). Twenty-four of the 87 FBW injury fatalities (28%) and 198 NBW injury fatalities (15%) were of non-Kentucky residents.

The average age of FBW death was 38 years of age compared to 47 years of age in NBWs (Table 1). Nearly all workers in both groups (FBWs and NBWs) were male (94 and 93%, respectively) and white (85 and 95%, respectively). There was a statistically significant difference between the two groups for race ($p < 0.0001$) but no statistically significant difference for gender ($p = 0.5612$). Higher percentages of fatally injured FBWs were black and Asian/American Indian.

There was a statistically significant difference between the two groups for ethnicity ($p < 0.0001$). Out of the total FBW deaths, 52% were of Hispanic origin while only 1% of the total NBW deaths were of Hispanic origin. There also was a statistically significant difference in completed education between the two groups ($p < 0.0001$); 51% of the FBWs did not complete high school, whereas, only 22% of NBWs did not complete high school. Of the FBWs, 47% were born in Mexico, and 13% were born in Central America and the Caribbean. More than half of the FBWs spoke Spanish as their first language (63%).

There were statistically significant differences between industries for fatally injured FBWs and NBWs ($p = 0.0082$) (Table 2). The majority of FBWs worked in construction (26%), services (22%), and transportation,

Fig. 1 Foreign-born vs. native-born worker fatality rates in Kentucky vs. U.S., 2001–2014

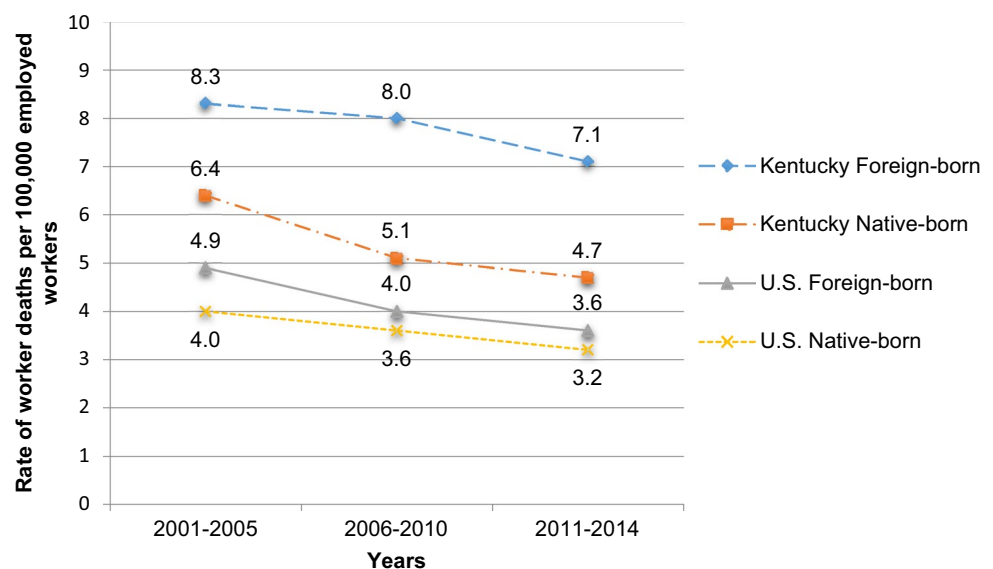


Table 1 Demographic characteristics of foreign-born vs. native-born worker fatalities in Kentucky, 2001–2014

