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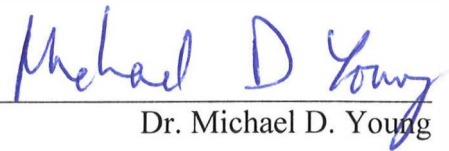
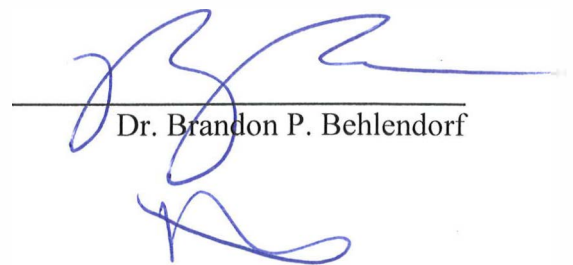
Analysis of the Police Response to Mass
Shootings in the United States between
1966 and 2016

Keily Linger

Honors Thesis

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Analysis of the Police Response to Mass Shootings in the United States between 1966 and 2016

Abstract

This study examines 186 mass shooting events for the protocol police followed upon arrival at the scene. In 124 of these cases, the police arrived on scene after the shooter had stopped shooting, either because the shooter committed suicide, fled the scene or was detained by people in the area who were not currently police officers. Of the 186, only 62 cases included police arriving on scene and following a response protocol, either engagement or perimeter. The number of casualties varied for each incident and type of police response. These cases were analyzed to determine if one type of response protocol was more effective in decreasing the number of casualties resulting from a shooting. Analysis of the data showed signs that suggested there are more casualties when the perimeter protocol is followed, but these results remain statistically insignificant. However, indirect support for the effectiveness of the engagement protocol reducing the number of casualties included a significant correlation between the shooting duration and the total number of casualties.

Analysis of the Police Response to Mass Shootings in the United States between 1966 and 2016

One mass shooting many people are familiar with is the 1999 Columbine High School shooting, which killed 12 students and one teacher and injured 24 students (Erickson, 2001). This event was a pivotal point in police response to mass shootings. Since the Columbine High School shooting, the police protocol for shooting events has changed in many jurisdictions from the perimeter protocol to an engagement protocol (Blair, Nichols, Burns & Curnutt, 2013). When following a perimeter protocol, the first responding officers create a perimeter and wait for Special Weapons and Tactics (SWAT) or other tactical teams. When following an engagement protocol, contact teams made of the first responding officers engage or neutralize the shooter as quickly as possible (Blair et al., 2013). This change was instituted in some jurisdictions because it was believed that an engagement protocol would decrease the number of casualties resulting from a mass shooting.

Due to these different police response protocols and the random and unpredictable application of each, each protocol needs to be studied to determine which leads to fewer casualties. This calls for an evaluation of the statistical relationship between the type of police response and the number of casualties from mass shooting events. This analysis can then be used to determine if there is a police response that is most effective in limiting the number of civilians, law enforcement officers, and collaborating agency members who become casualties.

Although the Columbine shooting inspired a change in a police response protocol, not all police departments follow the engagement protocol. A very recent example of perimeter protocol occurred on February 14, 2018 in Parkland, Florida during a shooting at Stoneman Douglas High School, where 17 people were killed and 15 were injured (Burch & Mazzei, 2018; Earl &

Schallhorn, 2018; Almkhatar, Lai, Singhvi & Yourish, 2018). At 2:19pm, a shooter entered the school and used smoke grenades to set off fire alarms, so that people would leave their classrooms (Almkhatar et al., 2018; Burch & Mazzei, 2018). While students were attempting to leave the building because of the fire alarm, the shooter opened fire in hallways, five classrooms, and the stairwell, where he left his rifle, ammunition, and vest (Almkhatar et al., 2018). Once these items were abandoned, the shooter managed to escape the building in a crowd of others leaving the scene before he was arrested at 3:41pm walking down a street a few miles from the school (Burch & Mazzei, 2018; Almkhatar et al., 2018). The police were seen standing outside, surrounding the building as students ran out (Almkhatar et al., 2018). This included the School Resource Officer, who did not engage the shooter, but waited outside the building and ordered responding officers to shut down the street in front of the school (Flores et al., 2018). Many officers were ordered to stay at least 500 feet away from the building (Flores et al., 2018). Additionally, as the Broward County Sheriff's supervisor arrived on scene, he asked if a perimeter had been set up, but was told it had not yet been completed (Flores et al., 2018).

