Pattern of law enforcement–related injuries in the United States

David C. Chang, PhD, MPH, MBA, Mallory Williams, MD, MPH, Naveen F. Sangji, MD, MPH, L.D. Britt, MD, MPH, *and* **Selwyn O. Rogers, Jr., MD, MPH**, *Boston, Massachusetts*

BACKGROUND: The pattern of law enforcement–related injuries of police and civilians in the United States is unknown.

METHODS: Data were aggregated from the Federal Bureau of Investigations, the Bureau of Justice Statistics, the Centers for Disease Control (CDC) Web-based Injury Statistics Query and Reporting System, and the Nationwide Inpatient Sample (NIS) from 2003 to 2011. Law enforcement–related injuries in the CDC Web-based Injury Statistics Query and Reporting System and the NIS were identified using E-codes 970–976, which are meant to identify "injuries inflicted by the police or other law-enforcing agents, including military on duty, in the course of arresting or attempting to arrest lawbreakers, suppressing disturbances, maintaining order, and other legal action."

RESULTS: The CDC reported a total of 715,118 nonfatal injuries and 3,156 fatal injuries from 2003 to 2011. In contrast, for the same period, the NIS identified a total of 3,958 patients, ranging from 348 to 572 per year. Among the injured, 1,548 (48.0%) were white, 866 were black (26.8%), and 605 were Hispanic (18.8%); 1,011 patients (25.5%) were injured by firearms, while 2,304 (58.2%) experienced blows or manhandling. Firearm-injured hospitalized patients are more likely to be male, black or Hispanics, and in the age group of 18 years to 39 years.

CONCLUSION: The majority of law enforcement–related injuries are among white or black young men. Hispanic patients are more likely to be injured by a firearm than struck. When injured by firearm, white and black patients are more likely to die compared with Hispanic patients. Unfortunately, data about these injuries are scattered across multiple data systems. A uniform national system to aggregate these data sources is needed to better understand the scope of the problem, for both law enforcement personnel and civilians. (*J Trauma Acute Care Surg.* 2016;80: 870–876. Copyright © 2016 Wolters Kluwer Health, Inc. All rights reserved.)

LEVEL OF EVIDENCE: Epidemiologic study, level III.

KEY WORDS: Law enforcement; civilian; pattern of injuries.

Contemporary events of both law enforcement–related homicides of citizens and citizen-related homicides of police have attracted our nation's attention to the overall state of community-police relations.[1–4] One global measurement of the health of this relationship over time can be measured by the violent interactions between communities and law enforcement. This information demonstrates the fair, appropriate, and equal use of law enforcement strategies for all populations. While the data for law enforcement officers killed or assaulted are robustly collected, our understanding of the use of force by law enforcement agencies is significantly limited by local and federal reporting structures.[5,6]

The objectives of this study were to investigate the federal data sets for law enforcement–related injuries and deaths and to describe any patterns that exist. We hope that these data could shed light on current community-police relations by better understanding the current state of reporting of patterns of law enforcement–related injuries in the United States.

Submitted: September 30, 2015, Revised: January 21, 2016, Accepted: January 25, 2016, Published online: February 18, 2016.

From the Department of Surgery (D.C.C., N.F.S.), Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts; Department of Surgery (L.D. B.), Eastern Virginia Medical School, Norfolk, Virginia; and Department of Surgery (S.O.R.), University of Texas Medical Branch at Galveston, Galveston, Texas; and Department of Surgery (M.W.), Medical Element, Soto Cano Air Base, Comayagua, Honduras.

This study was presented at the 74th annual meeting of the American Association for the Surgery of Trauma, September 9–12, 2015, in Las Vegas, Nevada.

Address for reprints: David C. Chang, PhD, MPH, MBA, Department of Surgery, Massachusetts General Hospital, Harvard Medical School, 165 Cambridge St, Suite 403, Boston, MA 02114; email: dchang8@mgh.harvard.edu.