Demographic characteristic	Foreign-born	Native-born	p-value
Mean age (years)	38	47	
Gender			0.5612
Male	82 (94%)	1260 (93%)	
Female	5 (6%)	101 (7%)	
Total (gender)	87 (100%)	1361 (100%)	
Race			<0.0001
White	73 (85%)	1260 (95%)	
Black	7 (8%)	69 (5%)	
Asian/American Indian	6 (7%)	3 (<1%)	
Total (race)	86 (100%)	1332 (100%)	
Ethnicity			<0.0001
Hispanic origin	45 (52%)	13 (1%)	
Not of hispanic origin	42 (48%)	1322 (99%)	
Total (ethnicity)	87 (100%)	1335 (100%)	
Education			<0.0001
Less than high school	38 (51%)	251 (22%)	
Finished high school	22 (30%)	625 (54%)	
Some college/completed college	14 (19%)	291 (25%)	
Total (education)	74 (100%)	1167 (100%)	
Marital status			<0.0001
Married	54 (65%)	861 (66%)	
Never married	25 (30%)	187 (14%)	
Widowed/divorced	4 (5%)	264 (20%)	
Total (marital status)	83 (100%)	1312 (100%)	
Primary language			<0.0001
English	6 (8%)	1355 (100%)	
Spanish	49 (63%)	1 (<1%)	
Other	23 (30%)	1 (<1%)	
Total (primary language)	78 (100%)	1357 (100%)	
Country of origin			
U.S.A	0	1361 (100%)	
Mexico	41 (47%)		
Canada	4 (5%)		
Central America/Caribbean	11 (13%)		
Eastern Europe	6 (7%)		
Western Europe	7 (8%)		
Asia	9 (10%)		
Africa/Middle East	9 (10%)		
Total (country of origin)	87 (100%)	1361 (100%)	

Bold indicate p-values

warehousing, and utilities (TWU) (21%). In contrast, NBWs were primarily employed in Services (22%), TWU (18%) and agriculture, forestry and fishing (AFF) (18%) industries. Compared to NBWs, a higher percentage of FBWs were employed in the construction industry (26%

vs. 15%, respectively), and in the manufacturing industry (13% vs. 9%, respectively).

Occupations also differed between both groups (Table 2). FBWs were most frequently employed in transportation and material moving (TMM) (28%), construction and extraction (CE) (26%), and management, business, and financial (12%) occupations at time of fatal injury. Compared to FBWs, fewer NBW fatalities occurred in the TMM occupations (25% NBWs vs. 28% FBWs), and CE occupations (18% NBWs vs. 26% FBWs), but were employed at higher percentages in management, business and financial occupations (20% NBWs vs. 12% FBWs) at time of death.

FBWs and NBWs had statistically significant differences in their external causes of injuries ($p < 0.0001$) (Table 3). Primary causes of injuries for FBWs were transport incidents (30%) compared to 35% for NBWs. Accidental falls were higher for FBWs (25%) compared to 10% in NBWs. Fatal assault among FBWs was more than double that of NBWs (15% in FBWs compared to 6% in NBWs).

Semi truck crashes were the most frequent type of FBW fatal injury scenarios within the transportation occupation ($n = 13$; 54%); of the 13 fatalities, 10 truck drivers were killed in the driver’s seat, 2 were killed as pedestrians and one was a team driver killed in the sleeper berth (Table 4). Eight of these fatalities involved single semi truck crashes, and three were semi truck crashes involving other vehicles. Of the 11 single and multiple (more than one vehicle) semi truck driver crashes, six FBW semi truck drivers did not use occupant safety restraints, and one disabled the air bag.

The most frequent types of FBW fatal injury scenarios within the construction trades workers (CTW) occupation involved roofing, scaffolding, and ladder-related falls ($n = 11$; 48%) (Table 4). Six roofers fell off or through roofs; two roofers fell from ladders while accessing roofs. Four construction laborers fell from scaffolding or from ladders. Personal fall arrest (PFA) system use was unknown for the majority of the falls but is presumed to have not been worn when the fatal injury occurred.

Discussion

The findings in this study show significantly elevated overall FBW injury fatality rates in Kentucky compared to overall U.S. worker fatality rates (regardless of whether the U.S. workers were foreign-born or native-born). FBW fatality rates were 51% higher than NBW fatality rates in Kentucky, and 97% higher than the overall FBW fatality rates in the U.S. Both Kentucky FBW and NBW injury fatality rates declined over the study period. Industry-specific NBW and FBW fatality rates could not be calculated because Kentucky employment (by industry and nativity) statistics are not collected by BLS (personal communication).

