The effect of body armor on saving officers' lives: An analysis using LEOKA data

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Abstract

Using the Law Enforcement Officers Killed and Assaulted (LEOKA; 2002-2011) database, we examined the life-saving effectiveness of body armor while adjusting for a range of confounders not assessed in previous studies. Among the 637 officers who were shot by a firearm at the torso, those who wore body armor were 77% less likely to be killed than those who did not wear armor, controlling for an array of individual and incident characteristics. A number of factors influenced officers' armor wearing behavior include age, BMI, rank, geographic region, and type of assignment. Results will inform law enforcement agencies in assessing gaps in their current policy and help focus limited resources to encourage armor wearing. The investigation of other factors that influence police officers' chance of surviving a gun shooting (while controlling for body armor) will also have important implications for policies related to sending backup officers to police shootings, emergency response, and other critical areas.

Keywords

Body armor; LEOKA; Police injury

INTRODUCTION

Law enforcement officers have a fatality risk much higher than the average workers in the U.S.. A total of 1,466 law enforcement officers were killed in the line of duty during the past 10 years (2005-2014), an average of 146 per year [1]. This translates to a fatality risk of 16.2 per 100,000 (with a police force of 900,000), a rate four times higher than the national average of 4 per 100,000 [2]. Over one-third of total officer deaths during the past decade resulted from gun shots [1], making gun shooting the second leading cause of police officer death after motor vehicle crash.

Body armor has been long recognized by the law enforcement field to play a major role in reducing deaths and injuries from firearm shooting. The International Association of Chiefs of Police (IACP) regularly campaigns to encourage officers to wear such protection during the course of their duty [3]. Since 1999, more than 13,000 jurisdictions have participated in the Bulletproof Vest Partnership program, with $277 million in federal funds committed to support the purchase of an estimated 800,000 vests. In response to the increasing number of officer line of duty homicides from handguns, the National Institute of Justice (NIJ) initiated a research program in the early 1970s to investigate development of lightweight body armor that on-duty police could wear full time, with the most recent standard published in 2008 requiring rigorous testing of body armor [4].

Despite that over 90% of police officers nationwide reported that they are required to wear body armor at least sometimes and over 75% reported that the agencies they work at have a written mandatory wearing policy, a sizable proportion (12%) reported that they did not follow their agencies' body armor wearing policy all the time [5]. This percentage is even higher when

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only focusing on those shot to death in the line of duty, as over 30% of all officers killed in the line of duty between 2010 and 2012 were not wearing body armor [6].

Despite the widely recognized role that body armor plays in saving officers' lives and continuing efforts from professional organizations and the federal government to encourage body armor use, there is limited research on documenting the benefit of body armor outside military settings [7-10]. However, the military environment differs substantially from municipal law enforcement settings and is not directly comparable [11]. Empirical data supporting the benefits of body armor use for law enforcement officers is limited to a handful of studies and analyses. For example, a Federal Bureau of Investigation (FBI) analysis based on a small number of shootings in 1992 found that an officer not wearing body armor was 14 times (Odds ratio (OR)=14; the risk of dying without armor is 75% compared with 18% with armor) as likely to experience a fatal injury than an officer wearing armor [12]. The IACP/DuPont Kevlar Survival Club states that over 3,100 officers have been saved from death or serious injury by body armor since 1987 [13]. However, application for membership in the "club" is voluntary [14] and therefore does not include officers who have avoided fatal injuries but not reported them to IACP which could lead to an undercount of lives saves. Also, it is difficult to interpret the lifesaving component of body armor from these data because the IACP does not collect data on officers who do not wear body armor who are shot and also survive.

