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Work-Related Violent Deaths in the US Taxi and Limousine Industry 2003 to 2013:

Disparities Within a High-Risk Working Population

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Abstract

Objective—We describe the magnitude and distribution of violent work-related deaths among taxi and limousine drivers, a high-risk population.

Methods—We analyzed rates using the Bureau of Labor Statistics Census of Fatal Occupational Injuries (CFOI) for all violent work-related deaths in the taxi and limousine industry from 2003 to 2013. We described demographics, work characteristics, and other injury details, examining temporal trends for nativity and race/ethnicity.

Results—Men (adjusted rate ratio [RR_{adj}] 6.1 [95% confidence interval [CI] 2.6–14.1]), blacks (RR_{adj} 2.3 [95% CI 1.6–3.4]), Hispanics (RR_{adj} 2.1 [95% CI 1.3–3.4]), and drivers in the South (RR_{adj} 2.7 [95% CI 1.9–3.9]) had significantly higher fatality rates than comparison groups. Over time, the rates remained substantially higher compared with all workers.

Conclusions—The taxi and limousine industry continues to face a disproportionately dangerous working environment. Recommended safety measures implemented uniformly by cities, companies, and drivers could mitigate disparities.

In 2014, approximately 400 workers died as a result of violence while doing their jobs.¹ Some industries continue to be disproportionately affected due to job activities that put them

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at risk, such as: handling cash, working with the public, working alone, and working late at night or early in the morning.^{2,3} Almost 10 per 100,000 taxi and limousine industry drivers were murdered ($n=31$)⁴ while performing their job duties that same year, 50% more than were killed in a transportation incident (the current leading cause of work-related death) in an industry that exclusively provides transportation.⁴ While occupational public health research has historically highlighted taxicab drivers as one of many industries at risk for violence in the workplace,⁵⁻⁹ and interventions designed to reduce violence in this worker population have been evaluated,¹⁰⁻¹³ there are no recent analytic studies focused on describing taxi and limousine industry fatalities as a primary objective for this workforce estimated at 300,000.¹⁴ We describe demographic, employment, and injury characteristics among taxi and limousine industry drivers killed due to violence in the United States from 2003 through 2013.

Methods

Data Sources

In 2016, we analyzed violence-related fatalities of taxi and limousine industry drivers from 2003 through 2013 from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI). This analysis was conducted with restricted-access BLS datasets that are provided to the NIOSH Division of Safety Research under a memorandum of understanding. The BLS has assembled the CFOI annually to characterize all fatal work-related traumatic injuries in the United States since 1992. To identify and confirm fatalities, BLS uses multiple federal, state, and local sources such as death certificates, police reports, and workers' compensation reports. For a death to be recorded as "work-related" the decedent must have been employed at the time of the incident, working as a volunteer in the same capacity as a paid employee, or present at a site as a job requirement.¹⁵ CFOI includes all public and private sector workers regardless of age, but excludes fatalities occurring during a normal commute and deaths related to occupational diseases. Data fields are predominantly categorical with the exception of narrative text parsed into up to six text fields (depending on content) that may provide circumstances surrounding the fatality not elsewhere captured. Taxi and limousine service workers were identified by industry classification from the 2002 North American Industrial Classification System (NAICS) for 2003 through 2010,¹⁶ and the 2007 NAICS was used for 2011 through 2013.¹⁷ Although there were slight differences between the 2002 and the 2007 NAICS codes, the code for taxi and limousine service remained "4853" for both versions.

The Occupational Injury and Illness Classification System (OIICS) system developed by BLS classifies work-related injuries and illnesses into four separate hierarchical categorical structures: event/exposure, nature, primary and secondary source, and affected body part.^{18,19} Each structure uses a four digit coding scheme that increases detail with each digit. The BLS OIICS defines nature of injury as the "principal physical characteristic(s) of the injury or illness" and the body part as that which is directly affected by the nature of injury or illness. Source and secondary source are the "objects, substances, equipment, and other factors that were responsible for the injury or illness incurred by the worker or that

precipitated the event or exposure.” Event or exposure is “the manner in which the injury or illness was produced or inflicted by the source of injury or illness.”