Table 2 Foreign-born vs. native-born worker fatalities in Kentucky (by industry and occupation), 2001–2014

	Foreign-born	Native-born	p-value
Industry			0.0082
Construction	23 (26%)	202 (15%)	
Services	19 (22%)	292 (22%)	
Transportation, warehousing and utilities	18 (21%)	249 (18%)	
Manufacturing	11 (13%)	126 (9%)	
Other ^c	9 (10%)	237 (18%)	
Agriculture, forestry, and fishing	7 (8%)	246 (18%)	
Total ^a	87 (100%)	1352 (100%)	
Occupation			0.1052
Transportation and material moving	24 (28%)	343 (25%)	
Construction and extraction	23 (26%)	236 (18%)	
Management, business, and financial	10 (12%)	265 (20%)	
Service	9 (10%)	134 (10%)	
Other occupations	8 (9%)	222 (16%)	
Production	7 (8%)	74 (6%)	
Farming, fishing, and forestry	6 (7%)	76 (6%)	
Total ^b	87 (100%)	1350 (100%)	

Bold indicate p-values

^aInformation on industry was not available for 9 of the native-born workers

^bInformation on occupation was not available for 11 of the native-born workers

^cThe following industries and occupations were merged into the other due to low cell values (mining, oil and gas extraction, public safety, healthcare and trade industries) and (computer, engineering, science, education, legal, community service, arts and media, healthcare practitioners and technical, sales and related, office and administrative support, and military specific occupations)

The highest proportions of FBW fatalities occurred in the construction; services; and TWU industries. High percentages of NBW fatalities occurred in the same industries but in different proportions, and included a higher proportion of AFF industry fatalities. The construction and TMM occupations were the primary occupations of the deceased FBWs, accounting for 54% of the FBW injury fatalities.

Within the TMM occupation, the most frequent type of FBW fatal injury was due to semi truck crashes, many of them involving single vehicle roadway departure incidents that could be indicative of fatigue/sleepiness (at least four drivers did not attempt avoidance maneuvers) and inattention/distracted (vehicle not under proper control was listed in four crash reports). Occupant protections were not used in seven of the FBW semi truck crashes (six drivers did not use seat belts and one driver disabled the air bag). The Federal Motor Carrier Safety Administration (FMCSA) mandated use of occupant restraints by semi truck drivers in 1971 and recently mandated semi truck passenger restraint use in 2016 [16]. Sleepiness/fatigue, distraction/inattention, and nonuse of occupant restraints by commercial vehicle drivers have been associated with higher odds of commercial vehicle fatalities [17]. Drug use was noted as a contributing cause to FBW semi truck fatalities in only one case (alcohol use), and vehicle failure was not listed as a contributing cause in any of the FBW semi truck crashes.

Transportation industry FBW employers should consider cultural competent semi truck driver safety programs that address fatigue management, occupant protection, and avoiding distractions.

Consistent with previous studies, our study found that falls continue to be a high FBW fatal injury risk within the CTW occupation. According to OSHA, the leading cause of worker deaths on construction sites was due to falls, and lack of PFA protection was one of the most cited violations [18]. This study confirms OSHA's finding that almost half of FBW construction occupation fatalities involved falls, and identified ladder falls and roof falls due to inadequate PFA protection as probable causes of FBW deaths. Construction industry FBW employers should consider cultural competent roofing safety programs that require PFA system use, and that incorporate ladder and scaffolding safety. Training in appropriate languages as well as training delivery systems (e.g., visual presentations since many FBW injury fatalities occurred among FBWs with less than a high school education) may help reduce FBW falls within the construction industry.

