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Eleven Years of Occupational Mortality in Law Enforcement: The Census of Fatal Occupational Injuries, 1992–2002

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Background *Occupational injury deaths remain high for Law Enforcement Officers (LEOs). This study describes and compares intentional and transportation-related fatality rates in US LEOs between 1992 and 2002.*

Methods *Workplace injury deaths among LEOs from 1992 to 2002 were categorized into "Intentional," "Transportation-related," and "Other," using the Census of Fatal Occupational Injuries. Occupations included in this analysis were sheriffs and bailiffs, police and detectives, non-public service guards, and correctional officers. Fatality rates were compared among law enforcement occupations, cause of death, and demographics with rate ratios and 95% confidence intervals.*

Results *During the 11-year period, 2,280 workers died from an occupational injury, for a fatality rate of 11.8 per 100,000 across all LEO occupations. Forty-seven percent were homicides (n = 1,072, rate 5.6 per 100,000), 36% transportation-related (n = 815, rate 4.2 per 100,000), 11% were due to other causes (n = 249, rate 1.3 per 100,000), and 5% were workplace suicides (n = 122, rate 0.6 per 100,000). The proportion of fatalities by cause of death differed significantly between occupations ($P < 0.0001$). Sheriffs and bailiffs experience a high risk for occupational injury death compared to other law enforcement occupations. Of the transportation-related fatalities, LEOs were operating a motor-vehicle in 58% of the incidents and 22% of the fatalities were struck by incidents.*

Conclusions *Transportation-related deaths were nearly as common as homicides as a cause of occupational injury death among US LEOs. Struck by vehicle incidents remain an important and overlooked cause of death. This research points to opportunities for the prevention of transportation-related deaths in law enforcement.* Am. J. Ind. Med. 53:940–949, 2010. © *2010 Wiley-Liss, Inc.*

KEY WORDS: CFOI; traumatic injury; fatality rates; occupation; police

INTRODUCTION

For those in law enforcement, occupational injury fatality rates remain high compared to the average US worker. In 2007, the occupational injury fatality rate for police officers was nearly 5 times higher than the US average (19.8 per 100,000 workers compared to 4.0) [BLS, 2007a]. The number of law enforcement officers (LEOs) killed while on-the-job has not significantly decreased in the last 15 years and the most recent data from the Bureau of Labor Statistics

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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

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(BLS) demonstrates that between 2006 and 2007, fatalities rose 30% among police officers and 11% among security guards [BLS, 2009a]. Law enforcement remains a dangerous occupation and studies have demonstrated that the greatest risks facing LEOs are homicides, suicides, and motor-vehicle fatalities [Violanti et al., 1996; Clarke and Zak, 1999; Hessl, 2003].

In 2007, 57 police officers were feloniously killed in the line of duty and 75% of these fatalities involved arrest situations, ambushes, or traffic stops [FBI, 2007]. While data on risk factors and circumstances of homicides among police officers are collected annually by the Federal Bureau of Investigations for the Law Enforcement Officers Killed and Assaulted (LEOKA) report [FBI, 2007], much less is known about homicides among other law enforcement occupations. Security guards and correctional officers face a different set of hazards from that of the average police officer, including close contact with violent inmates, working alone, and working late at night, these also increase their risk for intentional injury death [Kraus, 1987; Lincoln et al., 2006; BLS, 2009a].

Recently, suicide has been considered an occupational hazard of police work, resulting from high levels of job stress, availability of firearms, family pressures, and increased alcoholism [Marzuk et al., 2002]. Some studies have indicated that suicide rates are actually increasing; however, these studies have been limited to single police departments and/or cities [Violanti, 1995, 2004, 2008]. There is a general dearth of published work on the risk for suicide among other law enforcement occupations including correctional officers. This is surprising since research shows that mental disorders, depressive symptoms, anxiety, stress, and job dissatisfaction are higher among prison staff than other occupations [Cullen et al., 1989; Goldberg et al., 1996].

Clarke and Zak [1999] found that among police, 45% of occupational fatalities were due to assaults and violent acts and 31% were due to transportation incidents. LEOs spend a large amount of time conducting vehicle patrols, can be involved in dangerous high-speed pursuits, and often perform work alongside interstates and roadways near speeding motor vehicles [Clarke and Zak, 1999; Hutson et al., 2007]. While transportation-related fatality rates remain high, there is a general lack of data describing motor-vehicle crashes (MVCs) in law enforcement.