DOI: 10.1097/TA.0000000000001000

PATIENTS AND METHODS

Data were aggregated from the Federal Bureau of Investigations (FBI) Uniformed Crime Report, including the Law Enforcement Officer Killed or Assaulted Report, the Bureau of Justice Statistics (BJS) Deaths in Custody Reporting Program (DICRP), the Centers for Disease Control (CDC) Web-based Injury Statistics Query and Reporting System, and the Nationwide Inpatient Sample (NIS) from 2003 to 2011.[5,7–9]

FBI Uniformed Crime Reporting Program Data Collection and Evaluation

The FBI's Uniform Crime Reporting (UCR) program is the most comprehensive analysis of violent crime and property crime in the United States. The UCR applies estimation procedures to account for populations covered by reporting agencies. Currently, 18,000 voluntary reporting entities consist of city, university and college, county, state, tribal, and federal law enforcement agencies. For the Law Enforcement Officers Killed or Assaulted Report of the UCR, FBI collects local and state data with both annual FBI investigative reports and information from nonprofit organizations such as Concerns of Police Survivors and National Law Enforcement Officer's Memorial Fund. The UCR covers approximately 98% of the nation's population. Ninety-nine percent of metropolitan areas are covered versus 93% of nonmetropolitan areas.[10] The FBI defines "justifiable

TABLE 1. Statistics Related to Nonpolice Injuries During Law Enforcement Activities, as Reported From the Following Sources

Year	Arrests Total	Police Assaulted in the Line of Duty	Nonpolice Injuries	Nonpolice Inpatient Admissions Estimates	Fatal Injuries	ARDs	Arrest-Related Homicides	Justifiable Homicide by Law Enforcement	Police Killed in the Line of Duty
Source	FBI	FBI	CDC	NIS	CDC	BJS	BJS	FBI	FBI
2003	9,529,469	57,841	59,371	1,946	347	627	376	373	52
2004	9,940,671	59,373	73,282	2,056	311	673	375	367	57
2005	10,189,691	57,546	68,603	1,700	330	689	377	341	55
2006	10,437,620	58,634	84,383	2,121	360	721	447	376	48
2007	10,656,710	59,201	79,730	2,057	351	455	455	398	57
2008	10,662,206	58,792	78,718	1,874	326	629	404	378	41
2009	10,690,561	57,268	83,565	2,336	333	729	497	414	48
2010	10,177,907	53,469	90,914	2,884	344	n/a	n/a	397	56
2011	9,499,725	54,774	96,552	2,508	454	n/a	n/a	393	72

homicides" as the killing of a suspected felon by a law enforcement officer in the line of duty.[11] Single linear regression was used to determine linear trends over time, which were examined with year as the covariate.

CDC and NIS Data Collection and Evaluation

For the CDC data and the NIS data, law enforcement–related injuries were identified using International Classification of Diseases—9th Rev. (ICD-9) E-codes 970–976, which are meant to identify "injuries inflicted by the police or other law-enforcing agents, including military on duty, in the course of arresting or attempting to arrest lawbreakers, suppressing disturbances, maintaining order, and other legal action." Unadjusted comparisons were performed with χ^2 tests. Linear trends over time were examined with single linear regressions, with year as the covariate.

BJS DICRP Data: Collection and Evaluation

The BJS reports on "arrest-related deaths" (ARDs) in more than 40 states within the DICRP, the largest source of information ever collected on ARD.[7] This program covers 36% to 48% of all law enforcement homicides in the nation.[12] The BJS defines ARD as all juvenile and adult deaths of criminal suspects and noncriminal individuals whose death was attributed to events that occurred during an interaction with state or local law enforcement.[7] Four populations are excluded from the reporting of ARD: (1) bystanders, hostages, and law enforcement personnel; (2) law enforcement officers; (3) wanted suspects before police contact; and (4) vehicular pursuits without any direct contract.[7] "Arrest-related homicides" are a subset of ARD and include murder and nonnegligent manslaughter: the willful killing of one human being by another that occurs during an interaction with law enforcement (law enforcement or others).[7] Homicides are judged by police investigation and not by jury trial.[7] Single linear regression was performed to determine linear trends over time, which were examined with year as the covariate.