We included the following variables about time, workplace and type of injury: time of incident, location of incident, establishment size, OIICS-coded variables for injury event, nature of injury, primary and secondary injury source, and body part injured. Establishment size refers to employer and is grouped into 1 to 10 employees, 11 to 19, 20 to 49, 50 to 99, and 100 or more. Location of incident is characterized by the following examples: home, farm, mine/quarry, industrial structure, recreational location, street/highway, parking lot, and public buildings. We also included sex, age, race/ethnicity, nativity, and Bureau of Census (BOC) region. Sex was classified as either man or woman. Exact age at death was categorized into four major groups (less 35 yrs, 35 to 44 yrs, 45 to 54 yrs, and 55 yrs or older). Race/ethnicity was re-categorized into White (non-Hispanic), Black (non-Hispanic), Hispanic (any race), Asian, and all other races. Nativity was categorized into a dichotomous variable of either foreign born or US-born (including US territories, such as Puerto Rico, Guam, and the Virgin Islands). Region represented the four major US Bureau of Census regions: Northeast, Midwest, South, and West.²⁰ Major metropolitan areas with substantial taxi and limousine driver populations found in the Northeast are Boston, New York, and Philadelphia; the Midwest includes Chicago, Cincinnati, Columbus, and Detroit; the South includes Atlanta, Austin, Baltimore, Dallas, Houston, Miami, New Orleans, Orlando, Tampa, and Washington DC; and the West contains Denver, Honolulu, Las Vegas, Los Angeles, Portland, Reno, Sacramento, San Diego, San Francisco, and Seattle. The fatalities presented in this analysis are not limited to the metropolitan areas.

To identify the full range of violent fatalities, we included cases with one-digit event codes indicating “Assaults and Violent Acts” (Event code “6” for OIICS 1.01, 2003 to 2010) or “Violence and other injuries by persons or animals” (Event code “1” for OIICS 2.01, 2011 to 2013). This variable is classified as “intentional,” “unintentional,” or “intention unknown.” In order to identify the weapon used that resulted in the work-related fatality, we searched event, primary and secondary sources of injury for codes that indicated the type of weapon used, such as firearms, knives or cutting tools, and other types of weapons (multiple weapons, beatings, strangulation, or unknown weapon). We examined fatality narratives to classify the motive behind the violent fatality, including robbery, dispute, suicide, other and intentional violence by another person with unknown motive.

Rate Calculations

Rates were calculated using labor force denominator estimates derived from the BLS current population survey (CPS) for workers aged 16 years and older. The CPS is the principal source of US labor force statistics and is a monthly household survey that collects employment, unemployment, earnings, hours of work, and other indicators from a sampling frame of 60,000 households.²¹ Average annual rates were calculated as the total number of fatalities divided by estimated number of workers for all jobs for each of the characteristics of interest and are reported as the number of violence-related fatal work injuries per 100,000 workers. Unless otherwise stated categories with the lowest rates were used as the reference category.

Statistical Analysis

We analyzed data from 2003 to 2013 since these years include the most recent data with consistent, comparable coding for race, ethnicity, and the taxi and limousine industry. For 2003 to 2013, we calculated the number, rate per 100,000 workers, and rate ratios for the study variables. Variable groupings were consistent with BLS confidentiality requirements and previous analyses. Poisson regression models were run in SAS using PROC GENMOD to calculate unadjusted (univariate) and adjusted (multivariate) fatality risk ratios and 95% confidence intervals (CIs). Rate ratios were adjusted for sex, age, race/ethnicity, nativity, and region. Data were analyzed in 2016 using SAS, version 9.3 (SAS Institute, Inc. Cary, NC).

No review was required by an Institutional Review Board as the analysis was conducted on existing data collected by other agencies and did not include any personal identifiers. The views expressed here do not necessarily reflect the views of the BLS.

