

**Police Use of Force in the United States:  
Non-Lethal Use of Force Analysis, 1992–2007**

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### **Abstract**

This report examines which characteristics of police use-of-force incidents are associated with officers' use of two less-lethal weapons: conducted electrical devices (CEDs), such as Tasers, and oleoresin capsicum (OC) spray. Using data on 17,965 use-of-force incidents from 13 U.S. law enforcement agencies between 1992 and 2007 (Taylor & Koper, 2013), the analysis tested eight characteristics: the first officer's race and years of experience; the first suspect's race, age, weapon possession, alcohol or drug impairment, and most serious resistance behavior; and the type of call. Chi-square tests showed that every characteristic was significantly related to CED use, OC spray use, or both. In binary logistic regression models that considered the characteristics together, suspect behavior was the most consistent predictor. Passive resistance, verbal resistance, and mild or severe aggression increased the odds of OC spray use, and fleeing increased the odds of CED use. Suspect impairment was strongly associated with CED use. Black suspects had higher odds of OC spray use, and Hispanic suspects higher odds of CED use, than White suspects, while Black officers had lower odds of using OC spray than White officers. Officer experience and suspect age were not significant once other factors were controlled, contrary to the hypothesis that younger suspects would experience more less-lethal force. Large amounts of missing data, up to 65% for some variables, limit these conclusions. The findings support focusing use-of-force research and policy on what happens during the encounter.

*Keywords:* use of force, less-lethal weapons, conducted electrical devices, oleoresin capsicum spray, police, logistic regression

**Police Use of Force in the United States: Non-Lethal Use of Force Analysis, 1992–2007**

In recent years, police use of force has come into question throughout the United States. With the rapid spread of recording technology among police and the public, photos, videos, speculation, and politics have offered many different views of the issue. This report uses empirical data from the U.S. Department of Justice for the years 1992 to 2007 to answer specific questions about police use of force. Its goal is to provide the answers needed to identify potential problems in policing practice and training.

**Background**

In Los Angeles in 1991, officers of the Los Angeles Police Department (LAPD) beat Rodney King, an African American man, with batons during his arrest after a high-speed chase. King, who was intoxicated, had fled from officers before they stopped him and pulled him from his car. A bystander filmed the beating and shared the video with the media. The footage sparked national outrage, and police use of force has been closely watched ever since. In 1992, the acquittal of the four officers set off the Los Angeles riots and led many to believe the criminal justice system was corrupt at its foundation (Matiash & Rothman, 2016). Since then, body camera and bystander footage of similar incidents has routinely been shared to question both lethal and non-lethal use-of-force tactics. In 2020, a Minneapolis police officer was arrested and charged with the murder of George Floyd, an African American man, after bystander cell phone footage showed the officer kneeling on Floyd's neck during the arrest. At the officer's trial, the department's use-of-force training instructor testified that kneeling on the neck was not a trained neck restraint (Levenson & Cooper, 2021). The lack of transparency in training and officer accountability once again led to widespread protests and rioting across the nation. Protesters argued that race played a role in police use of force. Police used non-lethal weapons such as bean

bag rifles, tear gas, Tasers, and pepper spray during these protests. Although these weapons are commonly used for crowd control and arrests, there were multiple reports of serious injury and even death (Fowers et al., 2020). Non-lethal force has caused deaths outside of protests as well. In June 2020, George Zapantis, a man with bipolar disorder who was holding a sword, went into cardiac arrest and died after New York City police officers tased him (Simko-Bednarski, 2020). Similar incidents have occurred in the past, each with its own circumstances surrounding the use of non-lethal weapons.

Understanding the history and context of service weapons is important for analyzing the data and conclusions in this report. Law enforcement has relied on non-lethal force for as long as policing has existed in America. In the mid-19th century, police officers in New York and Boston relied mostly on wooden clubs. By the late 1800s, criminals had become better armed, and departments began issuing firearms to their officers to keep pace (Bulman, 2011). Once lethal force was part of the array of weapons officers carried, departments needed to specify when each weapon should be used. Federal regulations for Department of Energy protective force officers, for example, allow deadly force only in these five circumstances (Use of Deadly Force, 2021):

1. *Self-Defense*: necessary when one reasonably believes himself/herself to be in imminent danger of death or serious bodily harm
2. *Serious offenses against persons*: necessary to prevent the commission of a serious offense against a person(s) in circumstances presenting an imminent danger of death or serious bodily harm
3. *Nuclear weapons or nuclear explosive devices*: necessary to prevent the theft, sabotage, or unauthorized control of a nuclear weapon or nuclear explosive device

4. *Special nuclear material*: necessary to prevent the theft, sabotage, or unauthorized control of special nuclear material
5. *Apprehension*: necessary to prevent the escape of a person believed to have (a) committed an offense of the nature in reasons 1–4 or (b) who is escaping by use of a weapon or explosive or who otherwise indicates that he/she poses a significant threat of death or serious bodily harm

The regulation also requires a warning, such as an order to halt, before deadly force is used whenever feasible. All other situations in which force may be needed but lethal force may not be used call for non-lethal weapons. Policy on non-lethal weapons varies by department across the United States. Although one department cannot represent all others, the Rye Brook (New York) Police Department's non-lethal use-of-force policy, which follows the New York State Accreditation Standards, offers an example of a common policy:

A police officer, in the course of effecting or attempting to effect an arrest, or preventing or attempting to prevent the escape from custody of a person whom he reasonably believes to have committed an offense, may use non-deadly force to the extent he reasonably believes such to be necessary to effect the arrest, or to prevent the escape from custody, or to defend himself, or a third person from what he reasonably believes to be the use or imminent use of physical force. (Rye Brook Police Department, 2020, p. 146)

In summary, during a traffic stop or a call for service, officers may use non-lethal weapons to apprehend a suspect who is resisting or trying to flee custody. The choice between lethal and non-lethal force is left to the officer's discretion within the department's use-of-force policy. That discretion generally depends on whether the safety of the officer, the suspect, or a third party is threatened. However, officer discretion is largely impossible to measure. The rest

of this report therefore covers only prior research and data that can be analyzed through theory and statistics.

### **Less-Lethal Weapons**

Law enforcement agencies across the country have adopted specific non-lethal weapons. Although not every department has the same weapons or the same rules for using them, two of the most widely adopted are conducted electrical devices (CEDs) and oleoresin capsicum (OC) spray, commonly known as the Taser and pepper spray (Bulman, 2011). Less-lethal weapons such as these are used in confrontations, suicide interventions, riots, and prison disturbances (Stephenson, 2015). The CED carried on patrol is the officer's Taser, a single-shot weapon that uses an electrical current to incapacitate a suspect temporarily. It is about the size and shape of a pistol but is usually bright yellow (Norfolk Constabulary, n.d.). The Taser can either be applied directly to a person or fired from a distance. Other CEDs, used more often in riots and prisons, include electric shock shields and stun batons. All of them deliver an electrical current that causes involuntary muscle contractions, temporarily incapacitating the person (National Institute of Justice, 2011). The OC carried on patrol is the officer's mace or pepper spray, named for its source, oleoresin capsicum. Oleoresin capsicum is an oily resin derived from capsicum plants, a genus in the nightshade family. Its active compounds, the capsaicinoids, are extracted, dried, and combined; capsaicin is the main component, alongside several branched-chain alkyl vanillylamides (Hilmas, 2015). Capsaicinoids cause skin inflammation (dermatitis) and affect the nose, eyes, lungs, and digestive tract. OC became popular in the 1990s as a defensive weapon for civilians and law enforcement because, sprayed directly into the face or eyes, it causes immediate, temporary incapacitation, with severe eye irritation, tearing, pain, and temporary

blindness (Hilmas, 2015). Non-lethal weapons have become an important part of policing in situations that call for them.