The primary purpose of this study was to estimate and compare rates of homicide, workplace suicide, and transportation-related fatalities among law enforcement occupations using 11 years of data from the Census of Fatal Occupational Injuries (CFOI) database. A secondary purpose was to identify the work-related activities associated with these fatalities. To our knowledge, this is the first US study to use national data to comprehensively examine fatal injuries by cause and demographics among law enforcement occupations, outside of police officers.

MATERIALS AND METHODS

Data Sources

Workplace injury deaths among US Law Enforcement Officers (LEOs) from 1992 to 2002 were examined using the Census of Fatal Occupational Injuries (CFOI). The CFOI is the most comprehensive and timely source of US workplace injury death data and is maintained by the Bureau of Labor Statistics (BLS). BLS identifies and compiles all US fatal work-related injuries occurring to those 16 years or older using multiple administrative documents including death certificates, workers' compensation reports, medical examiner reports, and police reports. At least two sources are required to verify that an injury was work-related. The CFOI includes data on fatal work injuries from all 50 states and the District of Columbia and are collected from various federal, state, and local sources; however, this analysis used data from restricted access research files and excludes all fatalities from New York City (NYC). The primary difference between the CFOI restricted access files and the CFOI public use files is the addition of several variables including state of injury and state of death. None of these additional variables were utilized in this analysis.

For rate calculations, the number of workers for the years 1992–2002 was determined from the BLS Current Population Survey (CPS). The CPS is a monthly household survey conducted by the BLS to determine demographic and employment information, among other items [BLS, 2007b]. The CPS provides information on the US civilian, non-institutionalized population aged 15 years or older and includes wage and salary workers, self-employed, part-time workers, and unpaid workers in family-oriented enterprises such as farms [BLS, 2007b]. While the numerator excludes fatalities from NYC, the denominator data includes NYC workers and while this may have a minimal impact on rate calculations, we are not able to measure to what extent. CPS data were stratified by gender, age, race, and Census Bureau Occupation Codes.

Variable Definitions

Occupational fatalities occurring in law enforcement were identified using the 1990 Census Bureau Occupation Classification System codes. Data from 1992 to 2002 were selected for this analysis rather than more recently available data in order to capture a decade of occupational fatalities in law enforcement using a consistent set of occupation categories. Between 1992 and 2002, detailed occupation information in the CFOI was coded using the 1990 Census Bureau Occupation Classification System codes. Starting in 2003, CFOI defined occupation using the Standard Occupational Classification (SOC) system. Given the differences between these two classification systems, CFOI considers

2003 to be a break in series for the coding of occupation and there is not a direct match in law enforcement occupation between the 1990 Census Bureau Occupation Classification System codes and the Standard Occupational Classification (SOC) system codes. Four occupation categories were considered for this analysis: (418) public service police and detectives; (423) sheriffs, bailiffs, and other law enforcement officers; (424) correctional institution officers; and (426) guards and police except public service. Excluded from this study were: (414) supervisors, police and detectives, (425) crossing guards and (427) protective service occupations, not elsewhere classified.

All law enforcement fatalities were categorized into three mutually exclusive categories using a systematic methodology: ''Intentional'' including homicides and suicides, ''Transportation-related,'' and ''Other.'' Firstly, the Occupational Injury and Illness Classification System (OIICS) variables for ''source of injury,'' ''nature of injury,'' and ''event or exposure'' were used to place fatalities into one of the three categories [BLS, 1992]. After categorization using these variables, all fatalities were manually examined for accuracy using the narrative text fields. After this quality control step, a trained nosologist further mined the narrative text fields for detailed information such as the weapon used in homicides and suicides, specific police work activity at time of homicide or transportation-related death, and type of motor-vehicle driven for transportation-related deaths. Before data analysis, the lead author performed a final quality control check using a combination of the narrative text fields and OIICS variables.

''Intentional'' fatalities were defined as, ''those killed in an intentional manner via shooting, stabbing, kicking, punching, hitting, or via self-inflicted injuries.'' Fatalities occurring in an accidental manner such as friendly fire or those fatalities occurring during training situations were considered ''Other'' and excluded from the ''Intentional'' category. ''Transportation-related'' fatalities were defined as ''those killed while operating any type of motor-vehicle, being a passenger in a motor-vehicle operated by another, being struck by a moving vehicle while performing work activities either as a pedestrian or sitting in a parked vehicle.'' Fatalities where the narrative text indicated that the LEO was struck by a moving vehicle in an intentional manner were classified as ''Intentional.'' ''Other'' fatalities included training injuries, friendly fire, helicopter and air crashes, crushing injuries, unintentional poisonings, drownings, falls, struck by injuries, and those of unknown circumstances.