Using four years of LEOKA data (2004-2007), U.S. national data on the number of officers feloniously killed or officers that experienced an aggravated assault and whether or not the officer was wearing body armor at the time of the incident [15], LaTourette examined the relationship between officers' death as a result of shooting in the torso and whether they were wearing body armor at the time of the incident (n=262). The analysis found that an officer not

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wearing body armor is 8.5 times as likely to be killed by a shot to the torso as an officer wearing armor (odds ratio (OR)=8.5; the risk of dying form a torso shot is 68% when not wearing armor and 20% when wearing armor, with a reported relative risk of 3.4).

LaTourette acknowledged the possibility that officers who wear armor may be fundamentally different from those who do not which may (partially) explain the observed relationship (i.e., confounding) and that there may be other critical factors that contribute to officers' chance of surviving. However, these potential confounders were not taken into account when estimating the effect of body armor. Limited research has found that a number of factors influence police officers' decision to wear body armor and their chance of surviving a gun shot. For example, a nation-wide survey of police officers [5] indicated that the most significant obstacle to regular use of body armor for police officers is that armor can be bulky, heavy and uncomfortable for regular wearing. As the perception toward the size, weight, and comfort of armor is likely to differ by police officers' age, gender, Body Mass Index (BMI), and region of service, there is sufficient reason to believe that these factors may influence officers' body armor wearing behavior. Important factors that may influence officers' survival in shooting include types and ammunition of weapon used by the shooter and distance between victim and shooter [11].

In this paper, the most recent and larger multi-year LEOKA dataset of police officer shootings (data from 2002 to 2011) was used to examine 1) the association between individual characteristics and the likelihood of wearing body armor; 2) the conditional association between wearing body armor and the likelihood of dying from a shooting to the torso, while controlling for a range of potential confounders. We hypothesize that a number of individual characteristics, such as age, gender, BMI and region of service may influence officers' body armor wearing

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behavior. For example, as body armor may create extra weight and discomfort, older officers and officers who are over-weight may be more likely to forgo wearing armor, as it might limit their mobility and lead to fatigue[16]. We also hypothesize that while the effect size may reduce, body armor significantly increases the likelihood of an officer surviving a shooting, even after controlling for commonly known confounders. Results will inform law enforcement agencies on gaps in their current policy and focus limited resources to encourage armor wearing. The investigation of factors that influence police officers' chance of surviving a shooting will also have important implications for policies related to sending backup officers to police shootings, emergency response, and other critical areas.

METHOD

Study sample

LEOKA dataset on officers assaulted or killed (2002-2011) used for our study purpose was directly obtained by a special request to the FBI LEOKA program. For the purpose of the study, we focus on those who were shot by a firearm to the torso (Up to 10 locations of wounds were reported for each officer injured/killed, and detailed locations were reported; e.g., front lower torso/stomach, side head, front head, neck/throat, etc. A case was counted as torso shot if at least one of the 10 locations was reported as a front upper torso/chest wound, front lower torso/stomach wound, lower torso/back wound, or lower torso/back wound). We decided to focus on shootings to the torso because that is the area that standard body armor is designed to protect). Among the 1,789 officers assaulted (by firearm or other weapon) between 2002 and 2011, 1,322 (73.9%) were shot by a firearm, and among them 637 (48.2%) were shot to the torso. We further excluded 71 cases with missing data on at least one of the independent

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variables included in the analysis, resulting in a total sample size of 566 cases (selected cases were not significantly different from the unselected cases in terms of demographic variable such as age, race, gender, and rank, see TABLE I).

Measures

Dependent variable: The event of *an officer being killed* from the firearm shooting to the torso was coded as 1 (for death) or 0 (for survival). We also used *officer wearing armor* at the time of the incident coded as 1 (yes) or 0 (no) as a second dependent variable