A less recent, but just as relevant mass shooting that illustrates this incomplete change in protocols is the October 1, 2017 Las Vegas shooting, which left 58 people dead and over 546 others injured (United States Secret Service [USSS], 2018). Initially police officers responded and tracked down the shooter to his hotel room at approximately 10:24pm, but the police then waited for SWAT officers to engage the shooter (Almkhatar et al., 2017). When the SWAT officers entered the hotel suite to engage the shooter around 11:20pm, they found that the shooter had already committed suicide, likely around 10:25pm (Almkhatar et al., 2017). Although it is estimated that the shooter committed suicide shortly after his location was determined, it took SWAT approximately 75 minutes to mobilize and enter the hotel suite, which is far longer than

the 20-minute response time by some SWAT teams (Los Angeles Times Staff, 2018; Blair & Martaindale, 2013). Due to the delay in SWAT response, many more lives could have been at risk, as was the case during the Columbine and Parkland shootings, if SWAT and police officers were unaware the shooter was no longer active. SWAT and the police department's understanding of the status of the shooter by the time SWAT entered the room remains unknown to the public.

These are only two examples of mass shootings (at least three people killed or physically injured) within the last year, but there are many others. Mass shootings and active shooter events (ASEs) have become more prevalent in recent years, but there are only a few databases that track the number of mass shootings, which include the Gun Violence Archive (n.d.) and the Mass Shooting Tracker (2013). Others, such as the Stanford Mass Shootings in America (MSA) database and the Gun Violence Archive track the number of the casualties that result from the shootings included in their database. According to the Gun Violence Archive, there were 384 mass shootings in the US within 2016, which has largely increased from the two known mass shootings that occurred in the US within 1966 (Jeffrey, 2018; MSA, 2012). Between 1966 and 2016, there have been over 1,000 mass shootings in the US, with at least 986 occurring between 2014 and 2016 (Gun Violence Archive, n.d.; Mass Shooting Tracker, 2013).

Before the Columbine shooting, law enforcement officers were trained to create a perimeter around the location so the shooter could not escape, evacuate those who could easily be evacuated, establish communications, and to call SWAT to neutralize the shooter (Blair et al., 2013; Smith & Delaney, 2013). These steps were summarized as five c's: "contain, control, call SWAT, communicate with the perpetrator, and come up with a tentative plan" (Smith & Delaney, 2013). After Columbine, law enforcement protocols changed to emphasize creating

groups of two to four police officers as small contact teams who would attempt to end the shooting by killing or apprehending the shooter (Smith & Delaney, 2013); a switch to an active rather than a passive response. The intent of the change in active shooter response protocol is to reduce casualties, however, little research has examined whether this has occurred (Blair et al., 2013).

Literature Review

Prior research in this area has considered the roles of first responders during ASEs and mass shootings as well as how communities are becoming more aware of their role in the response to such events. Additional research discusses the background and psychological profiles of shooters, and how these can be used to improve threat assessments. The common characteristics of previous shootings have also become more widely available.