Statistical Analysis

Fatal occupational injury rates for 1992–2002 were calculated as the total number of fatalities during this period divided by the estimated number of working LEOs and expressed as the number of fatalities per 100,000 workers. The estimated number of workers was calculated using average annual employment data from the CPS. Fatality rates were compared among different strata of law enforcement occupation, cause of death (intentional or transportation-related), and demographics (race, gender, and age) with rate ratios (RRs) and 95% confidence intervals (95% CI). Characteristics of fatalities including time of death, location of death, type of motor-vehicle involved in fatality, activity at time of death, and weapon used were compared between law enforcement occupations. Analyses were performed with SAS, version 9.1 [SAS Institute, Cary, NC, 2004].

RESULTS

Fatal Occupational Injury Rates

Between 1992 and 2002, there were 2,280 occupational injury deaths in Law Enforcement Officers (LEOs), resulting in an overall injury fatality rate of 11.8 per 100,000 workers (Table I). One thousand seventy-two LEOs died as a result of

TABLE I. Number of Fatalities and Fatality Rate Per 100,000 for Law Enforcement Officers by Occupation and Cause of Death: CFOI, 1992–2002

		Cause of death									
		Homicides		Suicides		Transportation-related		Other[b]		Total[c]	
Occupation	Workers[a]	Number (%)	Fatality rate per 100,000	Number (%)	Fatality rate per 100,000	Number (%)	Fatality rate per 100,000	Number (%)	Fatality rate per 100,000	Number (%)	Fatality rate per 100,000
Sheriffs, bailiffs, others	1,595,026	163 (42%)	10.2	16 (4%)	1.0	174 (44%)	10.9	36 (9%)	2.3	392	24.6
Police and detectives (public service)	6,106,609	425 (43%)	7.0	49 (5%)	0.8	432 (44%)	7.1	78 (8%)	1.3	986	16.1
Guard and police, not public service	8,256,019	455 (57%)	5.5	45 (6%)	0.5	169 (21%)	2.0	116 (14%)	1.4	801	9.7
Correctional institution officers	3,324,594	29 (29%)	0.9	12 (12%)	0.4	40 (40%)	1.2	19 (19%)	0.6	101	3.0
Total	19,282,248	1,072 (47%)	5.6	122 (5%)	0.6	815 (36%)	4.2	249 (11%)	1.3	2,280	11.8

[a]Worker denominator obtained from the Current Population Survey.
[b]"Other" category includes friendly fire, falls, struck by objects, drownings.
[c]Row values do not sum to total due to the exclusion of 22 intentional deaths that were not classifiable as to "Homicide" or "Suicide."

a homicide, resulting in a rate of 5.6 per 100,000 workers and 122 committed suicide while on-duty resulting in a rate of 0.6. Twenty-two intentional fatalities could not be categorized as either homicide or suicide due to lack of sufficient information. Eight hundred fifteen LEOs died as a result of a transportation-related injury, for an overall rate of 4.2 per 100,000 and 249 died of other causes for a rate of 1.3. Cause of occupational injury death differed significantly between LEO occupation categories ($P < 0.0001$). ''Sheriffs, Bailiffs, and Others'' had the highest overall occupational injury fatality rate (24.6 per 100,000), highest homicide rate (10.2 per 100,000), highest suicide rate (1.0 per 100,000), and highest transportation-related fatality rate (10.9 per 100,000) compared to all other LEO occupations.

Male LEOs had significantly higher rates of occupational injury death compared to female LEOs (RR = 3.8, 95% CI = 3.1–4.5) and this discrepancy was evident for both intentional and transportation-related fatalities (RR = 4.7, 95%CI = 3.4–6.0 and RR = 2.6, 95% CI = 1.9–3.3; respectively) (Table II). Black LEO's had a 40% significant decreased risk of transportation-related injury death compared to White LEOs (RR = 0.6, 95% CI = 0.4–0.7). LEOs aged 65 years or older had the highest overall fatality rate (13.3 per 100,000) and transportation-related fatality rate (4.9 per 100,000) compared to all other age groups. LEOs aged 25–34 years of age had the highest intentional fatality rates (7.0 per 100,000).