Independent variables: Other than the main independent variable, officer wearing armor, we selected an array of independent variables that may influence officers' chance of surviving a shooting event. Two categories of variables were used: A) victims' characteristics, including victim's *gender, race* (white and nonwhite, with white as the reference category), *age, rank* (line level officer, supervisor, and manger/commander, with line level officer as the reference category), *BMI* (calculated by dividing bodyweight in kilograms by height in meters squared) and *geographic region* that the victims worked in (South, Midwest, Northeast, West and US territory, with South as the reference category; B) incident characteristics, including *weapon lethality* (recoded from firearm type and cartridge type into handgun low, handgun medium, handgun high, rifle and shotgun, with handgun medium as the reference category; see [11] for details), *types of assignment* (off duty, patrol, detective, undercover, and special assignment, with patrol as the reference category), and *distance between offender and victim* (>10 feet and ≤10 feet, with >10 feet as the reference category). We also included a binary indicator "Incident occurred after 2008" in order to assess whether armor became more effective after 2008, when NIJ published the latest and more rigorous body armor testing standards. Results, however,

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should be interpreted with the caveat that it is likely that older armor were still in use until it was replaced by the agencies. Low bivariate correlations (generally in the 0.1 range, with one exception, age and rank, at 0.37) and a test of model fit using variance inflation factor (VIF, <2) suggest that multicollinearity is not likely to be a concern.

Analysis plan

Logistic regression was used for the binary dependent variables, wearing body armor and being killed in a shooting incident [17]. The effect of independent variables on the dependent variables are presented as adjusted odds ratios (i.e., the ratio between odds of the dependent variable taking the value of 1 and that taking the value of 0, with 1 unit increase on a given independent variable, when controlling for other independent variables in the model). In addition, predicted probabilities for certain groups (defined by values of independent variables) are also presented. .

In order to answer the research questions proposed in this study, five models were estimated.

Model 1: We examined the factors influencing armor wearing behavior.

Model 2: We estimated the bivariate relationship between wearing body armor and the probability of being killed in a shooting incident, in order to replicate the findings in LaTourette's study. The last three models are multivariate models where we explored the relationship between wearing body armor and officers' being killed in a shooting incident while controlling for other predictors.

Model 3: We controlled for victims' demographic variables.

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Model 4: We controlled for both victims' characteristics and incident characteristics.

Nested models were tested for relative fit using chi-square significance tests, and a significant p-value suggests that the model with more independent variables provides superior fit. All analyses were conducted in Stata 12.

RESULTS

Descriptive statistics

As shown in TABLE II, about half (45%) of the officers in the sample were killed from shooting, and the majority wore armor at the time when the shooting occurred. The average age was 37 years old and the vast majority was male, line level officers on patrol assignment at the time of the shooting. Over 50% of LEOs assaulted with a firearm that were shot in the torso live in the southern US. Over half of the officers in the sample were shot with handguns with medium caliber, and only less than 8% were either shot by a low caliber handgun or a shotgun. Shooting distance is closer than 10 feet for over half of these incidents.

What factors are associated with wearing body armor?

As shown in TABLE III, older officers were less likely to wear armor, with each year increase in age decreasing the likelihood of wearing armor by about 10% (Adjusted Odds Ratio (*AOR)=0.908; P-value<0.001*). Managers and commanders were 73% less likely to wear armor when compared to line officers (*AOR=0.278; P-value=0.012*). Those with higher BMI were less likely wear armor, with each unit increase in BMI decreasing the likelihood of wearing armor by about 8% (*AOR=0.924; P-value=0.006*). Those from the western regions were 5 times as likely to wear armor as those from the South (*AOR=4.941; P-value<0.001*). Compared to those assigned to patrol roles, all other categories of assignments were associated with lower likelihood of wearing armor (*AOR ranges from 0.036 to 0.449*).

The effects can also be interpreted with predicted probabilities. For example, for a white, male, average-aged (37 years) line officer with an average BMI of 28 Kg/m2 from the South who were on patrol duty after year 2008, his predicted probability of wearing armor is 0.88. If the officer is from the West, his probability of wearing armor increases to 0.97, i.e. the marginal effect of region on the probability of wearing armor is 0.09 (0.97-0.88). Alternatively, if the officer was on special assignment, his predicted probability of wearing armor reduces to 0.77, i.e. the marginal effect of special assignment on probability of wearing armor is -0.11 (0.77-0.88).