### **Prior Research**

Prior research on non-lethal weapons raises two questions: Do administrative policies on lethal and non-lethal force affect how often force is used, and do the circumstances of an incident affect whether it is used? A 2018 study of the Chicago Police Department (CPD) examined whether policies expanding non-lethal weapons led officers to substitute them for lethal force. In 2010, the CPD began issuing Tasers to patrol officers instead of largely restricting them to sergeants. The researchers wanted to know whether this change affected the type of force officers used, along with other outcomes. The policy change first led to a large increase in Taser use. After a retraining period, substitution between Tasers and other types of force, both greater and lesser, increased. Although police injuries fell, civilian injuries were not affected, and there was no evidence that Tasers reduced police use of firearms (Ba & Grogger, 2018). A 2017 study in *Justice Quarterly* also examined the effect of administrative policy on non-lethal force. Those researchers likewise asked whether policy changed the use of force, comparing restrictive and permissive policy environments in 3,340 use-of-force incidents from three U.S. agencies. In the Chicago study, the CPD had to retrain its officers after reviewing high levels of non-lethal force following the policy change. The *Justice Quarterly* study supports this pattern: officers working under the most restrictive policy used force less readily than officers in more permissive policy environments (Terrill & Paoline, 2017). Together, these findings strongly support the argument that administrative policy plays a key role in the use of force.

The examples at the start of this introduction show the many variables involved in incidents in which force is used. Prior research is needed to form hypotheses about how these

variables affect use of force. One of the independent variables in this report is the suspect's race. Fryer (2019) examined the relationship between race and police use of force. He found no racial differences in officer-involved shootings, either in the raw data or when other variables were considered. For non-lethal force, however, African Americans and Hispanics were more than 50% more likely than White civilians to experience some form of force in interactions with police. Adding controls for the context of the interaction and civilian behavior, including variables like those used in this report, reduced this disparity but could not fully explain it (Fryer, 2019). A study in *The British Journal of Criminology* examined differences in use of force by officer race, which this report also analyzes. White officers were more coercive toward Black suspects and tended to use non-lethal force more frequently, whereas Black officers' use of force was unaffected by suspect race, with equal amounts of non-lethal force used. Officer race did not predict resistance among White or Black suspects (Paoline et al., 2018). Together, the studies by Fryer (2019) and Paoline et al. (2018) provide substantial evidence that one or more of these variables influence use-of-force incidents.

### **The Present Study**

This report's data analysis, together with the review of prior research, should improve the reader's understanding of the factors involved in use of force. Whether those factors affect the use of force is the guiding question of the report and the main point of the discussion that follows. This report analyzes multiple variables involved in police use-of-force incidents during routine traffic stops and calls for service, hypothesizing that certain characteristics of these incidents increase the likelihood that officers use CEDs or OC spray. Specifically, it hypothesizes that younger suspects experience less-lethal force more often than older suspects, that non-White suspects experience less-lethal force more often than White suspects, and that

suspects who display threatening and aggressive behavior toward officers have force used against them at higher rates.

## **Method**

### **Data Source**

The original study that produced these data examined how law enforcement agencies managed use of force. Specifically, it sought to help agencies set guidelines for conducted energy device (CED) deployment that ensure the safety of officers and the public. The data cover 13 law enforcement agencies across the United States. Seven agencies that used CEDs and had related policies were matched to six agencies that did not. For the agencies that used CEDs, data were collected for two years before and two years after deployment. For the agencies that did not, data were collected for four years over comparable time periods. The researchers collected incident-level data on 17,965 incidents in which officers used force, occurring between 1992 and 2007. They worked with the agencies to obtain the use-of-force data available in each agency's own database. They also drew on the FBI's Uniform Crime Reporting system and the 2000 U.S. Census for crime and demographic data on the cities served by the participating agencies. The study had three parts. Part 1 included all available use-of-force data from the participating agencies and focused on the individual officers and suspects involved. Part 2 covered the participating agencies, along with the crime and demographic data. Part 3 contained the same information as Part 1 but only for the focal time periods, with derived variables covering all officers and suspects involved in each incident. For confidentiality, the researchers masked some information to prevent identification of specific officers, suspects, bystanders, or incidents (Taylor & Koper, 2013).

### Variable Measurement and Descriptive Statistics

The analysis used two dependent variables: whether any officer used a CED and whether any officer used OC spray during the incident. It used eight independent variables: the first officer's years of experience and race; the first suspect's race, age, weapon possession, and alcohol or drug impairment; the suspect's most serious (maximum) behavior; and the type of call, recoded into fewer categories. Tables 1 through 10 summarize each variable.

One of the two dependent variables examined whether any officer present deployed a CED during the use-of-force incident. This variable was nominal, coded yes or no. Data were missing for 719 incidents (4.0% of all incidents). Of the incidents with CED data, 92.3% ( $n = 15,918$ ) involved no CED use, while only 7.7% ( $n = 1,328$ ) involved CED use.

**Table 1**

#### *Descriptive Statistics for CED Use in Incident*

| Variable             | Measurement | N      | Percentage |
|----------------------|-------------|--------|------------|
| CED Used in Incident |             |        |            |
|                      | No          | 15,918 | 92.3       |
|                      | Yes         | 1,328  | 7.7        |
|                      | Missing     | (719)  | (4.0)      |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

The second dependent variable examined whether an officer used OC spray during the use-of-force incident. This variable was also nominal, coded yes or no. Data were missing for 719 incidents (4.0% of all incidents). Of the incidents with data, 85.8% ( $n = 14,792$ ) did not involve OC spray, and 14.2% ( $n = 2,454$ ) did.

**Table 2***Descriptive Statistics for OC Spray Use in Incident*

| Variable                  | Measurement | N      | Percentage |
|---------------------------|-------------|--------|------------|
| OC Spray Used in Incident |             |        |            |
|                           | No          | 14,792 | 85.8       |
|                           | Yes         | 2,454  | 14.2       |
|                           | Missing     | (719)  | (4.0)      |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

The type of call that initiated contact between the suspect and officer was also examined. Call Type had nine categories: Pedestrian Contact, Traffic Stop, Robbery, Burglary, Under the Influence of Drugs or Alcohol, Domestic Dispute, Emotionally Disturbed Person/Mental Illness, Assault (excluding domestic), and Other. For this analysis, some categories were combined for ease of use: Robbery and Burglary were grouped into one category, as were Alcohol/Drug and Mental Illness. Call type was missing for 8,828 incidents (49.1% of all incidents). The most frequent category was Other, which included 68.9% ( $n = 6,298$ ) of calls; no further detail was given. Assault (excluding domestic) made up 6.6% ( $n = 599$ ) of calls, followed by Domestic Dispute at 5.7% ( $n = 520$ ) and Traffic Stops at 5.6% ( $n = 509$ ). The combined Alcohol/Drug and Mental Illness category included 8.9% ( $n = 815$ ) of calls. Only 3.1% ( $n = 280$ ) of calls were for Robbery/Burglary, and 1.3% ( $n = 116$ ) were Pedestrian Contacts.

**Table 3***Descriptive Statistics for Call Type*

| Variable  | Measurement                   | N       | Percentage |
|-----------|-------------------------------|---------|------------|
| Call Type |                               |         |            |
|           | Pedestrian Contact            | 116     | 1.3        |
|           | Traffic Stop                  | 509     | 5.6        |
|           | Robbery/Burglary              | 280     | 3.1        |
|           | Alcohol/Drug & Mental Illness | 815     | 8.9        |
|           | Domestic Dispute              | 520     | 5.7        |
|           | Assault (excluding domestic)  | 599     | 6.6        |
|           | Other                         | 6,298   | 68.9       |
|           | Missing                       | (8,828) | (49.1)     |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

The analysis examined whether the suspect(s) had a weapon. This nominal variable was coded yes or no. Data were missing for 7,404 incidents (41.2%). Most suspects did not have a weapon (80.5%,  $n = 8,506$ ), while 19.5% ( $n = 2,055$ ) had some type of weapon.