Within the first responder community, each entity has a different role to play when responding to these events. The role of law enforcement officers has been considered in terms of their response times to a shooting, the actions they take upon their arrival at a scene, and the training programs some officers go through in order to respond more efficiently (Ergenbright & Hubbard, 2012; Iselin & Smith, 2009; Martínez, 2012). Ergenbright and Hubbard (2012) reviewed 12 shootings in the US and determined that the amount of time it takes police to respond to the scene has a large impact on the number of casualties. They also found that the average police response time exceeds the average shooting duration by about six minutes (Ergenbright & Hubbard, 2012). Other articles consider the impact of law enforcement once they arrive on scene, including Iselin and Smith's (2009) study which considered the paradigm change in police response from perimeter protocol to engagement protocol. Similarly, Martínez (2012) looked at the training programs that have developed around this protocol change and

determined that officers who are trained to engage the shooter through these programs are more likely to decrease the number of casualties resulting from an ASE. However, none of these articles or ones similar to them (Dusek, 2013; Mazer, Thompson, Cherry, Russell, Payne, Kirby & Pfohl, 2015; Hodgins & Saliba, 2015; Kotora, Clancy, Manzon, Malik, Loudon & Merlin, 2014; Lankford, 2015; Challis, 2010), considered police response times for mass shootings, the change in protocol, or the effect this protocol change had on the number of casualties, they instead focused on the way an individual should respond during mass shootings.

In a parallel development to police protocols, there have also been changes considered and implemented in some areas to the Fire/Rescue with Emergency Medical Service (EMS) capabilities and EMS roles in the response to shootings. Previously, these groups were expected to wait until SWAT units or other responding police officers considered the scene clear and safe for those with EMS capabilities to enter in order to triage and minimally treat victims (Iselin & Smith, 2009). This has changed in recent years and led to the creation of a Rescue Task Force approach, where law enforcement officers enter the scene with EMS behind them and all responders continue through the building in a manner that allows for the highest possible safety for EMS while still triaging and treating patients as quickly as possible (Iselin & Smith, 2009; Jacobs, McSwain, Rotondo, Wade, Fabbri, Eastman, Butler, Sinclair & John, 2013; Atwater, 2012).

Aside from the first responder community, many other communities, such as schools, are also looking to improve their response to shootings. As such, school policies have changed to account for active shooters in all types of schools, which led to an increase in the number of video cameras, automatically locking doors, active shooter drills and trainings, and relationships with the local responding agencies (Fox & Savage 2009; Buerger & Buerger, 2010; Greenberg,

2007). Other articles (Jacobs, 2014; Johnson, Carlson, Murphy, Flory, Lankford & Wyllie, 2016; Fabbri, 2014; Sulkowski & Lazarus, 2011; McLaughlin, 2016) discuss the actions that civilians should take during a mass shooting. Although the initial focus was on a way to protect against workplace shootings, the whole community is now able to learn how to protect themselves through the creation of the Civilian Response to Active Shooter Events (CRASE) course. CRASE courses instruct civilians to avoid, deny, and defend in order to escape an active shooter without harm (McLaughlin, 2016).

Instead of a focus on all response aspects, some articles focus on the shooter and shared characteristics of mass shooters, such as Capellan and Gomez (2017) who considered the psychological profile of shooters as it related to the number of casualties that resulted from a shooting. They found that the most common characteristics of shooters are that they are white males who often have a history of mental illness, have not attended college, and are single or divorced (Capellan & Gomez, 2017). Other studies considered the characteristics of shootings that relate to the risk an officer takes when responding to a shooting (Blair & Schweit, 2014). Blair and Schweit (2014) showed that 90% of the shootings included in their study were over before police arrived on scene. To broaden these and similar results beyond shootings, the United States Secret Service (2018) analyzed mass attacks, defined as the use of any weapon to kill or injure three or more people in a public place, and ways to improve threat assessment techniques and investigations. The USSS (2018) analyzed these attacks based on variables such as the type of public site, the weapon used, the amount of time each event took and the time of day it occurred at, the way the attack ended, and the resolution of the event. They found that most of these attacks occurred at businesses, were carried out with a firearm, ended within five minutes, occurred between the hours of 7am and 3pm, ended because the attacker either escaped the scene

or committed suicide, and were resolved either through suicide or an arrest that either took place at or near the scene of the shooting (USSS, 2018).