The Effect of Body Armor

In Model 2, we replicated the LaTourette finding of the bivariate relationship between wearing armor and officers' survival. The unadjusted OR is 0.196, suggesting that those wore armor were 80% less likely to be killed from the shooting compared to those who did not.

In Model 3 (results shown in TABLE IV), officers' probability of being killed in the shooting incident was regressed on victims' demographics. Likelihood ratio test shows significant improvement in model fit over Model 2 ($\Delta X^2(10)=35.38$, *P-value*<0.001). TABLE V presents the adjusted odds ratio and p-value estimated in Model 4 (We have also explored the interaction between year 2008 and wearing armor, between gender and wearing armor, and between race and wearing armor, however, none of the interaction effects were significant. We decided to present the findings in Model 4 as our final model). A Likelihood Ratio Chi-square test indicate that Model 4 provides superior model fit when compared to Model 3 ($\Delta X^2(10)=100.74$, *P-*

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value<0.001). The effect of body armor stays roughly the same as in Model 3, that is those who wore armor at the time of the incident were 76% less likely to die from the shooting those who did not (*AOR=0.240, P-value<0.001*). Similar to Model 3, non-white officers were twice (*AOR=2.195, P-value=0.008*) as likely to be killed from the shooting compared to white officers. Those who were off duty (*AOR=4.067, P-value=0.010*) and detectives (*AOR=2.586, P-value=0.028*) were significantly more likely to be killed compared to patrol officers. Those who were shot by low caliber handguns were 63.4% less likely to be killed than those who were shot by medium caliber handguns (*AOR=0.366, P-value=0.016*). In contrast, those who were shot by rifles (*AOR=3.569, P-value<0.001*) were 3.6 times more likely to be killed when compared to medium caliber handguns. Those who were shot within 10 feet were over twice as likely to be killed as those who were shot at a greater distance (*AOR=2.204; P-value=0.001*).

Alternatively, the model can also be interpreted with predicted probabilities. For example, we can assume the victim is a male, white, average-aged (37 years) with average BMI (28 kg/m^2), line officer on patrol duty in the Southern United States, who is shot with a medium caliber handgun at a distance greater than 10 feet, after year 2008. If he was not wearing armor the chance of him surviving a shooting to the torso is 0.53, and this increased to 0.83 if he was wearing armor, i.e., the marginal effect of wearing armor on probability of surviving from shooting is 0.30 (0.83-0.53). Other factors also influence his chance of surviving the shooting, independent of wearing body armor. For example, if the victim had been wearing body armor and had been shot in the torso with a rifle, as opposed to with medium caliber handgun, the chance of surviving the incident would have been reduced to 0.57, i.e. the marginal effect of being shot by a rifle on the probability of surviving from shooting is -0.26 (0.57-0.83).

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DISCUSSION

Despite the fact that body armor has been long recognized to play a major role in saving police officers' lives, there is limited research on documenting the benefit of body armor outside military settings. Using the most recent multi-year LEOKA dataset of police officer shootings (2002-2011), this study examined 1) the association between individual characteristics and the likelihood of wearing body armor, and 2) the conditional association between wearing body armor and the likelihood of dying from a shooting to the torso, while controlling for a range of potential confounders. Our results show that body armor more than doubles the likelihood that a police officer will survive a shooting to the torso.

While it is a positive development that a large number of agencies have adopted a mandatory wear policy for body armor [5], a sizable proportion of officers opt not to wear body armor in line of duty. About 26% of the officers in our study sample were reported by their agency as not wearing body armor at the time of the incidence, a rate in between the 12% among all police officers [5] and the 30% among those killed in line of duty [6]. Risk factors for not wearing body armor include age, status as a manager or commander, BMI status, region, and type of assignment. These findings are of concern as officers who are in general least likely to survive from fatal injuries (older and/or overweight [18]) in a region with more gun attacks against police (the southern US[19]) are the least likely to wear armor, indicating that police agencies need to target older, overweight officers, and those assigned to detective and undercover assignments when enforcing armor related policies, and that agencies in the south need to pay special attention to mandatory wearing policies.