**Table 4***Descriptive Statistics for Suspect Weapon Possession*

| Variable              | Measurement | N       | Percentage |
|-----------------------|-------------|---------|------------|
| Suspect(s) Had Weapon |             |         |            |
|                       | No          | 8,506   | 80.5       |
|                       | Yes         | 2,055   | 19.5       |
|                       | Missing     | (7,404) | (41.2)     |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

This analysis also examined the race of the first suspect involved in the use of force. This nominal variable had four categories: White (not Hispanic), Black or African American (not Hispanic), Hispanic or Latino, and Other. Of all incidents, 1,819 (10.1%) had no data on the suspect's race. Black/African American suspects were the most frequent (42.9%,  $n = 6,926$ ), followed by White suspects (33.4%,  $n = 5,388$ ) and Hispanic/Latino suspects (21.4%,  $n = 3,453$ ). A small percentage of suspects (2.3%,  $n = 379$ ) were of another race.

**Table 5**

*Descriptive Statistics for First Suspect Race*

| Variable           | Measurement                                         | N       | Percentage |
|--------------------|-----------------------------------------------------|---------|------------|
| First Suspect Race |                                                     |         |            |
|                    | White (not of Hispanic descent)                     | 5,388   | 33.4       |
|                    | Black or African American (not of Hispanic descent) | 6,926   | 42.9       |
|                    | Hispanic or Latino                                  | 3,453   | 21.4       |
|                    | Other Race                                          | 379     | 2.3        |
|                    | Missing                                             | (1,819) | (10.1)     |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

Another variable was the first officer's years of experience. The ordinal categories were less than 1 year, 1–2 years, 3–4 years, 5–6 years, 7–8 years, 9–10 years, and more than 10 years. About half of all incidents (50.4%,  $n = 9,060$ ) had no data on the officer's experience. The most frequent category was more than 10 years of experience (21.3%,  $n = 1,896$ ), followed by 1–2

years (20.0%,  $n = 1,784$ ) and 3–4 years (19.9%,  $n = 1,772$ ). Another 16.9% ( $n = 1,509$ ) of officers had 5–6 years of experience, 12.4% ( $n = 1,102$ ) had 7–8 years, 6.8% ( $n = 605$ ) had 9–10 years, and only 2.7% ( $n = 237$ ) had less than 1 year. More than half of the officers involved in use-of-force incidents (59.5%) had less than 7 years of experience. The mean category score was 4.22 ( $SD = 1.87$ ).

**Table 6**

*Descriptive Statistics for First Officer Years of Experience*

| Variable                             | Measurement | N       | Percentage | Mean | Standard<br>Deviation |
|--------------------------------------|-------------|---------|------------|------|-----------------------|
| First Officer Years of<br>Experience |             |         |            | 4.22 | 1.872                 |
|                                      | <1 Year     | 237     | 2.7        |      |                       |
|                                      | 1–2 Years   | 1,784   | 20.0       |      |                       |
|                                      | 3–4 Years   | 1,772   | 19.9       |      |                       |
|                                      | 5–6 Years   | 1,509   | 16.9       |      |                       |
|                                      | 7–8 Years   | 1,102   | 12.4       |      |                       |
|                                      | 9–10 Years  | 605     | 6.8        |      |                       |
|                                      | >10 Years   | 1,896   | 21.3       |      |                       |
|                                      | Missing     | (9,060) | (50.4)     |      |                       |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

Alcohol or drug impairment of the first suspect was also examined. This nominal variable was coded yes or no. Data were missing for 4,467 incidents (24.9%), and impairment was unknown in another 787 (4.4%). Of the incidents with data, 65.9% ( $n = 8,378$ ) of suspects were not impaired by drugs or alcohol and 34.1% ( $n = 4,333$ ) showed some form of impairment.

**Table 7***Descriptive Statistics for First Suspect Alcohol or Drug Impairment*

| Variable                            | Measurement | N       | Percentage |
|-------------------------------------|-------------|---------|------------|
| Alcohol/Drug Impairment - Suspect 1 |             |         |            |
|                                     | No          | 8,378   | 65.9       |
|                                     | Yes         | 4,333   | 34.1       |
|                                     | Don't Know  | 787     | (4.4)      |
|                                     | Missing     | (4,467) | (24.9)     |

*Note.* Percentages exclude missing and don't know responses. The number and percentage of all 17,965 incidents in those rows are shown in parentheses.

The age of the first suspect was measured in ordinal categories: 17 or younger, 18–20, 21–25, 26–30, 31–40, 41–50, 51–60, and 61 or older. Data were missing for 3,988 incidents (22.2%). The youngest group made up 7.1% ( $n = 988$ ) of suspects and the oldest group 1.0% ( $n = 135$ ). Suspects aged 18–20 made up 18.1% ( $n = 2,527$ ). The 21–25 and 26–30 age groups each made up 15.2% ( $n = 2,124$  and  $n = 2,122$ , respectively). Suspects aged 31–40 made up 26.7% ( $n = 3,732$ ), 41–50 made up 13.2% ( $n = 1,850$ ), and 51–60 made up 3.6% ( $n = 499$ ). The mean category score was 2.95 ( $SD = 1.67$ ).

**Table 8***Descriptive Statistics for First Suspect Age*

| Variable          | Measurement   | N       | Percentage | Mean | Standard Deviation |
|-------------------|---------------|---------|------------|------|--------------------|
| First Suspect Age |               |         |            | 2.95 | 1.668              |
|                   | 17 or Younger | 988     | 7.1        |      |                    |
|                   | 18-20         | 2,527   | 18.1       |      |                    |
|                   | 21-25         | 2,124   | 15.2       |      |                    |
|                   | 26-30         | 2,122   | 15.2       |      |                    |
|                   | 31-40         | 3,732   | 26.7       |      |                    |
|                   | 41-50         | 1,850   | 13.2       |      |                    |
|                   | 51-60         | 499     | 3.6        |      |                    |
|                   | 61 or Older   | 135     | 1.0        |      |                    |
|                   | Missing       | (3,988) | (22.2)     |      |                    |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

Suspect behavior was also examined. This nominal variable recorded the suspect's most serious (maximum) behavior, with the categories No Resistive Behavior Recorded, Passive, Fleeing, Verbal, Mild Aggression, Severe Aggression, Deadly Force, and Other. Data were missing for 11,633 incidents (64.8%). Severe Aggression was the most frequent (23.9%,  $n = 1,516$ ), followed closely by No Resistive Behavior Recorded (22.0%,  $n = 1,392$ ) and Other (21.1%,  $n = 1,336$ ). Fleeing accounted for 15.1% ( $n = 956$ ) of incidents, Mild Aggression for 7.6% ( $n = 481$ ), Passive for 6.2% ( $n = 392$ ), Verbal for 2.7% ( $n = 168$ ), and Deadly Force for just 1.4% ( $n = 91$ ).

**Table 9***Descriptive Statistics for Maximum Suspect Behavior*

| Variable                    | Measurement                    | N        | Percentage |
|-----------------------------|--------------------------------|----------|------------|
| Maximum of Suspect Behavior |                                |          |            |
|                             | No Resistive Behavior Recorded | 1,392    | 22.0       |
|                             | Passive                        | 392      | 6.2        |
|                             | Fleeing                        | 956      | 15.1       |
|                             | Verbal                         | 168      | 2.7        |
|                             | Mild Aggression                | 481      | 7.6        |
|                             | Severe Aggression              | 1,516    | 23.9       |
|                             | Deadly Force                   | 91       | 1.4        |
|                             | Other                          | 1,336    | 21.1       |
|                             | Missing                        | (11,633) | (64.8)     |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

Officer demographics were represented by the race of the first officer involved in the use of force. This nominal variable had four categories: White, Black or African American, Hispanic or Latino, and Other Race. Data were missing for 40.6% ( $n = 7,286$ ) of incidents. White officers were involved most often (80.8%,  $n = 8,625$ ), followed by Black/African American (10.3%,  $n = 1,105$ ), Hispanic/Latino (5.8%,  $n = 621$ ), and Other (3.1%,  $n = 328$ ) officers.