RESULTS

Police Morbidity and Mortality (FBI Data)

Table 1 illustrates numerical counts for years 2003 to 2011 from the different databases. The FBI reported a total of 91 million arrests in a 9-year period. During this same period, there were a total of 516,898 law enforcement officers assaulted or 0.6% of all arrests. FBI's Law Enforcement Officer Killed or Assaulted Reports show that there were a total of 486 police killed in the line of duty during this same period or a 0.0005% chance of mortality per arrest. There was a statistically significant decrease in police assaulted in the line of duty (linear regression coefficient for year is −506, $p = 0.04$) during the 9-year period.

Civilian Morbidity and Mortality (CDC and NIS Data)

The CDC reported a total of 715,118 nonfatal injuries and 3,156 fatal injuries by civilians in this period, while the NIS captured a total of 19,482 inpatient admissions related to law enforcement injuries. This represents a 0.9% nonfatal injury rate and a 0.004% mortality rate per arrest for civilians during the 9-year period. The BJS reported a total of 4,523 ARDs from 2003 through 2009 (0.005% mortality rate per arrest). There were 2,931 deemed "arrest-related homicides" or 65% of all ARDs. Separately, the FBI reported a total of 3,437 "justifiable homicides by law enforcement." Statistically significant increases were observed in nonfatal injuries as reported by CDC (linear regression coefficient, +3765; $p = 0.001$) and increase in inpatient admissions (linear regression coefficient for year is +96, $p = 0.03$). There has been an increase in "arrest-related homicides" (linear regression coefficient for year is +17.8, $p = 0.03$) and increase in "justifiable homicides" (linear regression coefficient for year is +5.3, $p = 0.045$). There was no statistically significant trend over time in terms of total number of arrests, CDC-reported fatal injuries, BJS-reported ARDs, or FBI-reported police killed in the line of duty.

Demographics and Characteristics of Law Enforcement–Related Civilian Injuries (CDC)

Table 2 presents the characteristics of law enforcement–related civilian injuries as captured by the CDC. The majority of patients experiencing injuries were young males. Blacks outnumber whites and Hispanics. Strikes accounted for the majority of injuries (63.6%). Firearms accounted for the least injuries (1.1%). Among nonfatal injuries, firearm-injured patients were more likely for those of Hispanic ethnicity and male sex.

TABLE 2. Comparison of Nonfatal Nonpolice Injuries by Law Enforcement (CDC Data)

	Total		Struck		Firearm		*p*
			n	%	n	%	(Firearm vs. Struck)
Total	715,118	100.0%	454,699	63.6	7,691	1.1	
Sex							
Male	600,817	84.0%	376,420	82.8	7,201	93.6	<0.001
Female	114,058	16.0%	78,154	17.2	490	6.4	
Race							
White	230,613	32.2%	141,338	31.1	2,165	28.1	<0.001
Black	252,757	35.3%	162,971	35.8	1,460	19.0	
Hispanic ethnicity	77,216	10.8%	50,799	11.2	2,481	32.3	
Age							
15–39	514,911	72.0%	326,160	71.7	5,839	75.9	<0.001
40–44	72,458	10.1%	44,809	9.9	605	7.9	
45–49	52,347	7.3%	33,351	7.3	439	5.7	
50–54	32,141	4.5%	21,540	4.7	157	2.0	
55–59	14,406	2.0%	9,310	2.0	324	4.2	
60–64	5,831	0.8%	4,009	0.9	107	1.4	
65–69	3,348	0.5%	2,391	0.5	<10		
70–74	1,144	0.2%	835	0.2	<10		
75–79	791	0.1%	674	0.1	<10		
80–84	270	0.0%	249	0.1	<10		
≥85	216	0.0%	45	0.0	<10		
Year							
2003	59,371	8.3%	37,590	8.3	702	9.1	<0.001
2004	73,282	10.2%	45,516	10.0	890	11.6	
2005	68,603	9.6%	41,004	9.0	1,034	13.4	
2006	84,383	11.8%	54,686	12.0	801	10.4	
2007	79,730	11.1%	52,257	11.5	1,198	15.6	
2008	78,718	11.0%	49,813	11.0	984	12.8	
2009	83,565	11.7%	51,537	11.3	679	8.8	
2010	90,914	12.7%	58,778	12.9	963	12.5	
2011	96,552	13.5%	63,517	14.0	440	5.7	