Results

Demographics and Incident Details

We found 366 taxicab and limousine drivers died a violent death over an 11-year period at a rate of 17.8 per 100,000 workers (95% CI 16.9 to 18.7). Adjusted rate ratios revealed men died violent deaths 6.1 times the rate of women in this industry (Table 1) and violent death rates were higher for blacks (RR_{adj} 2.3 [95% CI 1.6 to 3.4]) and Hispanics (RR_{adj} 2.1 [95% CI 1.3 to 3.4]) than whites. Fatality rates were highest for the South (RR_{adj} 2.7 [95% CI 1.9–3.9]) and significantly higher for the Midwest (RR_{adj} 2.1 [95% CI 1.3–3.4]) and the West (RR_{adj} 1.8 [95% CI 1.2–2.8]) compared with the Northeast. Foreign-born taxi and limo drivers experienced significantly lower rates than US-born drivers (RR_{adj} 0.6 [95% CI 0.42–0.79]). Violent deaths were uniformly distributed across age groups (Table 1). Regardless of race/ethnicity the majority of fatalities occurred in establishments with less than 10 employees, on a local road or street, due to a robbery, by a firearm, or with the injury to the head, when reported (Table 2).

Where reported, a majority of violent deaths (42%) occurred in establishments with 10 or fewer employees (Table 2). A local road or street was the predominant location (71%). Robbery, when known, was the overarching motive (55%) and firearms (82%) the most frequently occurring weapon. The most frequently injured body part was the head, followed by the trunk.

Violent deaths among taxi and limo drivers predominantly occurred between 9 pm and before 7 am, with notable shifts in prevalence from nighttime occurrences to daytime occurrences (Fig. 1). The 24-hour distribution of violent deaths among all workers was more attenuated.

Temporal Patterns

Each year, an average of 33 taxi and limousine drivers died a violent death with a range of 24 fatalities in 2009 to 47 fatalities in 2003. The fatality rates due to work-related violence among taxi and limousine drivers ranged from 8.7 per 100,000 workers in 2009 to as high as

21.7 per 100,000 workers in 2003. The rates were 14.5 (2009) to 21.7 (2003) times greater than all workers (Fig. 2). The rates were higher for US-born drivers compared with foreign-born drivers for every year examined, with the exception of 2003 to 2004 and 2013; these differences were not statistically significant. Black and Hispanic drivers had consistently higher violent death rates compared with white drivers (Fig. 3A). By contrast, violent death rates for all black workers were consistently higher compared with all Hispanic and all white workers (Fig. 3B).

Discussion

Taxi and limousine drivers continue to represent one of the most dangerous occupations in the United States in spite of an overall decline in workplace violence observed from the mid-90s to early 2000s.⁹ We found violent death rates among these workers to be higher than that for all workers at a magnitude that is concerning given well-established best practices and interventions that show promise for their effectiveness in reducing robberies and their related injuries. In 2000, the Occupational Safety and Health Administration (OSHA) released a comprehensive set of recommendations for a safe work environment, free from workplace violence.²² These best practices were found to be effective for the retail industry which shares some of the same risk factors for workplace violence but in a stationary work environment.^{23,24} To our knowledge there has been no research conducted to evaluate implementation of the full range of safety measures known to prevent or reduce robbery-related violence among taxi and limousine drivers. One likely explanation for the persistently high violent death (predominantly homicide) rates is inadequate adoption of comprehensive safety measures at the industry, city, company, and driver levels.