**Table 10***Descriptive Statistics for First Officer Race*

| Variable           | Measurement                                    | N       | Percentage |
|--------------------|------------------------------------------------|---------|------------|
| First Officer Race |                                                |         |            |
|                    | White, not Hispanic descent                    | 8,625   | 80.8       |
|                    | Black or African American, no Hispanic descent | 1,105   | 10.3       |
|                    | Hispanic or Latino                             | 621     | 5.8        |
|                    | Other Race                                     | 328     | 3.1        |
|                    | Missing                                        | (7,286) | (40.6)     |

*Note.* Percentages exclude missing cases. The number and percentage of all 17,965 incidents with missing data are shown in parentheses.

**Results****Bivariate Analyses**

Chi-square tests of independence (cross-tabulations) compared the percentage of incidents in which each weapon was used across the categories of each independent variable (Tables 11–18).

***First Suspect Race***

Overall, a CED was used on 8.5% of first suspects: 9.0% of Black/African American suspects, 8.3% of Hispanic/Latino suspects, 8.3% of suspects of another race, and 8.0% of White suspects. The race of the first suspect was not significantly related to CED use,  $\chi^2(3) = 3.57$ ,  $p = .312$ . Overall, OC spray was used on 15.2% of first suspects: 16.5% of Black/African American suspects, 15.3% of White suspects, 13.7% of suspects of another race, and 12.7% of Hispanic/Latino suspects. This relationship was statistically significant,  $\chi^2(3) = 25.8$ ,  $p < .001$ .

**Table 11***Less-Than-Lethal Use of Force by First Suspect Race*

| Use of Force Type | First Suspect Race |                        |                 |                 |                   |
|-------------------|--------------------|------------------------|-----------------|-----------------|-------------------|
|                   | White              | Black/African American | Hispanic/Latino | Other           | Total             |
| CED               | 8.0%<br>(n=405)    | 9.0% (n=595)           | 8.3% (n=282)    | 8.3%<br>(n=31)  | 8.5%<br>(n=1313)  |
| OC Spray          | 15.3%<br>(n=775)   | 16.5% (n=1094)         | 12.7% (n=429)   | 13.7%<br>(n=51) | 15.2%<br>(n=2349) |

*Note.* Each cell shows the percentage of incidents in that category in which the weapon was used, with the number of incidents in parentheses.

***First Suspect Age***

Overall, a CED was used on 4.8% of first suspects: 5.7% of suspects aged 26–30, 5.7% of those aged 41–50, 5.6% of those aged 31–40, 5.2% of those 61 or older, 4.8% of those aged 21–25, 4.8% of those aged 51–60, 3.2% of those aged 18–20, and 1.9% of those 17 or younger. Age of the first suspect was significantly related to CED use,  $\chi^2(7) = 43.81, p < .001$ . Overall, OC spray was used on 15.6% of first suspects: 18.2% of suspects aged 21–25, 16.6% of those aged 31–40, 16.3% of those aged 26–30, 15.2% of those aged 41–50, 14.2% of those aged 18–20, 12.9% of those aged 51–60, 11.6% of those 17 or younger, and just 6.7% of those 61 or older. Age was also significantly related to OC spray use,  $\chi^2(7) = 41.85, p < .001$ .

**Table 12***Less-Than-Lethal Use of Force by First Suspect Age*

| Use of<br>Force Type | First Suspect Age |                  |                  |                  |                  |                  |                 |                |                   |
|----------------------|-------------------|------------------|------------------|------------------|------------------|------------------|-----------------|----------------|-------------------|
|                      | 17 or<br>Younger  | 18-20            | 21-25            | 26-30            | 31-40            | 41-50            | 51-60           | 61 or<br>Older | Total             |
| CED                  | 1.9%<br>(n=19)    | 3.2%<br>(n=81)   | 4.8%<br>(n=101)  | 5.7%<br>(n=121)  | 5.6%<br>(n=207)  | 5.7%<br>(n=105)  | 4.8%<br>(n=24)  | 5.2%<br>(n=7)  | 4.8%<br>(n=665)   |
| OC Spray             | 11.6%<br>(n=114)  | 14.2%<br>(n=358) | 18.2%<br>(n=385) | 16.3%<br>(n=345) | 16.6%<br>(n=620) | 15.2%<br>(n=280) | 12.9%<br>(n=61) | 6.7%<br>(n=9)  | 15.6%<br>(n=2175) |

*Note.* Each cell shows the percentage of incidents in that category in which the weapon was used, with the number of incidents in parentheses.

***Maximum Suspect Behavior***

Overall, a CED was used on 17.4% of suspects: 32.4% of suspects who fled, 26.8% of those who displayed severe aggression, 26.7% of those who used deadly force against officers, 15.0% of those with no resistive behavior recorded, 11.2% of those who displayed mild aggression, 7.1% of those who resisted verbally, 6.2% of those whose behavior was categorized as other, and 1.8% of passive suspects. Maximum suspect behavior was significantly related to CED use,  $\chi^2(7) = 460.27, p < .001$ . Overall, OC spray was used on 12.3% of suspects: 27.2% of suspects who displayed mild aggression, 25.0% of those who resisted verbally, 19.0% of those who displayed severe aggression, 13.6% of those whose behavior was categorized as other, 12.2% of those who used deadly force, 7.5% of passive suspects, 5.6% of suspects who fled, and 3.2% of those with no resistive behavior recorded. Suspect behavior was also significantly related to OC spray use,  $\chi^2(7) = 343.35, p < .001$ .

**Table 13***Less-Than-Lethal Use of Force by Maximum Suspect Behavior*

| Use of<br>Force Type | Maximum Suspect Behavior                |                |                  |                 |                  |                  |                 |                  |                   |
|----------------------|-----------------------------------------|----------------|------------------|-----------------|------------------|------------------|-----------------|------------------|-------------------|
|                      | No<br>Resistive<br>Behavior<br>Recorded | Passive        | Fleeing          | Verbal          | Mild Agg         | Severe<br>Agg    | Deadly<br>Force | Other            | Total             |
| CED                  | 15%<br>(n=209)                          | 1.8%<br>(n=7)  | 32.4%<br>(n=307) | 7.1%<br>(n=12)  | 11.2%<br>(n=53)  | 26.8%<br>(n=406) | 26.7%<br>(n=24) | 6.2%<br>(n=82)   | 17.4%<br>(n=1100) |
| OC Spray             | 3.2%<br>(n=44)                          | 7.5%<br>(n=29) | 5.6%<br>(n=53)   | 25.0%<br>(n=42) | 27.2%<br>(n=129) | 19.0%<br>(n=288) | 12.2%<br>(n=11) | 13.6%<br>(n=181) | 12.3%<br>(n=777)  |

*Note.* Each cell shows the percentage of incidents in that category in which the weapon was used, with the number of incidents in parentheses.

***Suspect(s) Had Weapon***

Overall, a CED was used on 10.9% of suspects: 11.9% of suspects who did not have a weapon, compared with 6.6% of suspects who did. Weapon possession was significantly related to CED use,  $\chi^2(1) = 47.8, p < .001$ . Overall, OC spray was used on 15.8% of suspects: 20.5% of suspects who had a weapon, compared with 14.6% of those who did not. This relationship was also significant,  $\chi^2(1) = 42.44, p < .001$ .