Intentional Fatalities—Homicides and Suicides

Table III describes the characteristics of the 1,072 occupational homicides, by occupation. Across all LEO occupations, the vast majority of the homicides were the result of a gunshot wound (n = 927, 86%); however fatalities due to stabbings, beatings, and strangulations accounted for over half of the homicides in correctional officers (Table III). Using the narrative text fields, 77% (n = 829) fatalities could be further coded with details related to the work activity at the time of death with the exception of homicides occurring to ''Correctional Institution Officers;'' over half could not be further classified due to missing information. Work-related activity at the time of the occupational homicide differed between LEO occupations. Responding to a call was the leading work activity for ''Police and Detectives,'' as well as for ''Sheriffs, Bailiffs and Others'' (n = 127, 30% and n = 56, 34%, respectively). Breaking up or being involved in an altercation, riot, or robbery was the leading cause for ''Guards and Police'' (n = 164, 36%).

Overall, 90% of the intentional occupational fatalities were homicides (n = 1072) and 10% were suicides (n = 122); however this proportion differed significantly across LEO occupations ($P = 0.0006$, data not shown). Suicides occurring in the workplace comprised 29% of all intentional deaths occurring to ''Correctional Institution Officers,'' compared with 9% occurring to all other LEO occupations. The

TABLE II. Intentional and Transportation-Related Occupational Mortality Rates for Law Enforcement Officers Per 100,000 by Age, Gender, and Race: CFOI, 1992–2002

	Intentional (homicide and suicide)			Transportation-related			Total[a]		
	Number (%)	Rate	RR (95% CI)	Number (%)	Rate	RR (95% CI)	Number (%)	Rate	RR (95% CI)
Total	1,216	6.3		815	4.2		2,280	11.8	
Gender									
Female	52 (4%)	1.6	1.00	60 (7%)	1.8	1.00	120 (5%)	3.6	1.00
Male	1,164 (96%)	7.3	**4.7 (3.4, 6.0)**	755 (93%)	4.7	**2.6 (2.0, 3.3)**	2,162 (95%)	13.6	**3.8 (3.1, 4.5)**
Age[b]									
18–24	118 (10%)	5.2	1.00	74 (9%)	3.3	1.00	210 (9%)	9.3	1.00
25–34	430 (35%)	7.0	**1.3 (1.1, 1.6)**	285 (35%)	4.7	**1.4 (1.1, 1.8)**	776 (34%)	12.7	**1.4 (1.2, 1.6)**
35–44	322 (27%)	6.4	1.2 (1.0, 1.5)	205 (25%)	4.1	1.2 (0.9, 1.6)	575 (25%)	11.5	1.2 (1.0, 1.4)
45–54	215 (18%)	6.3	1.2 (0.9, 1.5)	136 (17%)	4.0	1.2 (0.9, 1.6)	402 (18%)	11.9	**1.3 (1.1, 1.5)**
55–64	95 (8%)	5.6	1.1 (0.8, 1.4)	69 (8%)	4.1	1.2 (0.8, 1.7)	199 (9%)	11.8	1.3 (1.0, 1.5)
65+	35 (3%)	4.3	0.8 (0.5, 1.1)	40 (5%)	4.9	1.5 (0.9, 2.1)	108 (5%)	13.3	**1.4 (1.1, 1.8)**
Race									
White	913 (75%)	6.2	1.0	669 (83%)	4.6	1.00	1,783 (78%)	12.2	1.00
Black	238 (20%)	5.9	0.9 (0.8, 1.0)	105 (13%)	2.6	**0.6 (0.4, 0.7)**	376 (17%)	9.2	**0.8 (0.7, 0.8)**
Other	49 (4%)	8.3	1.3 (0.9, 1.7)	21 (3%)	3.7	0.8 (0.4, 1.1)	80 (4%)	13.5	1.1 (0.9, 1.4)

Bold-face type on RR's indicate a significant finding.
[a]Rows do not sum to total since "Other" category is removed.
[b]Missing age and age <18 excluded.