A major finding was differences in violent death fatality rates by sex, race and ethnicity, nativity, and region. Taxi and limousine drivers who are men, Hispanic, non-Hispanic black, or worked in the South and Midwest experienced the highest fatality rates after adjusting for all other demographic variables examined. Although these observations were not surprising given recent similar findings examining disparities among work-related homicides,^{25,26} they were striking since safety measures in this industry are almost exclusively regulated at the city level. Cameras and partitions, two major types of safety equipment, were found to be distributed in geographically different regions among the largest US cities.^{10,11} Generally, cameras were found to be mandated by city ordinance in the West and company policy in the South while partitions were primarily mandated in the Northeast and Midwest.^{10,11} Of further concern is this uneven distribution of two key types of recommended safety measures. There is no current information available at the national level that identifies implementation of the recommended safety measures at the driver/car level. However, if cameras and partitions are not widely and uniformly implemented throughout the United States, it is likely other recommended safety measures are not widely and uniformly implemented as well. In the small retail industry comprehensive safety measures for preventing robberies mandated by an ordinance in two cities in the South were fully implemented at low levels.²⁷ When safety measures are adopted, those that are demonstrated as being the most likely to prevent or reduce robberies and related injuries are generally not adopted with greater frequency than other less proven safety measures.²⁸ Comprehensive

and uniform adoption of recommended safety measures across all drivers by every city is crucial for reducing violent deaths and eliminating their associated disparities.

An interesting finding was the lack of elevated fatality rates among foreign-born drivers, long suspected to be disproportionately affected. Recent published occupational injury research at the national level reported elevated homicide rates among foreign-born workers,²⁶ effects that were mitigated after adjusting for other socio-demographic factors, industry, and occupation.²⁵ Notably, adjusted homicide rates for men, increasing age, blacks and American Indian/Alaska Native/Asian/Pacific Islanders remained higher.²⁵ In a recent survey of work-related violence experienced among 130 taxicab drivers in a large Western city in the United States, foreign-born drivers reported fewer incidents of physical assault, robbery, and/or weapon confrontation than their native-born counterparts.²⁹ The lack of an elevated adjusted rate ratio for foreign-born taxi drivers may be a reflection of safety strategies that foreign-born drivers may possess. Self-care strategies employed by the predominantly foreign-born taxi drivers participating in a study in a large US city included diffusion and decompression to manage stress, practicing proactive self-care to reduce danger, and maintaining power and control in the taxicab.³⁰ Further research comparing safety practices by nativity would provide insight into this possibility and allow for safety interventions to more effectively target demographics most at risk.

The importance of being a city-licensed driver cannot be overstated. City-licensed drivers are protected as part of a formal structure where safety measures are regulated for the benefit of both the driver and the passengers and weak safety links in the formal structure can be more easily identified and strengthened. Training is an effective approach for improving awareness and knowledge of creating a safe work environment, in this case violence de-escalation training and how to act during a robbery.^{31,32} The advent of transportation network companies (TNCs) distinguished by their corresponding apps provides exclusive use of cashless systems for those that use it, removing the target of robberies. However, it should be noted that 29% of adult consumers in the United States do not have a credit card^{33,34} and 32% do not have a smartphone.³⁵ The taxi and limousine industry will likely remain a cash industry, and at risk, as long as a significant proportion of its clientele can only pay in cash. City leaders and company owners can mandate the full set of recommended safety measures and encourage their use. Furthermore, influential intermediaries such as insurance companies can play a key role in increasing adherence to recommended safety measures by providing incentives such as discounted insurance premiums or fixed premiums that won't increase for drivers and companies in full compliance.^{36,37}

This analysis is limited to descriptions of basic socio-demo-graphic data and general circumstances surrounding each taxi and limousine industry driver's death. However, due to its mobility and lack of predictability between fares that makes study participation difficult, the CFOI data on this worker population are crucial for tracking fatalities and their characteristics. Previous presentations using data from the Census were used by industry regulators to promulgate safety ordinances in several large cities. Although the data are secondary and cannot provide city, company or individual-level measures of safety equipment, and training requirements and adoption, it has identified key sub-populations for