The overall fatal injury rate recorded by CDC was 0.44% (3,156 fatal injuries and 715,118 nonfatal injuries). Table 3 presents an analysis of a subset of the fatal injuries, by comparing fatal versus nonfatal injuries among firearm patients. The fatality rate in these patients is 29%. Fatal firearm injuries were more likely to be among men than women. They were also more likely to occur in whites or blacks compared with Hispanics. Fatal firearm injuries were also more likely to occur in patients older than 40 years.

NIS Data on Law Enforcement–Related Civilian Injuries

Table 4 presents the characteristics of law enforcement–related civilian injuries as captured by the NIS. There were a total of 3,958 patients in this period, ranging from 348 to 572 per year, which extrapolated to 1,700 to 2,884, nationally. This trend is statistically significant (linear regression coefficient for year is 96, $p = 0.03$). The majority of patients were male, young, and injured by blows or manhandling. There were 1,011 firearm injury patients (25.5%) and 2,304 from blows or manhandling (58.2%). Firearm-injured hospitalized patients are more likely to be male, black, or Hispanics and in the age group of 18 years to 39 years. These black and Hispanic male patients were also more likely to experience mortality as a result of their injuries.

Table 5 presents the multivariate analysis for likelihood of firearm injuries in these encounters. Male sex and young age are the only significant predictors. Race and ethnicity were not statistically significant.

DISCUSSION

Assaults against law enforcement officers decreased between 2003 and 2011. In contrast, during the same period, there were significant increases in law enforcement–related civilian injuries. The majority of law enforcement–related injuries are caused by strikes against white or black young men. However, in contrast to both national population demographics and arrests for violent crimes, these injuries are disproportionately more common in men and in blacks. Hispanic patients are more likely to be injured by firearms than struck. However, when injured by firearms, white and black patients are more likely to die than Hispanic patients.

TABLE 3. Comparison of Fatal and Nonfatal Nonpolice Firearm Injuries by Law Enforcement (CDC Data)

	Fatal		Nonfatal		
	n	%	n	%	*p*
Total	3,156	29.1	7,691	70.9	
Sex					
Male	3,032	96.1	7,201	93.6	<0.001
Female	124	3.9	490	6.4	
Race					
White	1,528	48.4	2,165	28.1	<0.001
Black	820	26.0	1,460	19.0	
Hispanic ethnicity	668	21.2	2,481	32.3	
Age					
15–39	2,064	65.4	5,839	75.9	<0.001
40–44	337	10.7	605	7.9	
45–49	281	8.9	439	5.7	
50–54	192	6.1	157	2.0	
55–59	112	3.5	324	4.2	
60–64	78	2.5	107	1.4	
65–69	42	1.3	<10		
70–74	22	0.7	<10		
75–79	11	0.3	<10		
80–84	<10		<10		
≥85	<10		<10		
Year					
2003	347	11.0	702	9.1	<0.001
2004	311	9.9	890	11.6	
2005	330	10.5	1,034	13.4	
2006	360	11.4	801	10.4	
2007	351	11.1	1,198	15.6	
2008	326	10.3	984	12.8	
2009	333	10.6	679	8.8	
2010	344	10.9	963	12.5	
2011	454	14.4	440	5.7	