Research Design

To build on the current literature, a quasi-experimental design was proposed using an expected change in police response protocols after Columbine to provide a natural experiment, despite an inability to assign each incident to a protocol group. Although some cases after Columbine still followed a perimeter protocol, this was the basis of incident selection. However, the engagement protocol is still not used in every active shooter incident, preventing the use of a quasi-experimental design. Therefore, a cross-sectional comparative design was used as the cases are from different times and vary by protocol followed. The number of casualties was selected as the dependent variable because it shows the level of impact of a mass shooting event, is known or can be found for every mass shooting event, and varies due to many factors, such as the type of protocol followed and the police response time.

Hypotheses:

Null Hypothesis: There is no difference in the number of casualties resulting from mass shooting events where 1) police arrive on scene and set up a perimeter while waiting for tactical teams, such as Special Weapons and Tactics (SWAT), to arrive and engage the shooter and 2) those events where the first police officers to arrive on scene engage active shooters.

Alternative Hypothesis: There are fewer total casualties resulting from mass shooting events where 1) police arrive on scene and set up a perimeter while waiting for tactical teams to arrive and engage the shooter and 2) those events where the first police officers to arrive on scene engage active shooters.

Case Selection:

Stanford University's MSA database was used to identify cases for this study that occurred between August 1, 1966 and June 26, 2016, which are the first and last dates of the sample of shootings published by the MSA database. Stanford University's database includes information related to the geography of the shooting and information about the shooter, such as veteran status, history of mental illness, and motive for the shooting. By using cases presented in the MSA database, this study can expand the information gathered from these cases by including information about the police response associated with each shooting. The only additional selection criteria was that the shooting was considered a mass shooting. This definition, established in the MSA database, requires at least a total of three people killed or physically injured as a result of the shooting (Stanford University Library, 2012).

However, of the 335 potential cases only 186 were used because cases were eliminated if:

- 1) The total number of casualties that were not family members of the shooter fell below three. Most family mass shootings take place in a residence of one or more family members and these are a different type of crime from stranger shootings.
- 2) The shooting took place in a primary residence because there is a decreased chance of a person calling 9-1-1 quickly and police responding in time to impact the outcome of the shooting if it occurred in a private residence.
- 3) The shooting had proven or suspected relation to gang violence.
- 4) The shooting took place in two separate locations, defined as being more than one square mile apart because this reduces the chance of police responding to the scene and implementing a distinct protocol, as well as including two police response times for the different scenes.

Independent Variable: Police Protocol

The independent variable for this study is the police response protocol followed, which was coded as one of three categories: Perimeter, Engagement, or Not Applicable. Perimeter protocol is defined as police responding to the scene of the shooting and creating a perimeter while waiting for a tactical team, such as SWAT, to arrive, search for the shooter, and clear the scene. Engagement protocol is defined as the first police officers on scene began searching for or neutralized the shooter without the assistance of tactical units. Cases that were deemed to be not applicable included those where: the shooter had 1) escaped the scene, 2) committed suicide, or 3) was neutralized prior to police arrival on scene and when police arrived, they were notified of these results and did not engage the shooter at the scene.

Dependent Variable: Total Number of Casualties

The total number of casualties was defined as the total number of people killed or physically injured as a result of the shooting. This means that some of the casualties were not all impacted by bullets, but from broken glass or being trampled by those trying to escape the shooter as well. Additionally, the total casualty count represents those who were not family members of the shooter and were not casualties of a geographically different shooting.

Other Variables:

Additional variables were considered, including the action that resulted in the end of the shooting, the police response time, police engagement time, the shooting duration, and the number of people in the location of the shooting. These variables were considered to determine if the difference in the number of casualties among shootings following different protocols were affected by a change in another factor. Additionally, these variables were included to determine

if they were a confounding variable for the impact of a given police response protocol on the number of casualties.