which industry stakeholders can be change agents for both driver and, consequently, passenger safety. All violent deaths identified were included in the analysis to clarify the proportion of suicides and other deaths described as intentional but with unclear motives. The identification of suicides was less than 2% of violent deaths, resulting in an inability to determine trends and guiding the focus of the paper to safety measures to prevent robbery-related and other intentional violence. Finally, fatalities in the taxi and limousine industry subsector rather than taxi drivers and chauffeurs as an occupation were described. A conscious decision was made to focus on the industry subsector instead of the occupation for several reasons: (1) the industry encapsulates the risk profile of the public health burden while the occupation crosses into other disparate industries, (2) safety regulation is industry-specific, and (3) major stakeholders represent the industry rather than the occupation. Therefore, any impact from regulatory or company policy level interventions would likely be observed more completely in the taxi and limousine industry rather than the taxi and chauffeur occupations.

Conclusions

Even within a peripheral worker population there are disparities in which specific demographics of taxi and limousine drivers are experiencing higher rates of violent deaths. Blacks, Hispanics, men, and workers in the South and Midwest regions are dying at disproportionately higher rates in an already dangerous job. Comprehensive violence prevention measures known to be effective should be uniformly available to all drivers across all regions, with safety inspections ensuring their correct implementation and use.

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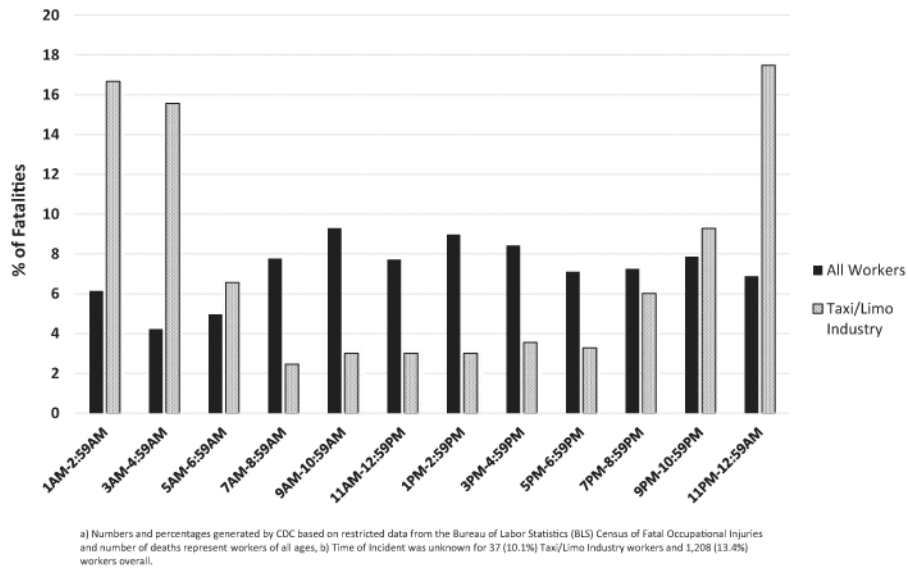


Figure 1. Time of incident for violent deaths among all workers compared with taxi and limo industry workers—United States, 2003 to 2013^{a,b}. ^aNumbers and percentages generated by CDC based on restricted data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries and number of deaths represent workers of all ages. ^bTime of incident was unknown for 37 (10.1%) taxi/limo industry workers and 1208 (13.4%) workers overall. CDC, centers for disease control and prevention.