TABLE 4. Comparison of Characteristics of Nonpolice Injuries By Law Enforcement, Subsequently Hospitalized (NIS Data)

	Total		Firearm		Blow or Manhandle		*p*
			n (Mean)	% (SD)	n (Mean)	% (SD)	(Firearm vs. Blow or Manhandling)
Total	3,958	100.0	1,011	25.5	2,304	58.2	
Sex							
Male	3,494	88.8	948	94.4	1,971	86.5	<0.001
Female	439	11.2	56	5.6	307	13.5	
Race							
White	1,548	48.0	337	42.4	940	50.0	0.003
Black	866	26.8	244	30.7	479	25.5	
Hispanic ethnicity	605	18.8	168	21.2	334	17.8	
Age							
18–39	2,290	60.7	681	71.6	1,252	57.3	<0.001
40–44	447	11.8	96	10.1	278	12.7	
45–49	376	10.0	59	6.2	244	11.2	
50–54	294	7.8	50	5.3	186	8.5	
55–59	147	3.9	30	3.2	85	3.9	
60–64	86	2.3	12	1.3	58	2.7	
65–69	51	1.4	11	1.2	29	1.3	
70–74	23	0.6	<10		18	0.8	
75–79	27	0.7	<10		18	0.8	
80–84	17	0.5	<10		12	0.6	
85–89	<10		<10		<10		
≥90	12	0.3	<10		<10		
Year							
2003	388	9.8	123	12.2	194	8.5	0.007
2004	420	10.6	119	11.8	225	9.8	
2005	348	8.8	76	7.5	219	9.5	
2006	436	11.0	112	11.1	245	10.7	
2007	422	10.7	113	11.2	229	10.0	
2008	385	9.7	93	9.2	228	9.9	
2009	469	11.9	108	10.7	286	12.5	
2010	572	14.5	137	13.6	349	15.2	
2011	518	13.1	130	12.9	320	13.9	
Hospital course							
Length of stay	6.10	11.72	10.17	18.37	4.85	8.44	<0.001
Survival risk ratio	0.87	0.18	0.73	0.25	0.93	0.07	<0.001
Death	102	2.60	87	8.73	12	0.53	<0.001

A series of ARDs across our nation have raised a fundamental question about equality in the law enforcement strategies deployed in communities across our nation. Although we may want to believe that these events are isolated incidents, especially in America, our history has nevertheless provided repeated examples of law enforcement actions that have been deemed questionable.[1–3] However, comprehensive data on this issue are sparse because of its political sensitivity, and thus, their patterns, if any, are unknown.

Our data demonstrate that police assaults (FBI UCR) significantly decreased during the period, while hospital admissions (NIS) and nonfatal injuries (CDC) to civilians increased. These data would seem to indicate that there are escalating interactions resulting in increasing harm to civilians but not to police officers. In multivariate analyses, NIS data suggest that male sex was the only predictor of firearm injury (not race or ethnicity). However, white and black males older than 40 years were statistically more likely to be injured by firearms (CDC). Blacks and Hispanic males aged 18 years to 39 years were more likely to be hospitalized from firearm injuries and experience mortality. Given the higher proportion of violent crime arrests reported in the white population, these data may suggest a different intensity and severity of force during law enforcement interactions with blacks and Hispanics. This is somewhat consistent with the contemporary images of recent events of ARDs in our nation.

Our study has several strengths. We examined national inpatient clinical databases, which provide some insights into the clinical course of patients and provide some validation for data from other sources. For the first time in an amalgam of data, we can identify patterns of law enforcement–related injuries in the United States over time. Our study also highlights the variability of the data definitions and lack of uniformity of the data sets.