**Table 14***Less-Than-Lethal Use of Force by Suspect Weapon Possession*

| Use of Force Type | Suspect(s) Had Weapon |                |                |
|-------------------|-----------------------|----------------|----------------|
|                   | Yes                   | No             | Total          |
| CED               | 6.6% (n=135)          | 11.9% (n=1011) | 10.9% (n=1146) |
| OC Spray          | 20.5% (n=421)         | 14.6% (n=1246) | 15.8% (n=1667) |

*Note.* Each cell shows the percentage of incidents in that category in which the weapon was used, with the number of incidents in parentheses.

*First Suspect Alcohol or Drug Impairment*

Overall, a CED was used on 8.3% of suspects: 14.7% of suspects impaired by alcohol or drugs, compared with 5.0% of suspects who were not impaired. Impairment was significantly related to CED use,  $\chi^2(1) = 352.04, p < .001$ . Overall, OC spray was used on 15.4% of suspects: 15.7% of suspects who were not impaired, compared with 15.0% of those who were. Impairment was not significantly related to OC spray use,  $\chi^2(1) = 1.08, p = .299$ .

**Table 15***Less-Than-Lethal Use of Force by First Suspect Alcohol or Drug Impairment*

| Use of Force Type | Alcohol/Drug Impairment |                |                |
|-------------------|-------------------------|----------------|----------------|
|                   | Yes                     | No             | Total          |
| CED               | 14.7% (n=633)           | 5.0% (n=416)   | 8.3% (n=1049)  |
| OC Spray          | 15.0% (n=646)           | 15.7% (n=1310) | 15.4% (n=1956) |

*Note.* Each cell shows the percentage of incidents in that category in which the weapon was used, with the number of incidents in parentheses.

***First Officer Race***

Overall, 11.4% of first officers used a CED: 16.1% of Hispanic/Latino officers, 11.3% of White officers, 10.1% of officers of another race, and 9.6% of Black/African American officers. Officer race was significantly related to CED use,  $\chi^2(3) = 17.48, p < .001$ . Overall, 16.0% of first officers used OC spray: 16.7% of White officers, 14.3% of officers of another race, 13.4% of Hispanic/Latino officers, and 12.2% of Black/African American officers. Officer race was also significantly related to OC spray use,  $\chi^2(3) = 18.05, p < .001$ .

**Table 16*****Less-Than-Lethal Use of Force by First Officer Race***

| Use of<br>Force Type | First Officer Race |                           |                 |                 |                   |
|----------------------|--------------------|---------------------------|-----------------|-----------------|-------------------|
|                      | White              | Black/African<br>American | Hispanic/Latino | Other           | Total             |
| CED                  | 11.3%<br>(n=906)   | 9.6% (n=102)              | 16.1% (n=100)   | 10.1%<br>(n=29) | 11.4%<br>(n=1137) |
| OC Spray             | 16.7%<br>(n=1335)  | 12.2% (n=130)             | 13.4% (n=83)    | 14.3%<br>(n=41) | 16.0%<br>(n=1589) |

*Note.* Each cell shows the percentage of incidents in that category in which the weapon was used, with the number of incidents in parentheses.

***First Officer Years of Experience***

Overall, 10.7% of first officers used a CED: 16.9% of officers with less than 1 year of experience, 12.9% of those with 5–6 years, 12.7% of those with 7–8 years, 11.2% of those with 3–4 years, 9.7% of those with 9–10 years, 9.0% of those with 1–2 years, and 8.3% of those with more than 10 years. Officer experience was significantly related to CED use,  $\chi^2(6) = 37.03, p < .001$ . Overall, 16.0% of first officers used OC spray: 9.2% of officers with less than 1 year of

experience, 14.3% of those with 1–2 years, 16.8% of those with 3–4 years, 15.9% of those with 5–6 years, 15.6% of those with 7–8 years, 15.4% of those with 9–10 years, and 18.1% of those with more than 10 years. Officer experience was also significantly related to OC spray use,  $\chi^2(6) = 17.02, p = .009$ .

**Table 17***Less-Than-Lethal Use of Force by First Officer Years of Experience*

| Use of<br>Force Type | First Officer Years of Experience |                  |                  |                  |                  |                 |                  | Total             |
|----------------------|-----------------------------------|------------------|------------------|------------------|------------------|-----------------|------------------|-------------------|
|                      | <1 Year                           | 1-2 Years        | 3-4 Years        | 5-6 Years        | 7-8 Years        | 9-10<br>Years   | >10 Years        |                   |
| CED                  | 16.9%<br>(n=35)                   | 9.0%<br>(n=141)  | 11.2%<br>(n=179) | 12.9%<br>(n=182) | 12.7%<br>(n=137) | 9.7%<br>(n=56)  | 8.3%<br>(n=147)  | 10.7%<br>(n=877)  |
| OC Spray             | 9.2%<br>(n=19)                    | 14.3%<br>(n=225) | 16.8%<br>(n=269) | 15.9%<br>(n=224) | 15.6%<br>(n=168) | 15.4%<br>(n=89) | 18.1%<br>(n=321) | 16.0%<br>(n=1315) |

*Note.* Each cell shows the percentage of incidents in that category in which the weapon was used, with the number of incidents in parentheses.

***Call Type***

Overall, 2.8% of calls resulted in CED use: 13.6% of assault calls, 7.2% of robbery/burglary calls, 5.2% of alcohol/drug or mental illness calls, 1.7% of other calls, 0.8% of traffic stops, 0.2% of domestic disturbances, and none of the pedestrian contacts. Call type was significantly related to CED use,  $\chi^2(6) = 342.7, p < .001$ . Overall, 17.1% of calls resulted in OC spray use: 21.7% of domestic disturbance calls, 19.3% of alcohol/drug or mental illness calls, 19.0% of assaults, 19.0% of pedestrian contacts, 16.9% of other calls, 13.0% of traffic stops, and 8.6% of robbery/burglary calls. Call type was also significantly related to OC spray use,  $\chi^2(6) = 32.80, p < .001$ .

**Table 18***Less-Than-Lethal Use of Force by Type of Call*

| Use of<br>Force Type | Call Type             |                 |                      |                                          |                     |                  |                   |                |
|----------------------|-----------------------|-----------------|----------------------|------------------------------------------|---------------------|------------------|-------------------|----------------|
|                      | Pedestrian<br>Contact | Traffic<br>Stop | Robbery/<br>Burglary | Alcohol/D<br>rug or<br>Mental<br>Illness | Domestic<br>Disturb | Assault          | Other             | Total          |
| CED                  | 0.0%<br>(n=0)         | 0.8%<br>(n=4)   | 7.2%<br>(n=20)       | 5.2%<br>(n=42)                           | 0.2%<br>(n=1)       | 13.6%<br>(n=81)  | 1.7%<br>(n=109)   | 2.8% (n=257)   |
| OC Spray             | 19.0%<br>(n=22)       | 13.0%<br>(n=66) | 8.6%<br>(n=24)       | 19.3%<br>(n=156)                         | 21.7%<br>(n=113)    | 19.0%<br>(n=113) | 16.9%<br>(n=1063) | 17.1% (n=1557) |

*Note.* Each cell shows the percentage of incidents in that category in which the weapon was used, with the number of incidents in parentheses.