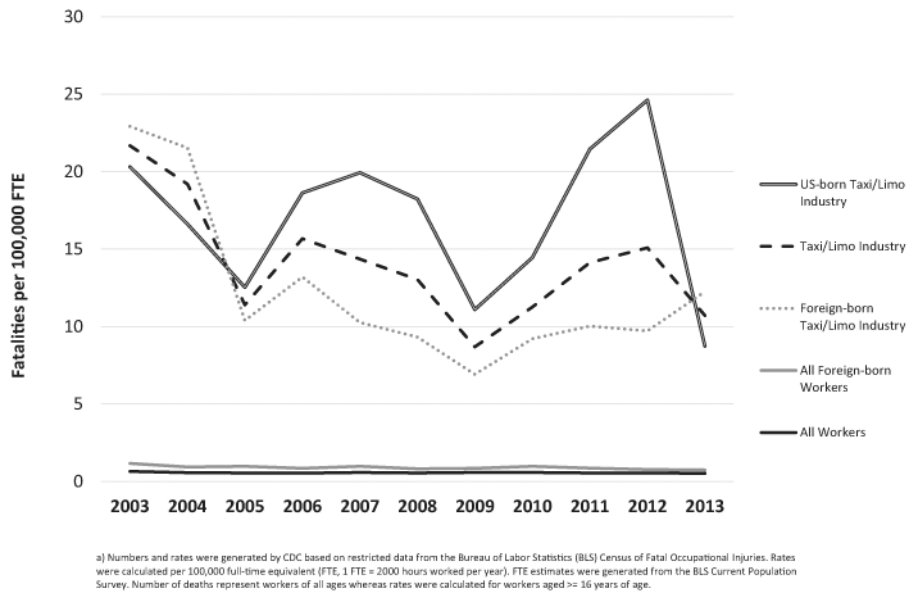


Figure 2. Rates^a of fatal work-related violence by nativity for all workers and taxi/limo industry workers—United States, 2003 to 2013. ^aNumbers and rates were generated by CDC based on restricted data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries. Rates were calculated per 100,000 full-time equivalent (FTE, 1 FTE=2000hr worked per year). FTE estimates were generated from the BLS current population survey. Number of deaths represent workers of all ages whereas rates were calculated for workers aged greater than or equal to 16 years of age.