TABLE 5. Logistic Regression for Likelihood of Nonpolice Injuries by Firearms While Being Arrested, and Subsequently Hospitalized

	Odds Ratio	95% Confidence Interval	*p*
Race			
White	Reference		
Black	1.24	0.97–1.58	NS
Hispanic ethnicity	1.12	0.86–1.46	NS
Asian	0.61	0.27–1.40	NS
Native American	0.88	0.37–2.13	NS
Other	0.87	0.55–1.38	NS
Sex			
Male	Reference		
Female	0.47	0.33–0.67	<0.001
Age			
18–40	Reference		
40–45	0.66	0.50–0.88	0.01
45–50	0.42	0.30–0.58	<0.001
50–55	0.48	0.33–0.71	<0.001
55–60	0.56	0.35–0.88	0.01
60–65	0.32	0.14–0.73	0.01
65–70	0.74	0.37–1.51	NS
70–75	0.26	0.06–1.12	NS
75–80	0.23	0.05–0.97	0.05
80–85	0.22	0.03–1.69	NS
85–90	0.69	0.08–5.77	NS
>90	1.28	0.33–4.89	NS

NS, nonsignificant.

The study has several limitations. The inconsistencies in the data and data definitions preclude any meaningful comparisons between databases. However, "inaccurate" data can still be valuable from a population screening perspectives, as a long as they are properly interpreted with limitations kept in mind. The reliance of an imperfect data source for population screening is common in the workup of many clinical conditions (e.g., fecal occult blood for colon cancer screening), and their values are not questioned, as long as they are understood as screening tests and no definitive treatments are pursued solely based on these screening tests. Conversely, dismissing positive screening test results because they are often "inaccurate" would be considered malpractice.[13] A more important limitation to our study is the fact that there are distinct ICD-9 E-codes to capture injuries to civilians but no separate ICD-9 E-codes to capture injuries to law enforcement personnel, which is a shortcoming of current definitions. Currently, injuries to law enforcement personnel are captured under E-codes meant to capture interpersonal violence; law enforcement personnel who are victims are not differentiated from civilian victims of other civilian interpersonal violence. The ICD-10 coding system should rectify this problem as it provides for separate E-codes to capture injuries to law enforcement personnel with greater specificity. The underrecording of E-codes is also a widely known problem, although it is likely to be random and not affect our findings. Furthermore, statistically significant findings from single linear regressions are very difficult to interpret because of the addition of reporting institutions each year. Finally, the reporting structures for the FBI and BJS are voluntary, and these reports cover less than 100% of the population. Specifically, the BJS DICRP only covers an estimated 36% to 48% of the law enforcement homicides in the nation.[7] BJS concluded that the Arrest-Related Death Report likely did not capture all ARDs in the nation and suspended the report on March 31, 2014.[14]

Our study has important policy implications. The United States has led the world in the human experiment of constitutional democracy. Since the ability to enforce laws in a way that minimizes casualty on both sides is an important fabric for every democratic society, America should now lead the world in the science of law enforcement. Currently, data about these injuries are scattered across multiple data systems that depend on voluntary reporting. A uniform national system to aggregate these data sources is needed to better understand the problem, for both law enforcement personnel and for civilians. While it is concerning that questions of equality are being raised in the crucial area of law enforcement, it is more concerning that these questions cannot be convincingly answered with comprehensive analyses of existing data. We would like to make two proposals, which are not meant to be comprehensive because we would not claim to be experts on this issue—the fact is no one really is—but we hope that they would merely serve to begin the dialogue, so that we can begin a collective discussion on this issue:

1. Development of a uniform nomenclature, to be used across all federal databases.
2. Comprehensive data collection for all ARDs in the United States, by continuing the Department of Justice BJS Arrest-Related Deaths Report that was previously suspended in 2014.
3. Development of a federal task force composed of key stakeholders including law enforcement personnel, civilians, legislators, and community leaders to assess and evaluate the factors contributing to and provide recommendations to reduce law enforcement–related injuries and deaths for officers and civilians in the United States.