These findings can be applied by law enforcement agencies in their training programs for body armor, educating officers about the types of officers least likely to wear armor and

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reminding officers of the life-saving benefits of armor. These findings could also be used to develop new programs and awareness campaigns (e.g., roll call videos or brochures) to increase use of body armor among officers[20]. In addition, agencies could change the department climate to place more emphasis on safety consciousness (e.g., having a safety month) in order to encourage body armor use. For example, a "3-E" model in injury prevention may be used, i.e., engineering (providing lightweight and comfortable armor), education (educating officers to be more safety conscious), and enforcement/enactment (designing department policies that reward body armor wearing and penalize those not wearing armor). With most law enforcement agencies requiring body armor use [5], those agencies can use these results to help guide their inspection efforts for compliance with body armor wearing policies by keeping closer tabs on officers from these higher risk groups.

Our bivariate results examining the effect of body armor in saving police officers' lives showed similar results as in LaTourette (2010). This study took a step further by employing a more detailed multivariate model to study the effect of wearing body armor on officer's survival conditioned on an array of potential confounders, using a more recent multi-year LEOKA dataset of officer shootings. The effect of body armor in this multivariate model remained significant and of similar magnitude as we found in our bivariate model.

In addition, we also found that regardless of body armor wearing, non-white officers (consisting mostly of African-Americans) were twice as likely to be killed compared to white officers, and detectives were significantly more likely to be killed compared to patrol officers. Since past studies have not examined the relationship between assignment type of likelihood of being killed from shooting, we speculate that it is possible that detectives are likely to be undercover at the time of shooting, putting them in a more vulnerable position (e.g., more

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difficult for emergency medical personnel to reach them). It is also possible that the detectives are likely to be in poorer physical health and less capable of withstanding a bullet wound than other officers due to having a more sedentary job than a patrol officer. The finding that non-white officers were twice as likely to be killed in a shooting incident, even after controlling for wearing armor and several other factors associated with surviving a gunshot, was an unexpected finding that warrants further research. However, with the data available from the LEOKA dataset, it is not possible to sort out what other differences or biases (e.g., possibly different health status by race[21]) that could account for the greater survival rate of white officers.

Another finding from this model (Model 4) was that, not surprisingly, those who were shot by low caliber handguns were less likely to be killed than those who shot by medium caliber handguns[22]. Also, those who were shot by rifles were over three times more likely to be killed when compared to those shot by a medium caliber handgun. An implication from this finding may be that tougher gun laws should be in place to make it harder for those with criminal convictions to obtain powerful firearms. Also, those who were shot within 10 feet were over twice as likely to be killed as those shot from a greater distance.

As with most studies there are limitations associated with our study. First, there are some specific limitations with the data included in the LEOKA database. To begin with, LEOKA is a voluntary database and LEAs are not required to report attacks against officers to the FBI. While generally about 12,000 LEAs report data to LEOKA, not all agencies provide such reports. In addition, while not required, agencies may feel more external pressure to report fatal incidents and to omit some non-fatal assaults, suggesting that our estimate of the body armor effect is likely a conservative estimate. Second, while (as suggested by LaTourette) there is only a very small proportion of shootings that do not result in some injury, incidents that did not result in

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injury are not included in the LEOKA database. This has the potential effect of leading to an underestimate of the effectiveness of body armor; i.e., if any officers wearing armor suffering nonfatal shots to the torso did not report an injury, they were not captured in LEOKA causing an underestimate of the effectiveness of body armor.