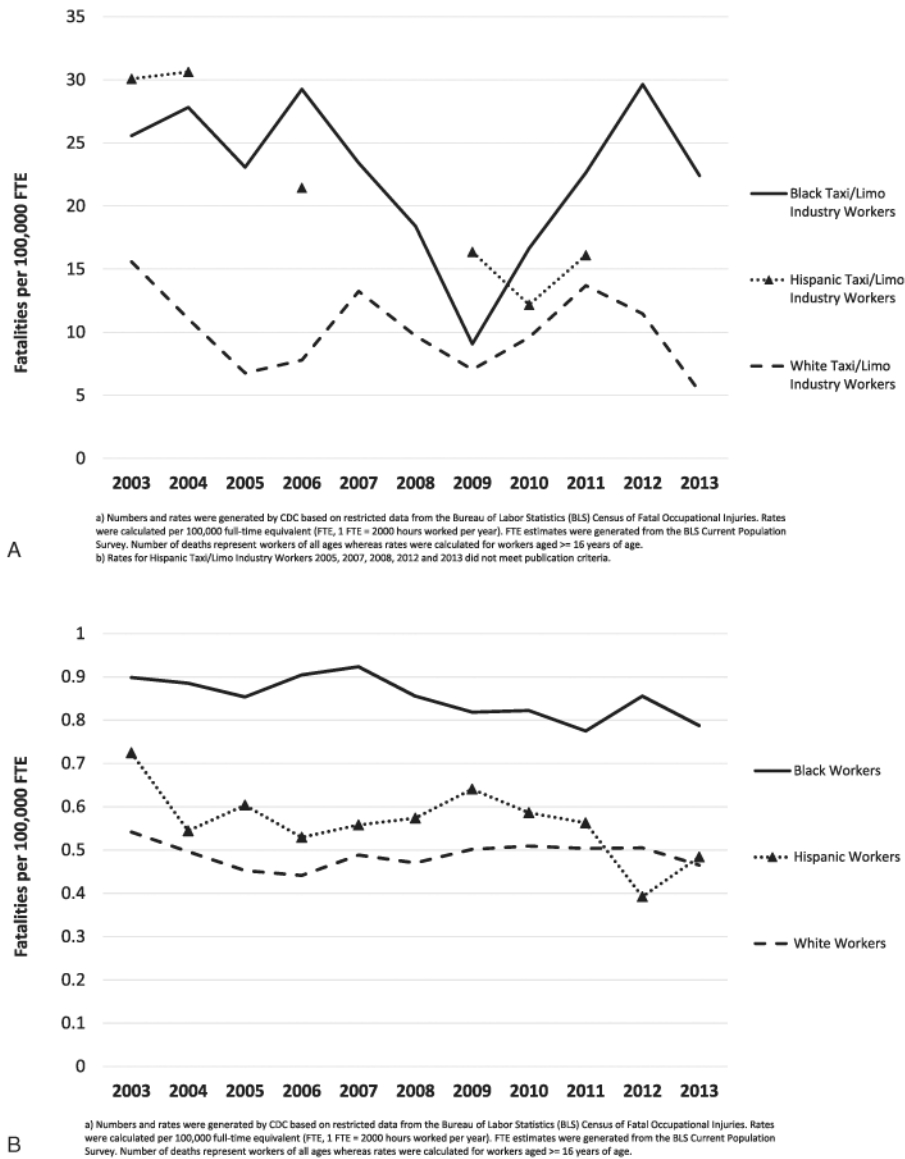


Figure 3.

A. Rates^a of violent work-related fatalities among taxi/limo industry workers by race/ethnicity^b— United States, 2003 to 2013. ^aNumbers and rates were generated by CDC based on restricted data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries. Rates were calculated per 100,000 full-time equivalent (FTE, 1 FTE=2000 hr worked per year). FTE estimates were generated from the BLS current population survey. Number of deaths represent workers of all ages whereas rates were calculated for workers aged greater than or equal to 16 years of age. ^bRates for Race/Ethnicity Hispanic Taxi/Limo Industry Workers 2005, 2007, 2008, 2012, and 2013 did not meet publication criteria. (B) Rates^a of violent work-related fatalities among all workers by race/ethnicity—United States, 2003 to 2013. ^aNumbers and rates were generated by CDC based on restricted data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries. Rates were calculated per 100,000 full-time equivalent (FTE, 1 FTE=2000hr worked per year). FTE

estimates were generated from the BLS current population survey. Number of deaths represent workers of all ages whereas rates were calculated for workers aged greater than or equal to 16 years of age.

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Table 1
Number, Percent, and Rate* of Violent Deaths among Taxi and Limo Drivers by Demographics—United States, 2003 to 2013

	No.	%	Rate [†]	(95% CI)	RR (Unadj)	(95% CI)	RR (Adj) [‡]	(95% CI)
Total	366	100.0	17.8	(16.9, 18.7)	1.00	(0.9, 1.0)	—	—
Sex								
Women	12	3.3	3.3	(1.2, 9.1)	1.0	REF	1.0	REF
Men	354	96.7	15.0	(5.3, 42.1)	4.6	(1.6, 12.8)	6.1	(2.6, 14.1)
Age groups								
<35	73	20.0	13.4	(8.9, 20.2)	1.0	REF	1.0	REF
35–44	87	23.8	12.2	(7.0, 21.3)	0.9	(0.5, 1.6)	1.0	(0.7, 1.6)
45–54	121	31.1	15.4	(9.1, 25.9)	1.1	(0.7, 1.9)	1.2	(0.8, 1.8)
>55	84	23.0	12.7	(7.3, 22.4)	1.0	(0.5, 1.7)	0.9	(0.6, 1.5)
Race/ethnicity								
White, non-Hispanic	108	29.5	9.9	(7.4, 13.4)	1.0	REF	1.0	REF
Asian	27	7.4	6.9	(3.6, 13.5)	0.7	(0.4, 1.4)	1.0	(0.5, 1.9)
Black, non-Hispanic	157	42.9	22.1	(15.0, 32.4)	2.2	(1.5, 3.3)	2.3	(1.6, 3.4)
Hispanic	60	16.4	14.1	(8.6, 23.3)	1.4	(0.9, 2.4)	2.1	(1.3, 3.4)
Other	14	3.8	15.4	(4.2, 56.1)	1.6	(0.4, 5.7)	1.8	(0.6, 5.8)
Nativity								
US-born	187	51.1	16.2	(12.7, 20.7)	1.0	REF	1.0	REF
Foreign-born	179	48.9	11.5	(8.1, 16.3)	0.7	(0.5, 1.0)	0.6	(0.42, 0.79)
Region								
Northeast	90	24.6	7.8	(5.6, 11.0)	1.0	REF	1.0	REF
Midwest	52	14.2	14.8	(8.4, 26.0)	1.9	(1.1, 3.3)	2.1	(1.3, 3.4)
South	153	41.8	22.7	(14.7, 35.0)	2.9	(1.9, 4.5)	2.7	(1.9, 3.9)
West	71	19.4	13.4	(8.1, 22.4)	1.7	(1.0, 2.9)	1.8	(1.2, 2.8)