In a recent speech, FBI Director James B. Comey stated, "Demographic data regarding officer-involved shootings is not consistently reported to us through our Uniformed Crime Reporting Program. Because reporting is voluntary our data is incomplete and therefore, in aggregate, unreliable…The first step to understanding what is really going on in our communities and in our country is to gather more and better data related to those we arrest, those we confront for breaking the law and jeopardizing public safety and those who confront us. 'Data' seems a dry and boring word but, without it, we cannot understand our world and make it better."[4] California recently began an initiative to provide public access to data regarding interactions between police and the public, following a study by the California Attorney General that found disproportionate patterns of injuries between different population groups.[15]

We wholeheartedly agree with Director Comey. Using aggregated data from several databases, we have attempted to create the most accurate picture possible to date of the pattern of law enforcement injuries in America. What our study perhaps best demonstrates is that the data are incomplete, the structure of the data reporting is variable with a heavy reliance on voluntary reporting systems, and there is an inconsistent nomenclature between databases. Currently, there is not a comprehensive understanding of law enforcement–related injuries by civilians because of multiple incomplete federal databases and a voluntary

reporting structure. Given the current scrutiny of law enforcement, we should expand the current databases within the Department of Justice BJS and heavily incentivize comprehensive reporting with uniform nomenclature.

AUTHORSHIP

D.C.C. contributed in the literature search, study design, data collection, data analysis, data interpretation, writing, and critical revision. M.W. contributed in the literature search, study design, data collection, data analysis, data interpretation, writing, and critical revision. N.F.S. contributed in the data interpretation and critical revision. L.D.B. contributed in the study design, data interpretation, and critical revision. S.O.R. contributed in the study design, data interpretation, and critical revision.

DISCLOSURE

The authors declare no conflicts of interest.

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DISCUSSION

Dr. Alexander Eastman (Dallas, Texas): Law enforcement today demands transparency. When we hurt people this should be studied, examined, and brought to light. I applaud the authors for attempting to bring some science to a place where really there has been none.

David and his co-authors have given us a paper that is clearly intended to provoke a provocative discussion. They set a lofty goal of measuring community and law enforcement relations as related by violent interactions.

Sometimes, particularly with regards to a topic as controversial and emotional as current community-police relations, no data is better than bad data with unclear methodology.

The authors have attempted to amalgamate several data sources, none of which can answer nor were designed to be surrogate measures of the community-police relationship.

The LEOCA [Law Enforcement Officers Killed or Assaulted] database is woefully inadequate as a marker of law enforcement officer injuries. In fact, it includes nothing about injury or medical information, despite ongoing attempts by several law enforcement agencies and organizations to include this in this dataset.

The Death in Custody Review Program from the Bureau of Justice Statistics was abandoned due to inadequate data collection. And both WISQRS and the NIS are way too vague to attempt to answer this challenging question because they ignore emergency department data.

If one wants to examine injuries to law enforcement officers or examine law enforcement officer assaults, there are better data sources, although none are perfect.

In the landmark study *Reducing Officer Injuries* commissioned by the International Association of Chiefs of Police, a 1% sample of U.S. law enforcement officers was followed prospectively over a year. This included data from 18 diverse local and state police agencies in this prospectively collected dataset. Thirteen-point-two percent of officers were injured in the line of duty.

Using U.S. OSHA data from 2013, policing falls into the top 1% of our most dangerous occupations, in line with many manufacturing industries, and more than twice the national median for all occupations.

When there is a paucity of data to present, sometimes statistical manipulation can make the data more palatable. Unfortunately, there are methodological and analytical problems that hurt this paper as well.