TABLE III. Characteristics of Law Enforcement Officer Homicides: CFOI, 1992–2002

	N (%)			
	Police and detectives	**Sheriffs, bailiffs, others**	**Correctional institution officers**	**Guard and police, not public service**
Total	425	163	29	455
Cause of death				
Gunshot wound	384 (90%)	150 (92%)	11 (38%)	382 (84%)
Stabbing	*– (–%)*		10 (34%)	26 (6%)
Beating, strangulation	31 (7%)	5 (3%)	*– (–%)*	36 (8%)
Unknown	*– (–%)*	*– (–%)*	*– (–%)*	11 (2%)
Activity at time of homicide				
Suspect apprehension	83 (20%)	23 (14%)	*– (–%)*	16 (4%)
Serving a warrant	31 (7%)	23 (14%)	*– (–%)*	*– (–%)*
Traffic stop	60 (14%)	11 (7%)	*– (–%)*	*– (–%)*
Responding to a call	127 (30%)	56 (34%)	*– (–%)*	62 (14%)
Altercation, riot, robbery	24 (6%)	8 (5%)	7 (24%)	164 (36%)
Other	32 (8%)	22 (14%)	6 (21%)	81 (18%)
Unknown	68 (16%)	20 (12%)	15 (52%)	131 (28%)
Time of day				
Midnight to 5 am	92 (22%)	24 (15%)	*– (–%)*	151 (33%)
5 am to 10 am	59 (14%)	20 (12%)	8 (28%)	42 (9%)
10 am to 3 pm	66 (16%)	36 (22%)	*– (–%)*	67 (15%)
3 pm to 8 pm	55 (13%)	38 (23%)	10 (34%)	38 (8%)
8 pm to midnight	90 (21%)	29 (18%)	*– (–%)*	81 (18%)
Unknown	63 (15%)	16 (10%)	5 (17%)	76 (17%)

Italicized cells do not meet BLS reporting criteria.

majority of the suicides were due to a gunshot wound (n = 100, 82%). Just under half of the suicides occurred between 10 am and 8 pm (n = 40, 40%). Just over half of the suicides occurred to those between the ages of 24 and 44 years of age (n = 69, 56%).

Transportation-Related Fatalities

Table IV describes the characteristics of the 815 transportation-related fatalities. Fifty-three percent occurred to ''Police and Detectives'' (n = 432), 21% occurred to ''Sheriffs, Bailiffs, and Others'' (n = 174), 5% occurred to ''Correctional Institution Officers'' (n = 40), and 21% occurred to ''Guard and Police'' (n = 169) (Table IV). With regard to victim characteristics, LEO's were either the driver or passenger of a motor-vehicle in 64% of the transportation-related fatalities (n = 524) and as pedestrian or while in a parked car in 25% (n = 198) (data not shown). Pedestrian fatalities were highest among ''Guard and Police'' (n = 63, 37%) and driver fatalities were highest among ''Sheriffs, Bailiffs, and Others'' (n = 122, 70%).

With regard to location of transportation-related deaths, most fatalities to ''Police and Detectives'' and ''Sheriffs, Bailiffs and Others'' occurred on local roads and streets (n = 247, 57% and n = 106, 61%, respectively) (Table IV). Interstate, freeways, and highways were the most common locations for ''Correctional Institution Officers'' (n = 25, 63%). Deaths occurring in parking lots or garages were highest among ''Guard and Police'' (n = 21, 12%). The time of day of the transportation-related fatality did not vary overall or between occupations.

Overall, 62% (n = 505) of transportation-related fatalities were coded as to the work activity at the time of the transportation-related death (Table IV). The most prevalent causes of transportation-related death for ''Police and Detectives'' and ''Sheriffs, Bailiffs, Others'' was driving to the scene/call (n = 62, 15% and n = 33, 19%; respectively). Directing traffic was the leading cause of death for ''Guard and Police'' (n = 17, 10%).

DISCUSSION

While homicide is a predominant cause of occupational death among those in law enforcement, police officers, correctional officers, and security guards are also at an increased risk for transportation-related deaths compared to the average US worker. Our study demonstrated that motor-vehicle related deaths were as prevalent as intentional deaths

TABLE IV. Characteristics of Transportation-Related Law Enforcement Officer Fatalities: CFOI, 1992–2002