Bold, italicized values are significant at $P<0.05$.

CI, confidence interval.

* Includes Occupational Injury and Illness Classification System (OIHCS) codes “6” from 2003 to 2010 and “1” from 2011 to 2013.

[†] Numbers and rates were generated by CDC based on restricted data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries. Rates were calculated per 100,000 workers. Estimates of workers were generated from the BLS current population survey. Number of deaths represent workers of all ages whereas rates were calculated for workers aged greater than or equal to 16 years of age.

⚡ Rates were adjusted for all other variables present in the table.

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Number and Percent of Violent Death* Incident Details of Taxi and Limo Drivers by Major Race/Ethnicity Groups†—United States, 2003 to 2013.

Table 2

	All Taxi/Limo Drivers		Non-Hispanic White		Non-Hispanic Black		Hispanic	
	No.	%	No.	%	No.	%	No.	%
Total	366	100.0	108	26.5	157	42.9	60	16.4
Establishment size								
1–10 employees	153	41.8	50	46.3	74	47.1	14	23.3
11–49 employees	54	14.75	17	15.74	27	17.2	—†	—
50+ employees	19	5.2	7	6.5	9	5.7	—	—
Not reported	140	38.3	34	31.5	47	29.9	40	66.7
Location								
Local road/street	259	70.8	72	66.7	109	69.4	48	80.0
Parking lot/garage	57	15.6	21	19.4	21	13.4	9	15.0
Public building	13	3.6	—	—	6	3.8	—	—
Dwelling	11	3.0	—	—	8	5.1	—	—
Other	26	7.2	8	7.4	13	8.3	—	—
Motive								
Robbery	200	54.6	59	54.6	87	55.4	31	51.7
Carjacking	15	4.1	—	—	8	5.1	—	—
Dispute	21	5.7	—	—	13	8.3	—	—
Suicide	5	1.4	—	—	—	—	—	—
Other‡	10	2.7	5	4.6	—	—	—	—
Unknown but intentional¶	115	31.4	36	33.3	45	28.7	22	36.7
Weapon								
Firearm	299	81.7	81	75.0	134	85.4	52	86.7
Knife	38	10.4	15	13.9	14	8.9	5	8.3
Other/unspecified	29	7.9	12	11.1	9	5.7	—	—
Body part injured								
Head	150	41.0	40	37.0	66	42.0	22	36.7
Trunk	100	27.3	29	26.9	47	29.9	18	30.0

	All Taxi/Limo Drivers		Non-Hispanic White		Non-Hispanic Black		Hispanic	
	No.	%	No.	%	No.	%	No.	%
Multiple body parts	75	20.5	25	23.2	28	17.8	15	26.0
Neck/throat	31	8.5	10	9.3	13	8.3	5	8.3
Body systems/other	10	2.8	—	—	—	—	—	—

* Numbers were generated by CDC based on restricted data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries. Number of deaths represent workers of all ages.

† Asian/American Indian/Alaska native grouping did not meet publication criteria.

‡ Did not meet publication criteria.

§ includes drug overdose, gang-related violence, and police self-defense.

¶ Intentional violence by another person with no clear motive.