More than half of FBW injury fatalities were of Hispanic workers who spoke Spanish as their first language. OSHA, the primary federal agency charged with establishment and enforcement of worker safety and health regulations, has a website in Spanish that provides information for

Table 3 Foreign-born vs. native-born worker fatalities in Kentucky (by external cause), 2001–2014

	Foreign-born	Native-born	p-value
EXTERNAL cause of mortality			<0.0001
Pedestrian injured in transport accident (V01–V09)	4 (5%)	53 (4%)	
Pedestrian injured in collision with car, pickup truck, or van	4	26	
Occupant of pickup truck or van injured in transport accident (V50–V59)	3 (3%)	50 (4%)	
Occupant of heavy transport vehicle injured in transport crash (V60–V69)	11 (13%)	204 (15%)	
Occupant of heavy transport vehicle injured in collision with fixed or stationary object (V67)	6	42	
Occupant of heavy transport vehicle injured in noncollision transport accident (e.g., overturn) (V68)	3	88	
Other land transport accidents (V80–V89)	3 (3%)	131 (10%)	
Occupant of special vehicle mainly used in agriculture injured in transport accident (V84)	3	63	
Air and space transport accidents (V95–V97)	5 (6%)	34 (2%)	
Accident to powered aircraft causing injury to occupant (V95)	5	34	
Falls (W00–W19)	22 (25%)	136 (10%)	
Fall on and from ladder (W11)	5	17	
Fall on and from scaffolding (W12)	3	10	
Fall from, out of or through building or structure (W13)	8	44	
Other fall from one level to another (W17)	4	30	
Exposure to inanimate mechanical forces (W20–W49)	6 (7%)	372 (27%)	
Struck by thrown, projected or falling object (W20)	4	134	
Accidental drowning and submersion (W65–W74)	3 (3%)	4 (<1%)	
Exposure to electric current, radiation and extreme ambient air temperature and pressure (W85–W99)	4 (5%)	38 (3%)	
Intentional self-harm (X60–X84)	3 (3%)	56 (4%)	
Assault (X85–Y09)	13 (15%)	85 (6%)	
Other	8 (9%)	199 (15%)	
Total	87 (100%)	1361 (100%)	

FBWs and NBWs had statistically significant differences in their external causes of injuries ($p = <0.0001$)

Spanish-speaking employers/employees on topics such as workers’ rights, OSHA standards, and employer responsibilities [19]. Employers with Spanish-speaking employees face challenges when training their workers, and additional OSHA guidance and regulation documents in Spanish (e.g., skills-based worker safety training, English language classes, and visual presentations/demonstrations) may be useful to improve FBW understanding of OSHA rules and regulations.

The elevated FBW and NBW fatality proportions in the construction, TWU, services, and AFF industries do not closely align with Kentucky’s industry employment mix, where according to Kentucky Labor Market Information, 83% of the employed population was in the services (83%) and manufacturing (16%) industries in 2014. Low industry compliance regulations, low-skilled and unskilled workers, and high injury-risk industries may contribute to the large proportions of FBW and NBW fatalities observed in this study. The trucking transportation industry is highly regulated by the Federal Motor Carrier Safety Administration, whereas, the services, construction, and AFF industries are not as tightly regulated. Also, according to Kentucky

CFOI, overall fatal occupational injury rates (including NBWs and FBWs) in 2014 were highest in the AFF (59.5 deaths/100,000 full-time equivalent [FTE] workers); TWU (23.2/100,000); and construction (11.1/100,000) industries. Last, of the total Kentucky workforce employment from 2010 to 2014, 9% had less than a high school education, and 15% spoke languages other than English at home [20]. Half (51%) of the total FBWs in this study had less than a high school education compared to 22% of the total NBWs, indicating lower skilled FBW employment in high fatal injury-risk industries in Kentucky.

Limitations to This Study

There were limitations to our study. First, Kentucky resident worker deaths and rates could have been underestimated since fatal occupational injuries that occurred outside Kentucky were not included in the data set; information on Kentucky residents who died out of state was not available. Second, the number of cases collected by the FACE program includes both Kentucky and non-Kentucky residents who died in Kentucky so fatal injury rates could

Table 4 Top foreign-born worker fatality injury scenarios in transportation and construction trades workers occupations, 2001–2014

Transportation: semi truck crashes (n = 13, 54%)