	N (%)			
	Police and detectives	**Sheriffs, bailiffs, others**	**Correctional institution officers**	**Guard and police, not public service**
Total	432	174	40	169
Victim				
Driver	259 (60%)	122 (70%)	21 (53%)	70 (41%)
Passenger	18 (4%)	8 (5%)	8 (20%)	18 (11%)
Pedestrian	90 (21%)	20 (11%)	*– (–%)*	63 (37%)
Parked car	20 (5%)	*– (–%)*	*– (–%)*	*– (–%)*
Unknown	45 (10%)	*– (–%)*	7 (18%)	*– (–%)*
Type of motor-vehicle[a]				
Car	119 (43%)	58 (45%)	*– (–%)*	11 (13%)
Van (bus)	*– (–%)*	*– (–%)*	11 (38%)	*– (–%)*
Motorcycle	42 (15%)	11 (8%)	*– (–%)*	*– (–%)*
Other	*– (–%)*	*– (–%)*	*– (–%)*	34 (39%)
Unknown	114 (41%)	55 (42%)	13 (45%)	34 (39%)
Location of fatality				
Local road and street	247 (57%)	106 (61%)	12 (30%)	67 (40%)
Interstate, freeway, or highway	171 (40%)	61 (35%)	25 (63%)	45 (27%)
Parking lot or garage	*– (–%)*	*– (–%)*	*– (–%)*	21 (12%)
Unknown	*– (–%)*	*– (–%)*	*– (–%)*	36 (21%)
Time of day				
Midnight to 5 am	93 (22%)	33 (19%)	5 (13%)	33 (20%)
5 am to 10 am	64 (15%)	30 (17%)	10 (25%)	26 (15%)
10 am to 3 pm	86 (20%)	28 (16%)	12 (30%)	31 (18%)
3 pm to 8 pm	63 (15%)	28 (16%)	5 (13%)	28 (17%)
8 pm to midnight	68 (16%)	39 (22%)	*– (–%)*	21 (12%)
Unknown	58 (13%)	16 (9%)	*– (–%)*	30 (18%)
Activity				
High speed pursuit	56 (13%)	14 (8%)	*– (–%)*	*– (–%)*
Driving to scene/call	63 (15%)	33 (19%)	*– (–%)*	*– (–%)*
Directing traffic	18 (4%)	9 (5%)	*– (–%)*	17 (10%)
Crossing street	*– (–%)*	*– (–%)*	*– (–%)*	15 (8%)
Traffic stop	48 (11%)	6 (3%)	*– (–%)*	*– (–%)*
Other	47 (11%)	15 (9%)	10 (25%)	25 (15%)
Patrolling	10 (2%)	11 (6%)	*– (–%)*	12 (7%)
Transporting inmates	*– (–%)*	*– (–%)*	5 (13%)	*– (–%)*
Back-overs	*– (–%)*	*– (–%)*	*– (–%)*	12 (7%)
Unknown	184 (43%)	83 (48%)	20 (50%)	83 (49%)

Italicized cells do not meet BLS reporting criteria.
[a]Category only includes decedents who were drivers or passengers.

among certain LEO occupations. Also, occupational motor-vehicle fatalities were not limited to car crashes; pedestrian activities such as setting up cones and directing traffic were leading causes of struck by vehicle deaths. Important differences in the circumstances of intentional and transportation-related fatalities were found between law enforcement occupations, indicating that prevention programs should be tailored to the specific worker populations.

Our data demonstrate that transportation-related deaths among US LEOs were relatively high over the 11-year period. While our data describe occupational deaths from 1992 to 2002, more recently available data indicate that transportation-related deaths are still a leading cause of occupational injury death in law enforcement. The number of officers killed in transportation-related incidents increased 17% during the first 6 months of 2009 [NLEOMF, 2009].

Reasons for these increasing fatality rates could include the lack of occupational training in specific driver skills or lower usage of personal protective devices among law enforcement. Unfortunately, literature in this area is scant and research on intervention programs is even more uncommon. Nationwide, training in high-risk driving situations such as high-speed pursuits is inconsistent for law enforcement. While some departments offer such training when officers enter the force, others mandate continuing education in this area, and others do not focus on driver skills at all. Police officers do not perceive themselves as better drivers than others and officers often claim they need more specific driving training [Dorn and Brown, 2003; Oron-Gilad et al., 2005]. To our knowledge, there has been no research studying the impact of training interventions in reducing transportation-related deaths among LEOs.

Another potential area for intervention research is the use of personal protective equipment, specifically seat belts, among LEOs. Some states do not require LEOs to wear seat belts and they are often reluctant to do so because seat belts may interfere with firearms and swift exit from patrol cars [Von Kuenssberg Jehle et al., 2005]. Research has demonstrated that while police are aware of the importance of seatbelt use, there are specific situations in which the perceived risk of wearing the seatbelt exceeds the risk of not wearing it [Oron-Gilad et al., 2005]. This same study demonstrated that officers were most concerned with taking the seatbelt off because the perceived time to exit the patrol car and draw a weapon are too long [Oron-Gilad et al., 2005]. This study suggests that non-usage of seatbelts among law enforcement is the result of an ill-fitting seatbelt design that reduces their mobility and increases their risk of intentional injury or death [Oron-Gilad et al., 2005]. While we were not able to measure the effect of seat belt use in this study as details were generally lacking in the CFOI narrative text fields, we believe it is crucial to replicate such research. Research into more effective seat belt designs or engineering interventions to address these concerns is imperative.