**Logistic Regression Analyses**

Because both dependent variables are yes/no outcomes, binary logistic regression was used to examine each independent variable while controlling for the others.  $\text{Exp}(b)$  is the odds ratio (*OR*): values above 1 indicate higher odds that the weapon was used than in the reference category, and values below 1 indicate lower odds. Table 19 presents the model for OC spray use. Officer race was not consistently significant. Compared with White officers, Black/African American officers had significantly lower odds of using OC spray ( $OR = 0.556$ ,  $b = -0.587$ , Wald = 16.465,  $p < .001$ ). Hispanic/Latino officers ( $OR = 0.911$ ,  $b = -0.093$ , Wald = 0.260,  $p = .610$ ) and officers of another race ( $OR = 1.133$ ,  $b = 0.125$ , Wald = 0.331,  $p = .565$ ) did not differ significantly from White officers. Officer experience had a positive but nonsignificant relationship with OC spray use: each one-category increase in experience (usually 2 years) multiplied the odds by 1.027 ( $b = 0.027$ , Wald = 1.722,  $p = .189$ ). Compared with White

suspects, Black/African American suspects had significantly higher odds of having OC spray used on them ( $OR = 1.300$ ,  $b = 0.263$ , Wald = 10.130,  $p = .001$ ). Hispanic/Latino suspects ( $OR = 0.800$ ,  $b = -0.223$ , Wald = 2.893,  $p = .089$ ) and suspects of another race ( $OR = 0.970$ ,  $b = -0.031$ , Wald = 0.013,  $p = .909$ ) did not differ significantly from White suspects. Suspect age had a positive but nonsignificant relationship with OC spray use ( $OR = 1.012$  per age category,  $b = 0.012$ , Wald = 0.273,  $p = .601$ ).

Suspect behavior was compared with incidents in which no resistive behavior was recorded. Suspects who displayed passive behavior had significantly higher odds of OC spray use ( $OR = 14.568$ ,  $b = 2.679$ , Wald = 5.221,  $p = .022$ ), as did suspects who resisted verbally ( $OR = 11.344$ ,  $b = 2.429$ , Wald = 15.680,  $p < .001$ ), those who displayed mild aggression ( $OR = 10.180$ ,  $b = 2.320$ , Wald = 33.569,  $p < .001$ ), those who displayed severe aggression ( $OR = 7.077$ ,  $b = 1.957$ , Wald = 34.940,  $p < .001$ ), and those whose behavior was categorized as other ( $OR = 7.932$ ,  $b = 2.071$ , Wald = 36.409,  $p < .001$ ). Fleeing ( $OR = 0.736$ ,  $b = -0.307$ , Wald = 0.161,  $p = .688$ ) and the use of deadly force by the suspect ( $OR = 2.093$ ,  $b = 0.738$ , Wald = 0.917,  $p = .338$ ) were not significant.

Suspects who had a weapon had significantly higher odds of OC spray use than suspects who did not ( $OR = 1.264$ ,  $b = 0.234$ , Wald = 7.030,  $p = .008$ ). Suspects impaired by drugs or alcohol had significantly lower odds of OC spray use than those who were not impaired ( $OR = 0.552$ ,  $b = -0.595$ , Wald = 4.507,  $p = .034$ ). Compared with pedestrian contacts, the odds of OC spray use were significantly higher for traffic stops ( $OR = 4.251$ ,  $b = 1.447$ , Wald = 17.958,  $p < .001$ ), calls involving alcohol, drugs, or mental illness ( $OR = 9.670$ ,  $b = 2.269$ , Wald = 55.988,  $p < .001$ ), domestic disputes ( $OR = 7.507$ ,  $b = 2.016$ , Wald = 40.992,  $p < .001$ ), assaults ( $OR = 12.836$ ,  $b = 2.552$ , Wald = 32.237,  $p < .001$ ), and all other calls ( $OR = 5.051$ ,  $b = 1.620$ , Wald =

32.382,  $p < .001$ ). Robbery and burglary calls also had higher odds, but the difference was not significant ( $OR = 4.334$ ,  $b = 1.466$ , Wald = 3.692,  $p = .055$ ).

**Table 19**

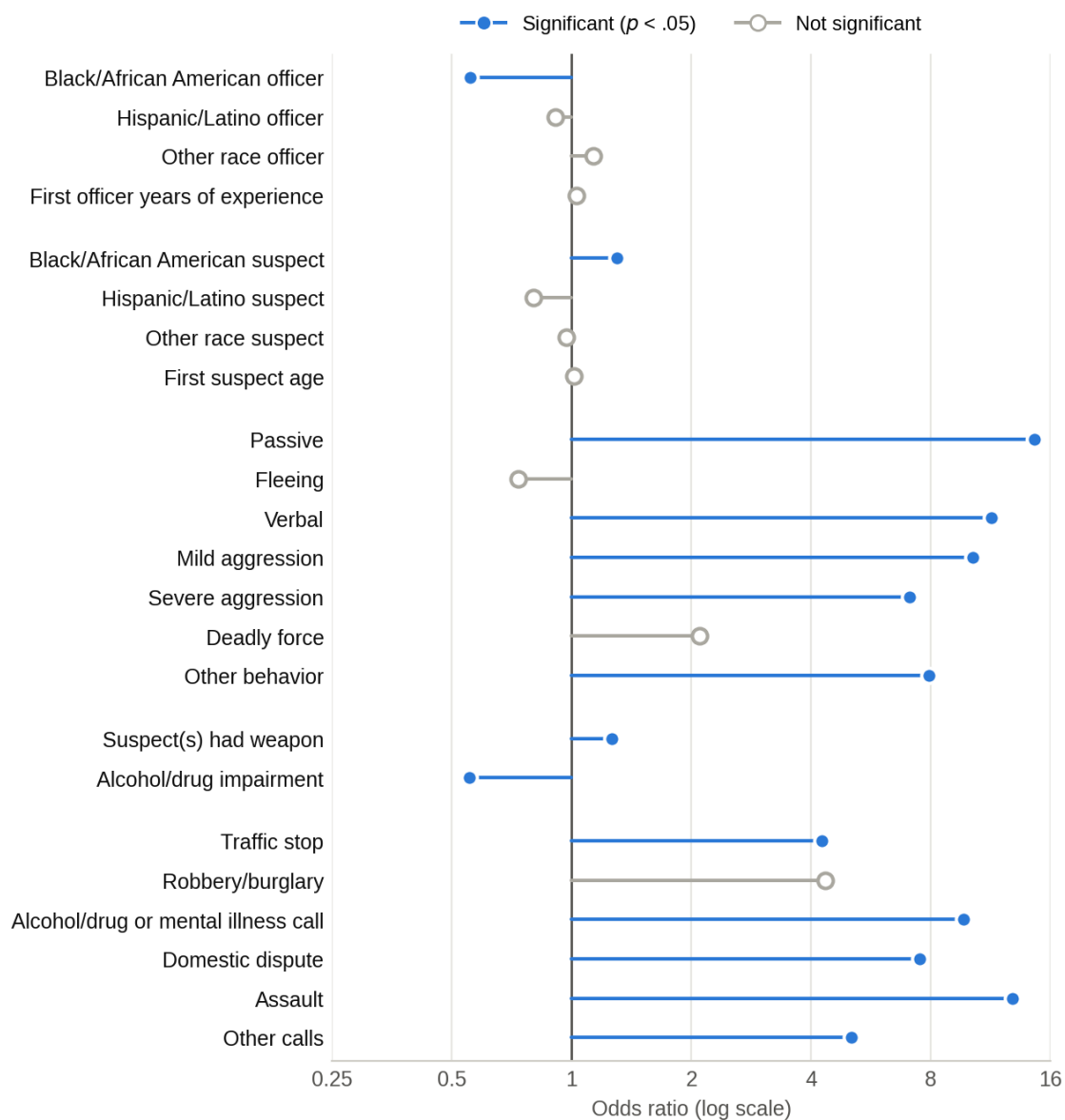
*Logistic Regression Analysis of OC Spray Use*