The action resulting in the end of the shooting was defined as a direct action taken that stopped the shooting. These were categorized as police intervention, tactical team intervention, suicide, escape, or other. Police intervention ended the shooting if police arrived on scene and neutralized the shooter. Tactical team intervention occurred if SWAT or another tactical team was called to the scene in order to neutralize the shooter, regardless of whether or not they actually made contact with the shooter. Suicide ended the shooting if the shooter killed himself, regardless of whether or not police were already on scene. Escape occurred if the shooter left the scene and was not neutralized upon leaving the premises. Other was defined as any other action that stopped the shooting from continuing. Most frequently, the other category represented civilians who were able to neutralize the shooter. Approximately 49% of the 84 active shooter cases in the United States from 2000 to 2010 ended before the police arrived (Blair & Martaindale, 2013). The table below shows how these 84 ASEs ended.

Action Ending Shooting	Escaped	Committed Suicide (Before Police Arrival)	Subdued (Non-Police)	Committed Suicide (After Police Arrival)	Subdued (Police)	Killed	Surrendered to Police
Number of ASE	4	21	16	13	7	17	6
Percent of ASE	4.76%	25%	19.05%	15.48%	8.34%	20.24%	7.14%

The police response time was measured as the time between the first 9-1-1 call and police arrival on scene. Police response time was considered because 90% of shootings end before police arrive on scene (Blair & Schweit, 2014). Additionally, in two studies, one of 44 incidents between 1966 and 2001 and a second of 24 school shootings over five years, the average police

response time was 10 minutes and the average duration of all shooting types is 12 minutes, with many lasting between three and four minutes, which is the average duration of a school shooting (Smith & Delaney, 2013; Anklam, Kirby, Sharevski, and Dietz, 2015). However, Anklam et al. (2015) found that although police responses to these events have taken an average of five minutes, some responses have taken as long as 20 minutes.

Police engagement time was measured as the time between police arrival on scene and entry into the building or other location of the shooting, with the intention of finding the shooter. This included the time it took police to stage, setup, and enter the shooting location or building. Police engagement time did not account for the police response time because if it was accounted for, then there would have been greater variation in the police engagement times due to a difference in police response times. These times typically vary among urban and rural police departments because of the availability of resources and proximity to most scenes of these departments. By counting the police response and engagement times as entirely separate variables, the amount of time a typical police officer will spend at the location of the shooting before entering the scene can be better understood.

The shooting duration was measured as the time between the first and last shots fired by the shooter. Since many shootings end before police arrive on scene, this can be used to determine the extra time shooters have to target more victims (Blair & Schweit, 2014).

The number of people in the location of the shooting was defined as the number of people in the same location as where the shooting occurred. This variable was used to determine the number of potential casualties that could have resulted from a shooting. Additionally, if a police protocol was followed in a case, the number of people in the location of the shooting in comparison to the number of casualties may provide information about evacuation by police. If

the shooting occurred in a building, the population was the number of people in the building and the vicinity at the time of the shooting. If the shooting occurred outside, then the population was determined to be the number of people estimated to be in the surrounding area, including nearby buildings. The term vicinity is defined as the exact building, and if the shooting occurred outside, the property on which the shooting occurred. The surrounding area is the area within one mile of the property where the shooting occurred. The location of the shooting is defined as the property on which the shooting occurred and spent bullets landed.

Data Collection

All information about these variables were found through open source searches for information. These sources were primarily newspaper articles as only six After Action Reports, primarily provided by the Naval Postgraduate School, were available on the cases evaluated in this study.

Open source information was used if it was verified by three sources using the most recent articles and information available. If there was an estimated range of values, such as the number of people present at the time of the shooting, then the lowest number was used as the most consistent point of comparison.