Next, the LEOKA database was not designed for research purposes and therefore does not include some of the variables that are of interest to researchers for model testing[23]. LEOKA was designed for more limited administrative purposes and thus does not include detailed data in areas such as the type of body armor worn by the officer (e.g., the level of armor worn and whether it passed NIJ standards testing) or include variables that would help explain in a comprehensive way the reason why some officers died and others survived. For example, while we were able to calculate the officers' BMI (from the height and weight data provided), it would have been more helpful to have other data about the overall health and fitness of the officer which might explain why some officers were less likely to survive a gun shot in the torso, even controlling for wearing body armor (e.g., maybe the white officers were in better health and fitness than the non-white officers and thus more likely to survive a gunshot). In addition, BMI does not take into account lean body mass and fat mass and this may have implications on survivability. Future iterations of the LEOKA database should consider including other factors that may affect an officers' likelihood of surviving a shooting; e.g., officers' prior training in risk mitigation strategies[24] and the response time of an emergency medical team from nearby hospitals[25]. Likewise it would be interesting to know if these officers were alone or with a partner at the time of the incident as the partner may have been able to render immediate first aid.

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Further, our examination of factors related to wearing body armor was also done only in the context of officers' armor wearing behavior where they were assaulted, and thus may not represent the general body armor wearing behavior. Furthermore, as pointed out by LaTourette , another limitation is that systematic differences in behavior between officers wearing body armor and officers not wearing armor could bias the results (e.g., body armor use is generally associated with higher risk situations, and police officers wearing body armor may therefore exercise more caution than officers not wearing armor and thus lower the chance of being killed independent of the wearing of armor). This is the first study on body armor effect that has controlled for a large array of potential confounders. We encourage future research to include more measures of officer behavior and level of danger the officer was facing at the time of the shooting. Last, information on how armor "failed" to protect police officers was not provided in the LEOKA data and it is possible that some cases counted as "torso shots" could have been outside the protective area of typical body armor. Future research studies need to explore the particular circumstance of these fatal incidents in greater detail; e.g., more data is needed on whether a bullet(s) penetrated the armor, or entered outside the boundaries of the armor between the flaps of the armor.

While researchers should continue to monitor the LEOKA database to monitor trends in officer deaths and the role of body armor in saving officer lives, we believe that other research is necessary to advance the field forward. For instance, a forensic study about how and why armor failed for officers who were wearing armor and died from a torso shot may help guide the focus of new body armor research on issues such as body armor penetration, resistance or coverage. Other research may include examining police officer risk taking/mitigation behavior, cover and concealment skills, attitudes toward body armor, in order to better relate individual

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characteristics, attitudes and behavior, with armor wearing behavior. In addition, a research agenda that views body armor in the broader picture of officer safety is necessary. That is, we need to understand the role of body armor in protecting officers in light of department policies/protocols, training, and various other environmental factors that affect officer safety in the officer patrol area.

CONCLUSION

In this study we examined the conditional association between wearing body armor and the likelihood of dying from a shooting to the torso, while controlling for a range of potential confounders. Our results show that body armor more than doubles the likelihood that a police officer will survive a shooting to the torso. We believe our analysis of the LEOKA database for a 10-year period reinforces the clear life-saving benefits of body armor, adds important additional data on who are most likely to wear body armor, and helps explain how officer and incident-level data can provide some insights into why some officers do not survive a torso gunshot. While this paper identifies additional areas for further research, these results can immediately begin to help inform law enforcement agencies on gaps in their current policy and ways to focus limited resources to encourage armor wearing.