Looking at assaults and injuries to law enforcement officers and examining these on a per-res basis shows a very poor understanding of policing today. The vast majority of arrests are uneventful. According to the U.S. DOJ Bureau of Justice Statistics, one of the same data sites sited by the authors, less than 1.5% of all people across the United States who have contact with a police officer in America have force used or threatened against them.

If you look at the authors' data it would tell you that only 7% of officers are assaulted each year. This is a clear underestimate countered by many other national data sources.

From a statistical standpoint, linear regression coefficients used by the authors are a pseudo-statistic at best, as the number of reported units changes this statistic drastically—they were up and down during the study period.

And on a personal note, I can tell you that policing in 2011 was very different than it was now. Using the authors' own methodology and the eight law enforcement officers that were murdered in the 14 days prior to this meeting, the linear regression coefficient would be astronomical and equally misleading.

With regard to questions for the authors, it is very hard to determine the methodology in the comparisons made but I have some questions.

I'd like you to go back to the statistical analysis and tell us what you think about linear regression coefficients. Why report those rather than some of the other comparisons you could have tried to make in this paper?

Do you think the data from 2003 to 2011 instead of something more timely in prospective currently skews this analysis at all, especially given the public attention to this problem and the increased reporting of same?

Lastly, several law enforcement organizations have called for a national comprehensive tracking system for both law enforcement officer injuries and those that we cause. Whose responsibility is this? Is it trauma centers? Is it jurisdictions? Is it agencies? And why do you think so?

As law enforcement officers and leaders, we have to strive every day to be transparent, fair, and impartial. And if we fall short of that goal, we absolutely should have it analyzed and discussed publically.

But as the American Association for the Surgery of Trauma, we bear the responsibility for bringing honest, meaningful and scientific discourse to an emotionally-charged topic like this one. Unfortunately, this paper doesn't meet that bar.

As academic trauma surgeons and leaders we can't focus the discussion on which particular lives matter. We have to remember every day in everything that we do that all lives matter.

Thanks for the opportunity to discuss this paper.

Dr. David C. Chang (Boston, Massachusetts): Thank you, Dr. Eastman, for those comments. I actually can't agree more that it is important to bring scientific discourse to a very emotionally-charged process. I can't really agree with that more.

And I think you made great comments and you have actually highlighted additional data sources for the questions we are talking about. Again, this highlights the fact that there is no single data source. They all have different methodologies and so it is impossible to actually draw much conclusions, if any.

I would take just a few minutes to respond to the questions you raise. In terms of single linear regressions, there is no other ways to look at counts over time. When we are looking at counts over time, it is not how many patients you have but how many units you are aggregating it down to. When we look at ten years of data, it is not the fact that we have a million records, we actually have ten data points.

Basically we are trying to draw a conclusion from ten data points. It would be no different from any study that has a sample size of ten or eleven. Single linear regression is limited but the problem is not the analysis. The problem is the fact that the data are limited.

I'm sure someone can come up with more fancy regression analysis, but I'm sure it's going to suffer from sort of the same problem. I wouldn't focus on the stats but more on the fact that there are no consistent data.

The questions about why go back to 2003, again, there is a value in looking at things over a long period of time. You can look at the recent events, but unless you look at things over time it's hard to tell if these were sort of random fluctuations or if this is part of a longer trend. You talk about the last few days with the 14 officer injuries, they were unlikely, actually, to be picked up in the regression analysis, if you look at it in the context from 2003.

And I agree with you regarding the comprehensive tracking system. I think we actually are in agreement here that there should be a comprehensive tracking system. The question is who should be leading this.

I, personally, don't think it should be trauma centers. Again, that would be, what, 2000 hospitals across the country. Everybody takes care of some trauma patients, even though not everyone is a trauma center.

So I think ultimately this is really something that has to be done at a federal level. And although a national group like this group could really facilitate that process, much like the American College of Surgeons has really tried to play a role in looking at quality of surgery across the country, this organization could really take that lead and try to help the feds in looking at the quality of data and the science behind this problem.