Similar methods were used in determining the action that ended a shooting. Specifically, if sources stated the shooter was arrested, other sources were sought out to validate when the shooter was apprehended. If this occurred after they left the vicinity of the shooting, then the shooter was considered to have escaped. Additionally, in situations where the shooter committed suicide before police arrived on scene, the police response was still recorded because in some of these situations, police responded and were unaware the shooter was dead, so they still followed a given protocol.

Challenges Encountered with Data Collection

The sources used in Stanford University's database were the first point of inquiry into determining values for the newly defined variables. After considering all the information provided by these sources, attempts were made to find additional information that would complete the dataset in news articles. Any information that was still not obtained received a mark of "unknown" in the given category. The inability to find information to fill all data points for each variable presented a challenge and limited the effectiveness of the analysis that can be performed. The most difficult variable to find sufficient data for was the police engagement time as it could only be found in 16 of 186 cases. This lack of information made it more difficult to determine if there is a true relationship between the length of police engagement times and the protocol followed by police.

The main challenge with the sources used in this study was that although attempts were made to gain access to police reports, arrest records, court records, and incident descriptions written by police departments, this access was not available. As such, information contained in police reports or court records are unknown, but were sought out in order to determine the most accurate accounts of the shootings considered. This lack of information caused some data points to be left blank. For example, out of 186 cases, the police response times could only be determined in 58, the shooting duration could only be found in 56, and the police engagement time could only be determined in 16 of these cases.

A third challenge of this study was determining the way each case should be classified. For example, if the shooter committed suicide before police arrived on scene, upon police arrival, or after the police arrived on scene, does that change the police protocol that was followed? If police found the shooter had committed suicide by the time they arrived on scene,

then these were categorized as suicide being the action that resulted in the end of the shooting and a police protocol was not applicable. However, if the suicide occurred upon or after the police arrived on scene, then the end of the shooting was characterized as suicide, but the police protocol was considered either perimeter, if the body of the shooter was found hours later or by a SWAT team, or engagement, if the body was found by police officers within an hour of their arrival on scene.

A part of the difficulty in categorizing the police response was the lack of specific information provided in the open source documents. Most frequently articles stated that police arrested, injured, or killed the shooter or that when police arrived on scene, the shooter was already dead. Most articles do not mention the time of the arrest, unless it specifically says the shooter surrendered to or had a shootout with the police. Most arrests actually occur after the shooting because the shooter had initially escaped the scene. Then questions that required consideration were: What counted as a shooter escaping the scene? and How is the protocol classified if the shooter was spotted by police as they were leaving the scene and were found or arrested as they were escaping? If a shooter escaped the scene and was not spotted or followed by police upon their escape, then the protocol followed was not applicable. However, if the shooter was followed while escaping the scene, then their escape was still considered as the reason the shooting ended, however, the police protocol followed was engagement protocol. These were some of the more surprising cases because they are not what would typically be considered active use of a protocol.

Analysis Methods

Another challenge was determining the classification of individual cases. Out of the 335 cases provided in the MSA database, there were only 62 which included any use of police

protocols. There are few analysis methods that are considered reliable with only 62 cases, which presented an analysis challenge.

To meet the analysis challenge various approaches were considered, included Qualitative Comparative Analysis, which has two branches: crisp set and fuzzy set. The crisp set branch requires strictly looking at categories and determining if the case fits these categories or not. As all of the data presented in this study required at least three casualties, all of the cases would include a varying number of casualties, precluding crisp set Qualitative Comparative Analysis. The second branch of Qualitative Comparative Analysis, fuzzy set Qualitative Comparative Analysis, allows for a distinction in the degree to which a case fits a specific category. Through this method, the data could be scaled and compared based on which protocol type was followed.

However, this analysis method was abandoned due to a lack of complete information for a sufficient number of cases with variation among the police protocols. Once the case pool was cut down to only include cases with complete information for the type of police protocol used, total number of casualties, police response time, and shooting duration, there were 17 resulting cases. However, out of these cases, there were only two that included a perimeter protocol while the other 15 followed the engagement protocol. Although the two perimeter protocol cases had higher casualty counts, which would suggest there is a difference in the total number of casualties resulting from cases which follow perimeter protocol than cases which follow engagement protocol, this could not be confirmed with fuzzy set Qualitative Comparative Analysis.