To our knowledge, there is no national report of struck by vehicle deaths among LEOs. We found that of the 815 transportation-related fatalities, over 20% died outside of the vehicle, performing work activities as a pedestrian. Over half of these struck by vehicle fatalities occurred when the LEO was involved with a traffic stop or directing traffic. We believe these findings point to an often over-looked risk of law enforcement work. In 2001, NIOSH developed recommendations for the prevention of struck by events while working along roadways specifically for firefighters, including training in safe procedures near moving traffic and the wearing of high-visibility apparel [NIOSH, 2001]. While these recommendations may have usefulness in law enforcement, studies on the implementation, enforcement, and evaluation of these recommendations in law enforcement are uncommon [NIOSH, 2001]. More recently, US federal law now requires all personnel working on a federally funded highway to wear a high visibility vest [Department of Transportation, 2006]. The impact of this law on struck by deaths among emergency responders has not yet been evaluated.

While there is a large volume of research on police suicide, there is controversy whether reported suicide rates are valid [O'Hara and Violanti, 2009]. Recently, a systematic review of suicide among police identified 41 studies and found that rates varied considerable [Hem et al., 2001]. Our reported suicide rate of 0.6 per 100,000 persons is well below the recently reported rates of 15 and 18 per 100,000 persons [Aamodt and Stalnaker, 2001; Marzuk et al., 2002]. There are two possible reasons for this disparity. Firstly, BLS advises caution when interpreting occupational suicide rates derived from the CFOI [BLS, 2009b]. CFOI generally only includes those cases of suicide that occur at the work site [BLS, 2009b]. Determinations of suicides occurring outside of the workplace or not on work time are difficult and not usually recorded as such without clear evidence in the source documents [BLS, 2009b]. Therefore, CFOI counts may not be a complete census of work-related suicide. Secondly, our analysis excluded occupational fatalities from New York City (NYC). At the time of this analysis, data from NYC was not available in our special research files. This is an important limitation since recent work has demonstrated that LEOs in major urban areas appear to have suicide rates in excess of LEOs in rural areas [Aamodt and Stalnaker, 2001]. These findings should not undermine the importance of suicide as a cause of death among LEO's. Data demonstrates that only 10% of suicides among LEOs occur in the workplace [Violanti, 1996]. The majority of suicides occur in the home (65%) [Violanti, 1996].

A finding of interest from this study was that black LEOs have lower occupational transportation-related fatality rates than whites. Historically, blacks have had higher occupational fatality rates (4.4 per 100,000 for blacks versus 4.1 per 100,000 for whites) [BLS, 2005]. The bulk of this difference is explained by differences in job type between blacks and whites—blacks have generally held more dangerous jobs [Wagener and Winn, 1991; Loomis and Richardson, 1998]. However, this overall difference in fatality rates is eliminated when controlling for occupation [Loomis and Richardson, 1998]. Loomis and Richardson examined occupational fatalities in North Carolina between 1977 and 1991 and found that fatality rates for those in protective service occupations were identical for blacks and whites (1.3 per 100,000) (1998). There are also few differences between blacks and whites in regards to overall motor-vehicle fatality rates (rates combining both occupational and non-occupational injury events). The most recent data from the National Highway Traffic Safety Administration demonstrates that blacks have similar overall motor vehicle fatality rates when compared to whites (12.50 per 100,000 for blacks and 12.31

per 100,00 for whites) [NHTSA, 2009]. To the best of our knowledge, no study has examined racial differences in specific causes of occupational injury death (such as motor-vehicle related events). Further research is needed to evaluate possible reasons for the discrepancy between blacks and whites in this study.

Moreover, some of the socio-demographic findings presented here could be indicative of urban-rural differences. While an analysis controlling for these important differences is not possible within CFOI, these factors should be considered in relation to our overall findings. There are important differences in the job duties, work routines, and risks of law enforcement work between urban and rural police officers [Liederbach and Frank, 2003, 2006]. In the US, police agencies are organized into geographical districts [Liederbach and Frank, 2003, 2006]. While uniformed police officers often work in municipal police departments and have duties including regular patrols and responding to calls for service, sheriffs enforce the law at the county level [Liederbach and Frank, 2003, 2006]. Sheriffs are normally elected officials, entrusted with a broader range of responsibilities, and often cover more geographical diverse areas [Liederbach and Frank, 2003, 2006]. Sheriffs may have more frequent and more intimate interaction with the public than their urban counterparts [Liederbach and Frank, 2003, 2006].