| Variable                          | <i>b</i>  | <i>OR</i> | <i>SE</i> | Wald   | <i>p</i> |
|-----------------------------------|-----------|-----------|-----------|--------|----------|
| Black/African American Officer    | -0.587*** | 0.556     | 0.145     | 16.465 | <.001    |
| Hispanic/Latino Officer           | -0.093    | 0.911     | 0.183     | 0.260  | .610     |
| Other Race Officer                | 0.125     | 1.133     | 0.217     | 0.331  | .565     |
| First Officer Years of Experience | 0.027     | 1.027     | 0.020     | 1.722  | .189     |
| Black/African American Suspect    | 0.263**   | 1.300     | 0.083     | 10.130 | .001     |
| Hispanic/Latino Suspect           | -0.223    | 0.800     | 0.131     | 2.893  | .089     |
| Other Race Suspect                | -0.031    | 0.970     | 0.271     | 0.013  | .909     |
| First Suspect Age                 | 0.012     | 1.012     | 0.022     | 0.273  | .601     |
| Passive                           | 2.679*    | 14.568    | 1.172     | 5.221  | .022     |
| Fleeing                           | -0.307    | 0.736     | 0.765     | 0.161  | .688     |
| Verbal                            | 2.429***  | 11.344    | 0.613     | 15.680 | <.001    |
| Mild Aggression                   | 2.320***  | 10.180    | 0.400     | 33.569 | <.001    |
| Severe Aggression                 | 1.957***  | 7.077     | 0.331     | 34.940 | <.001    |
| Deadly Force                      | 0.738     | 2.093     | 0.771     | 0.917  | .338     |

| Variable                       | <i>b</i> | <i>OR</i> | <i>SE</i> | Wald   | <i>p</i> |
|--------------------------------|----------|-----------|-----------|--------|----------|
| Other Behavior                 | 2.071*** | 7.932     | 0.343     | 36.409 | <.001    |
| Suspect(s) Had Weapon          | 0.234**  | 1.264     | 0.088     | 7.030  | .008     |
| Alcohol/Drug Impairment        | -0.595*  | 0.552     | 0.280     | 4.507  | .034     |
| Traffic Stop                   | 1.447*** | 4.251     | 0.341     | 17.958 | <.001    |
| Robbery/Burglary               | 1.466    | 4.334     | 0.763     | 3.692  | .055     |
| Alcohol/Drug or Mental Illness | 2.269*** | 9.670     | 0.303     | 55.988 | <.001    |
| Domestic Dispute               | 2.016*** | 7.507     | 0.315     | 40.992 | <.001    |
| Assault                        | 2.552*** | 12.836    | 0.450     | 32.237 | <.001    |
| Other Calls                    | 1.620*** | 5.051     | 0.285     | 32.382 | <.001    |

*Note.* Reference categories are White officers, White suspects, no resistive behavior recorded, and pedestrian contact. *OR* = odds ratio ( $\exp[b]$ ); Wald = Wald chi-square statistic.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Figure 1***Odds Ratios From the Logistic Regression of OC Spray Use*

*Note.* Odds ratios are from Table 19 and are plotted on a logarithmic scale. Points to the right of the line at 1 show higher odds of OC spray use than the reference category; points to the left show lower odds.

Table 20 presents the model for CED use. Call type was omitted from this model because the main purpose of the analysis was to examine the characteristics of the officers and suspects involved, not what initiated the contact. Officer experience had a positive but nonsignificant relationship with CED use: each one-category increase in experience multiplied the odds by 1.083 ( $b = 0.080$ , Wald = 1.832,  $p = .176$ ). Compared with White officers, Black/African American officers ( $OR = 0.514$ ,  $b = -0.665$ , Wald = 2.854,  $p = .091$ ) and Hispanic/Latino officers ( $OR = 0.565$ ,  $b = -0.571$ , Wald = 2.176,  $p = .140$ ) had lower odds of CED use, and officers of another race had higher odds ( $OR = 1.278$ ,  $b = 0.245$ , Wald = 0.080,  $p = .777$ ), but none of these differences were significant. Compared with White suspects, Hispanic/Latino suspects had significantly higher odds of CED use ( $OR = 1.887$ ,  $b = 0.635$ , Wald = 4.800,  $p = .028$ ). Black/African American suspects ( $OR = 1.100$ ,  $b = 0.096$ , Wald = 0.126,  $p = .723$ ) and suspects of another race ( $OR = 2.449$ ,  $b = 0.896$ , Wald = 2.155,  $p = .142$ ) did not differ significantly from White suspects. Suspect age had a positive but nonsignificant relationship with CED use ( $OR = 1.043$  per age category,  $b = 0.042$ , Wald = 0.271,  $p = .603$ ).

Only the suspect behaviors that occurred often were included in this model; no resistance, passive, verbal, and deadly force behaviors together served as the reference group. Suspects who fled had significantly higher odds of CED use than the reference group ( $OR = 4.819$ ,  $b = 1.573$ , Wald = 21.564,  $p < .001$ ). Mild aggression ( $OR = 0.434$ ,  $b = -0.835$ , Wald = 1.181,  $p = .277$ ) and severe aggression ( $OR = 1.524$ ,  $b = 0.421$ , Wald = 2.912,  $p = .088$ ) were not significant. Suspects who had a weapon had lower odds of CED use than those who did not, but the difference was not significant ( $OR = 0.738$ ,  $b = -0.304$ , Wald = 0.433,  $p = .510$ ). Suspects impaired by alcohol or drugs had far higher odds of CED use than those who were not impaired ( $OR = 1,081.049$ ,  $b = 6.986$ , Wald = 47.107,  $p < .001$ ). An odds ratio this large usually means the model had very few

CED incidents in one of the groups being compared, so this result should be interpreted with caution. This variable was left out of Figure 2 because its extremely large odds ratio would have made the other variables hard to see.

**Table 20***Logistic Regression Analysis of CED Use*

| Variable                          | <i>b</i> | <i>OR</i> | <i>SE</i> | Wald   | <i>p</i> |
|-----------------------------------|----------|-----------|-----------|--------|----------|
| First Officer Years of Experience | 0.080    | 1.083     | 0.059     | 1.832  | .176     |
| Black/African American Officer    | -0.665   | 0.514     | 0.394     | 2.854  | .091     |
| Hispanic/Latino Officer           | -0.571   | 0.565     | 0.387     | 2.176  | .140     |
| Other Race Officer                | 0.245    | 1.278     | 0.865     | 0.080  | .777     |
| Black/African American Suspect    | 0.096    | 1.100     | 0.269     | 0.126  | .723     |
| Hispanic/Latino Suspect           | 0.635*   | 1.887     | 0.290     | 4.800  | .028     |
| Other Race Suspect                | 0.896    | 2.449     | 0.610     | 2.155  | .142     |
| First Suspect Age                 | 0.042    | 1.043     | 0.081     | 0.271  | .603     |
| Suspect(s) Had Weapon             | -0.304   | 0.738     | 0.462     | 0.433  | .510     |
| Alcohol/Drug Impairment           | 6.986*** | 1,081.049 | 1.018     | 47.107 | <.001    |
| Fleeing                           | 1.573*** | 4.819     | 0.339     | 21.564 | <.001    |
| Mild Aggression                   | -0.835   | 0.434     | 0.768     | 1.181  | .277     |
| Severe Aggression                 | 0.421    | 1.524     | 0.247     | 2.912  | .088     |