As a consequence of the inability to accurately apply Qualitative Comparative Analysis, t-tests and Pearson Correlation values were determined for data. In order to perform these analysis methods, data was separated into three groups of incidents: one group which followed

the engagement protocol, one group that followed the perimeter protocol, and one group which did not involve police protocols. The “Total Number of Casualties” was a ratio variable that allowed for a two-sample t-test.

The protocol and casualty data were analyzed together using a two sample t-test in order to determine whether the resulting number of casualties from police following a perimeter protocol was statically significant compared to the number of casualties resulting from police following an engagement protocol. A second t-test was used to evaluate whether or not the difference in police response times were statistically significant in the total number of casualties that resulted from a shooting. Finally, a Pearson Correlation was conducted using information about the shooting duration and total number of casualties to determine if a relationship existed between these two variables.

Results

Descriptive Statistics:

There are many actions that can bring a shooting to an end. The ones considered in this study were that the shooter escaped, police arrived on scene and provided an intervention, Special Weapons and Tactics (SWAT), Federal Bureau of Investigations agents, or other tactical units were on scene and provided an intervention, the shooter committed suicide, or another action led to the end of the shooting. In 68 cases (36.6%), the shooter escaped the scene. In 44 cases (23.7%), police intervention ended the shooting. In 6 cases (3.2%), SWAT teams, FBI agents, or other tactical units were used to end the shooting. In 46 cases (24.7%), the shooter committed suicide. In 22 cases (11.8%), the shooting ended by some other intervention.

In 51 cases (27.4%), police began an engagement protocol. In 11 cases (5.9%), police followed a perimeter protocol. In 124 cases (66.67%), the protocol police did or would have

followed was not applicable to the situation. This is either because the shooter committed suicide, escaped, or a person or people who were not police officers took action against the shooter.

Variable	Maximum	Minimum	Median	Mean
Shooting Duration	600	0.25	10	26.3
Police Response Time	120	0	3.6	7.3
Police Engagement Time	450	0	5	90.6
Total Number of People in the Location of the Shooting	35000	5	152.5	1867.8
Percent of People who Became Casualties	100	0.009	5.6	18.8
Number of Fatalities	32	0	2	3.9
Number of Physical Injuries	58	0	4	5.7
Total Number of Casualties	70	3	6	9.6

The number of people in the location of the shooting and the percent of people who became casualties were both intended to be used as control variables, but because data was not widely available for these variables, the circumstances around these data points did not make these variables viable control variables or comparative factors. However, data was available to increase an understanding of police response and engagement times.

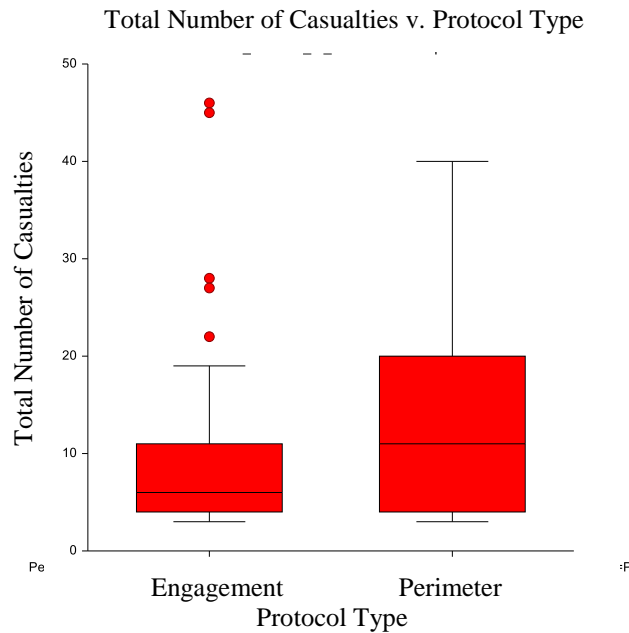
Most (81%) of the 58 cases in which police response times were known lasted 10 minutes or less. Police response times, police engagement times, and police response type helped to provide a full view of the response to the shooting. Although only 16 cases included information about the police engagement time, this length of time varied between 0 and 450 minutes, with most (56.25%) of these cases resulting in a police engagement time of 5 minutes or less.