In this study, we found those employed as ''Sheriffs, Bailiffs, and Others'' had higher fatality rates than all other LEO occupations. There are several possible explanations for this disparity. First, sheriffs' departments tend to be relatively small, most having fewer than 25 sworn officers [BLS, 2010]. Therefore, while sheriffs perform duties similar to police such as patrolling and responding to calls, they often perform these duties in isolation—without a partner and often in rural, unincorporated areas [BLS, 2010]. If problems arise during the course of a call, there can be a significant period of time between the call for back-up and the arrival of any form of assistance. Second, Sheriffs enforce the law at the county level and this often includes rural areas. Research has shown that motor-vehicle injury fatality rates are consistently higher in rural than in urban areas [Baker et al., 1987; Brown et al., 2000; Clark, 2001]. Potential explanations for this difference in motor vehicle injury fatality rates include: those in rural areas drive more miles [Baker et al., 1987]; rural roads may be less safe [Muelleman and Mueller, 1996]; rural crashes may be more severe due to differing speed limits [Muelleman et al., 1993], and crash victims may not receive medical attention quickly [Bentham, 1986]. Third, this occupational category includes bailiffs who provide security work in city and county courts. This work can be more hazardous than other types of police work since bailiffs are often not armed while inside court facilities and frequently transport criminals alone [BLS, 2010].

This study aimed to evaluate the usefulness of CFOI narrative text data in determining more specific details on intentional and transportation-related deaths among US LEOs. More detailed data on factors such as perpetrator, weapon used, type of motor-vehicle, seat-belt use, and work activity at the time of the injury death could have implications for occupational safety and health interventions and programs. There were discrepancies in the level of detail available in the narrative text fields between law enforcement occupations. While this may be a limitation of the CFOI, it may also be a reflection of the nature of work for the different LEO occupations. In general there were good details in the cause of death for police, sheriffs, and bailiffs. Conversely, death narratives for guards and correction officers, were often lacking detail, and stated only ''Killed by Inmates.'' Since persons in these occupations usually work alone and at night, there may not be an opportunity to collect more descriptive details of intentional fatalities in these occupations.

The limitations of this study are consistent with the limitations of other studies utilizing CFOI data. While we recoded the narrative text fields, there was limited information on the detailed circumstances of these events, especially for correction officers. While the CFOI is the most comprehensive surveillance system of occupational fatalities, we had limited data on confounding factors related to work conditions, lifestyle factors, and rural-urban status. Also, small cell values in some socio-demographic subgroups (females, workers older than 65 years of age) prevented a stratified analysis by cause, socio-demographics, and occupation. Finally, the occupational fatality rates could have misclassification in both the numerator and denominator. Data collection for the CFOI is limited to injury events occurring ''at work.'' LEOs may be at increased risk for fatal injuries occurring while off-duty. While off-duty, a LEO may be recognized and fatally assaulted by a previously apprehended criminal. While these deaths do not fall under the BLS criteria for an occupational fatality, they are clearly linked to their profession. Regardless of occupation, homicides and suicides are especially prone to misclassification as non-occupational, resulting in an underestimate of the true count [Stout and Bell, 1991; Kraus et al., 1995, 2005; Peek-Asa et al., 1997]. Since we included occupations that heavily utilize part-time employment (security guards), a more stable denominator choice would have been hours worked; however, such data were not available at the national level [Peek-Asa et al., 1999].

Another important limitation of this analysis is the exclusion of occupational fatalities occurring in New York City (NYC). At the time of this study, NYC did not provide data to the access-restricted CFOI research files used in this analysis. While this is a limitation that should be noted given the population of interest, recent data from BLS indicate that NYC LEOs may not be an increased risk for occupational death, above and beyond the average US LEO. In 2007, there

were nine deaths for those in protective service occupations in NYC, 55% were homicides (n = 5) [BLS, 2008]. This analysis found that 47% of LEO fatalities were homicides.

Also, while nationwide, motor-vehicle incidents remained the most frequent fatal workplace event (24% of all fatal work injuries), only 6% of occupational injury fatalities were due motor-vehicles in NYC [BLS, 2008].

In conclusion, this research provides a national description of intentional and transportation-related occupational fatalities among law enforcement personnel using a well-established surveillance system spanning an 11-year period. This analysis is an early step to the identification of circumstances and risk factors specific to law enforcement occupations and causes of work-related death. While these have long been recognized as important causes of occupational death among LEOs, research has not been able to evaluate specific circumstances of these events at a national level. This research points to a variety of opportunities for the prevention of intentional and transportation-related deaths in law enforcement. The implementation and evaluation of successful prevention programs which are based on scientific research data will help decrease the occupational mortality rate in LEOs.

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