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TABLE I: Attrition analysis comparing selected cases and excluded cases due to missing (N=637)

	Mean (st. dev.)/%		
	Selected (N=566)	**Excluded (N=71)**	**P-value**
Age	36.69 (8.95)	35.64 (7.58)	0.37
Gender (female)	4.2%	2.8%	0.76
Race (nonwhite)	13.1%	14.9%	0.70
Victim's ranking			
Line level officer	82.0%	92.8%	
Supervisor	12.9%	5.8%	0.15
Manager or commander	5.1%	1.4%	

TABLE II: Descriptive analysis (N=566)

Variable	Mean (st. dev.)/%
Officer died from shooting	44.9%
Wearing armor	73.7%
Gender (female)	4.2%
Age	36.7 (9.0)
Race (nonwhite)	13.1%
Officers’ rank	
Line officer	82.0%
Supervisor	12.9%
Manager or commander	5.1%
BMI	28.0 (4.4)
Geographic region	
South	50.9%
Midwest	13.4%
Northeast	11.3%
U.S. Territory	1.6%
West	22.8%
Type of assignment	
Patrol	77.0%
Off duty	6.5%
Detective	5.8%
Undercover	3.4%
Special assignment	7.2%
Incident occurred after 2008	26.1%
Weapon lethality	
Handgun medium	55.1%
Handgun low	7.8%
Handgun high	12.4%
Rifle	17.0%
Shotgun	7.8%
Shooting distance (shorter than 10 feet)	64.7%

TABLE III: The effect of officers' characteristics on probability of wearing body armor in AOR (X^2 (15)= 201.99, n=566. P<.001)

Variable	AOR*	P-value
Gender (reference: male)	1.574	0.579
Age	0.908	<0.001
Race (reference: white)	0.732	0.349
Rank (Reference: Line officer)		
Supervisor	0.725	0.320
Manager or commander	0.278	0.012
BMI	0.924	0.006
Geographic region (Reference: South)		
Midwest	1.211	0.594
Northeast	1.054	0.887
U.S. Territory	0.191	0.195
West	4.941	<0.001
Type of assignment (Reference: Patrol)		
Off duty	0.036	<0.001
Detective	0.185	<0.001
Undercover	0.154	<0.001
Special assignment	0.449	0.052
Incident occurred after 2008	1.639	0.083

*Adjusted odds ratio

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TABLE IV: The effect of body armor on officers' dying from shooting, adjusting for victims' demographics in AOR (X^2 (11)= 84.24, n=566. P<.001)

	AOR*	**P-value**
Wearing armor	0.227	<0.001
Gender (reference: male)	1.319	0.546
Race (reference: white)	2.030	0.011
Age	1.015	0.213
Rank (reference: line officer)		
Supervisor	1.234	0.462
Manager or commander	1.581	0.333
BMI	0.975	0.268
Geographic region (reference: south)		
Midwest	1.709	0.056
Northeast	1.012	0.970
US territory	6.867	0.087
West	1.157	0.531

*Adjusted odds ratio

TABLE V: The effect of body armor on officers' dying from shooting, adjusting for victims' demographics and incident characteristics in AOR (X^2 (21)= 134.61, n=566. P<.001)

Variable	AOR*	P-value
Wearing armor	0.240	<0.001
Victims' demographics		
Gender (reference: male)	0.789	0.620
Age	1.014	0.268
Race (reference: white)	2.195	0.008
Rank (Reference: Line officer)		
Supervisor	1.306	0.385
Manager or commander	1.772	0.253
BMI	0.970	0.216
Geographic region (Reference: South)		
Midwest	1.538	0.141
Northeast	1.030	0.929
U.S. Territory	5.081	0.171
West	1.205	0.454
Incident characteristics		
Type of assignment (Reference: Patrol)		
Off duty	4.067	0.010
Detective	2.586	0.028
Undercover	0.750	0.595
Special assignment	0.863	0.697
Weapon lethality (reference: handgun medium)		
Handgun low	0.366	0.016
Handgun high	1.226	0.496
Rifle	3.569	<0.001
Shotgun	0.784	0.558
Shooting distance (shorter than 10 feet)	2.204	0.001
Incident occurred after year 2008	1.113	0.629

*Adjusted odds ratio

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