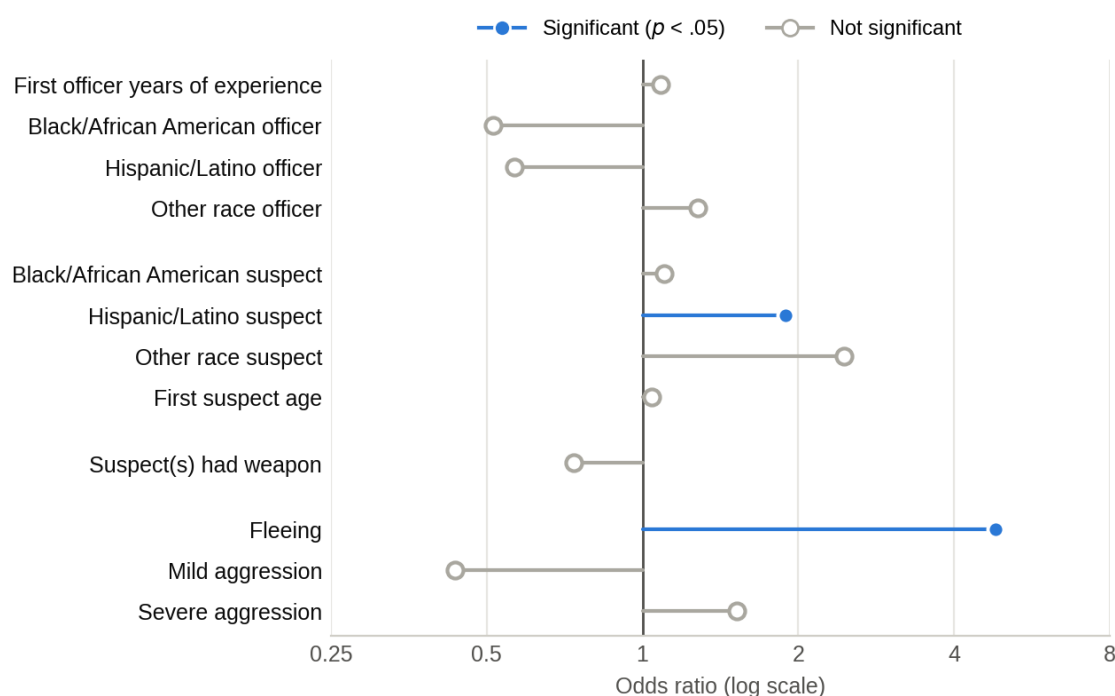
*Note.* Reference categories are White officers, White suspects, and no resistance, passive, verbal, or deadly force behavior. Call type was not included in this model. *OR* = odds ratio ( $\exp[b]$ );

Wald = Wald chi-square statistic.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Figure 2**

*Odds Ratios From the Logistic Regression of CED Use*



*Note.* Odds ratios are from Table 20 and are plotted on a logarithmic scale. Suspect alcohol or drug impairment ( $OR = 1,081.049$ ) is not shown because its very large value would compress the rest of the scale.

## Discussion

Overall, race was significantly related to less-lethal weapon use in the bivariate (cross-tabulation) analyses. However, when other factors were taken into account, officer race was less

often significant. In fact, only the difference between Black/African American and White officers in OC spray use remained significant after other variables were considered. This finding mirrored the prior research on which this analysis based its hypothesis. As noted earlier, prior research found that Black officers' use of force was unaffected by suspect race, whereas White officers were more coercive toward Black suspects (Paoline et al., 2018). This analysis found that Black/African American and Hispanic/Latino officers were less likely than White officers to use less-lethal force. Suspect race was also less often significant in the multivariate analyses than in the bivariate analyses. Suspect race mattered only for Black/African American suspects in OC spray use and for Hispanic/Latino suspects in CED use. This finding also supported the hypothesis that non-White suspects would experience less-lethal weapon use more often than White suspects. As prior research found, people of color experience use of force at higher rates than White people during interactions with law enforcement (Fryer, 2019).

The most consistent predictor of officers' less-lethal weapon use was the suspect's behavior during the incident. In both the bivariate and multivariate analyses, suspects who displayed aggression toward officers were more likely to have less-lethal weapons used on them, particularly OC spray. The differences across suspect behavior may also reflect that higher levels of aggression brought a stronger response from officers. Deadly force by the suspect was not significant in the multivariate analysis of OC spray. One explanation is that when a suspect appears intent on seriously injuring officers or bystanders, officers respond with lethal force, and OC spray is not a lethal option. A similar explanation may apply to suspect weapon possession. This analysis examined only whether the suspect had a weapon, not what the weapon was (e.g., a club or a firearm), and the lethality of the weapon could influence the type of force officers use. Although this report did not review prior literature on suspect behavior, the data supported the

hypothesis that aggressive behavior by the suspect increased the likelihood of force. One would hope this is also true in the practice of policing: the force officers use on suspects should match what the suspect's actions warrant, not some other arbitrary factor.

The significance of officer experience also changed when other factors were considered. Officer experience was significant for both OC spray and CED use in the bivariate analyses but for neither in the multivariate analyses. This suggests that factors other than officer experience influenced whether less-lethal weapons were used. No prior research on officer experience was available to base a hypothesis on. One reason for the nonsignificant finding may be that officers spend less time in the field as they gain seniority, which reduces their interactions with suspects. A similar conclusion applies to suspect age. Suspect age was significant for both OC spray and CED use in the bivariate analyses, but the multiple regression analyses showed that other factors were more important. Even in the cross-tabulations, the percentage of suspects involved in less-lethal weapon use varied little across age groups. These findings did not support the hypothesis that younger suspects would experience less-lethal force more often than older suspects, that is, that the chance of being involved in use of force decreases as suspect age increases. The data suggest that age mattered less than other characteristics of use-of-force incidents.

### **Limitations**

Missing data prevented a complete analysis. Because the original study relied on police databases, and not every department tracked the same information, many variables had only partial data. Some variables in this analysis were missing half or more of their data because departments did not collect that information for use-of-force incidents. For example, call type was missing for 49.1% of incidents, which is why it was excluded from one of the regression analyses. Incomplete data made the multivariate regression analyses difficult, and some variables

had to be omitted. This was especially challenging for CED use: of the 13 police departments in the study, only seven used CEDs, which alone cut the data almost in half for any analysis of CED deployment.

Some statistical issues also deserve attention. When CED use was regressed on first officer years of experience alone, the coefficient was negative and significant ( $b = -0.041, p = .033$ ), with an odds ratio just below 1, suggesting that more experienced officers were slightly less likely to use a CED. In the full model (Table 20), the coefficient was positive and not significant ( $b = 0.080, OR = 1.083, p = .176$ ). Coefficients can change direction and significance when other variables are controlled, and because incidents with missing data on any variable are dropped from the full model, the two models were also estimated on different sets of incidents. Even so, the shift raises questions about the precision of this estimate. The same variable showed no such inconsistency in the OC spray model. Some output also contained implausible values: odds ratios and lower confidence bounds of 0.0 for several dummy variables, identical values (0.88) for the coefficient, standard error, and Wald statistic of first suspect age, and a standard error of 18,570.392 for passive behavior. Estimates like these usually mean that some categories had too few cases, as with passive suspects, only 1.8% of whom had a CED used on them (Table 13).

Several factors may explain these issues. Much of the data was masked, and the original study may not have managed all of the data fully. Researchers may also construct dummy variables differently. For example, call types could be grouped differently, such as combining robbery, burglary, and homicide into a single violent-crime category instead of leaving homicide in the other category, and different groupings could produce different results. In addition, the constant is usually not tested for significance or interpreted, because an independent variable

value of zero is often impossible in reality. Here, however, an officer could have almost no experience, which makes the constant ambiguous and hard to interpret. Finally, statistically significant findings are not necessarily practically significant.

## **Conclusion**

Much of the research before this report was limited to narrative literature reviews and theoretical analysis rather than empirical data analysis. A meta-analysis by Bolger (2015) in the *American Journal of Criminal Justice* sought, like this report, to identify the most influential predictors of police use-of-force decisions. Bolger faced similar limitations, unable to use a substantial amount of likely important research because it lacked objectivity. His findings suggest that future theories of use-of-force decisions should focus primarily on the variables of the encounter rather than on theoretical perspectives on 21st-century policing. The authors of this report support Bolger's conclusion. Research like this, and the conclusions drawn from it, can strengthen administrative policies on use of force by focusing on the circumstances in which force is used and by drawing on prior evidence that stricter policies reduce unnecessary force.

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