- A semi truck left the road for unknown reasons, crossed a creek, and hit an embankment; seat belt was used but air bag was turned off
- A semi truck left the right side of the highway, traveled through the guard rail down an embankment, and overturned; seat belt was not used
- A semi truck was struck by a passenger vehicle then struck median barrier; team driver in sleeper berth was ejected; no occupant safety restraint was used
- A semi truck struck the median barrier, jack-knifed across three lanes of traffic then overturned; seat belt status is unknown
- A semi truck driver hauling livestock either lost control of the truck or fell asleep and drove off the side of the highway; seat belt was not used
- A semi truck driver presumed to have fallen asleep at the wheel and crashed; seat belt was not used
- A semi truck attempted to pass another truck, lost control and hit a bridge abutment; seat belt was not used
- A semi truck left the highway and rolled over; seat belt use unknown
- A semi truck rolled over and struck a utility pole; seat belt use unknown
- A semi truck sideswiped another semi truck and caught fire; seat belt was used
- A semi truck was involved in a crash with two other semi trucks and was ejected; seat belt was not used
- A semi truck driver was struck by a vehicle during vehicle egress while disabled on the interstate
- A semi truck driver was struck by a vehicle while crossing a street from a parking lot

Construction trades workers: roofing, scaffolding, and ladder-related falls (n = 11, 48%)

- A construction laborer (wearing a helmet) was struck by a sheet of plywood that blew off a roof and struck him on the ground
- A roofer leaned back on the leading edge of the roof when his fall protection rope severed, and he fell 30 feet; an appropriate personal fall arrest system was not used
- A roofer fell ~26 feet through a roof to the floor and died 11 h later; personal fall arrest system use unknown
- A roofer fell from a roof while cutting off ridge row; personal fall arrest system use unknown
- A roofer fell from a roof; personal fall arrest system use unknown
- A roofer fell from a ladder striking his head on the ground
- A subcontractor employee was installing brick board from a ladder, fell 25 feet, and sustained head injuries; personal fall arrest system use unknown
- A construction laborer fell from a ladder and struck head on ground
- A construction laborer fell from scaffolding when coworker moved the scaffolding; no personal fall arrest system was used
- A roofer fell from ladder at residential site while carrying shingles and struck head
- A construction laborer fell from ladder while handing tools to framers

be overestimated. Third, FACE data may not be directly comparable to CFOI data. For example, FACE cases may slightly differ from CFOI cases in case inclusion criteria. CFOI only counts fatal drug overdoses at work if the drug overdose occurred after an initial injury at work (with caveats), whereas, the Kentucky FACE program includes all fatal drug overdoses that occurred in the workplace regardless of whether or not a prior work injury occurred. Also, CFOI cases generally do not include overexertion cases; the Kentucky FACE program includes overexertion cases if the overexertion occurred while performing extremely physically strenuous activities such as military training exercises.

Conclusions

These findings highlight the importance of FACE data in the identification of high risk industries, occupations, and environments for fatal FBW injuries. The use of FACE surveillance and investigation data supplements general data sources such as CFOI and OSHA data. Data from

surveillance and investigation programs such as FACE programs can help inform targeted prevention efforts, and support the development and dissemination of culturally competent materials and interventions to improve FBW safety and health.

Acknowledgements Yaillet Cruz implemented the methods and prepared the initial draft manuscript; Terry Bunn developed the methods and co-wrote the manuscript; Nancy Hanner collected the worker fatality data and performed quality control checks; and Svetla Slavova provided statistical analysis expertise. All authors reviewed the submitted manuscript and approve the manuscript for submission.

Funding Grant sponsor: NIOSH; Grant Number: 2460OH008483-12. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of NIOSH. NIOSH had no role in the study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the article for publication.

Compliance with Ethical Standards

Conflict of interest This manuscript has not been published or submitted elsewhere. All authors declare no conflicts of interest. All pro-

cedures performed in this study involving human participants were in accordance with the ethical standards of the University of Kentucky research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. All subjects in the study were deceased so informed consent was not necessary. This study was approved by the University of Kentucky Institutional Review Board.

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