Perimeter Protocol			
	Fatalities	Injured	Casualties
Maximum	21	24	40
Median	4	7	11

Engagement Protocol			
	Fatalities	Injured	Casualties
Maximum	26	32	46
Median	3	3	6

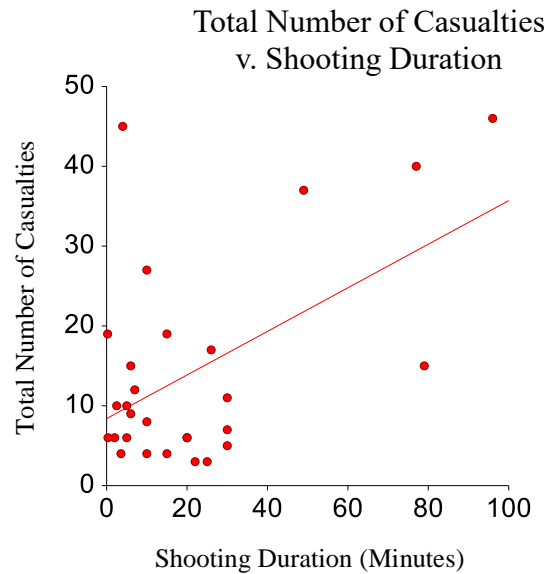
Mean	5.9	8.7	14.6	Mean	4	5.45	9.45
Minimum	0	0	3	Minimum	0	0	3

The median number of casualties resulting from the perimeter protocol (Median = 11, Mean = 14.6, SD = 12.8) was almost double the median number of casualties resulting from the engagement protocol (Median = 6, Mean = 9.5, SD = 9.6). While the perimeter protocol has a higher mean and median of total casualties, there were only 11 cases that followed perimeter protocol and 51 that followed engagement protocol, which may be due to the limited sample size. As such, the t-test was used to analyze this data in a similar manner that would account for the potential difference in sample sizes for each protocol type.

Statistical Tests:

When the police response protocols were analyzed in relation to the total number of casualties, the t-test results produced a t-value of -1.53 and p-value of 0.132 when assuming equal variances, which was supported by the test of assumptions and the inability to reject equal variances. As such, this test showed the null hypothesis, the difference between the mean of the cases following the engagement protocol and the mean of cases following the perimeter protocol was zero, could not be rejected. This shows that there is not a statistically significant difference in the number of casualties resulting from the type of police response protocol that was followed.

Additionally, there was not a statistically significant Pearson Correlation between the police response time and the total number of casualties, as the R was -0.0984 and the p-value was 0.4625. However, the relationship between the shooting duration and the total number of casualties, excluding an outlier with a shooting duration of 600 minutes, was considered statistically significant with a Pearson Correlation value of 0.5302 and a p-value of 0.0037.



Discussion

As the results of this study showed the impact of the shooting duration on the total number of casualties through the Pearson Correlation test, a way to decrease the number of casualties would be to decrease the shooting duration. One way of doing this is to improve police response times, but to also improve police engagement times. Shorter police engagement times were associated with the engagement response protocol while longer police engagement times were related to the perimeter response protocol.

Taking these results into account, the Las Vegas 2017 and Parkland 2018 shootings lasted 10 minutes and 6 minutes, respectively, and resulted in casualty counts of at least 546 and 32, respectively (Los Angeles Times Staff, 2017; USSS, 2018; Fausset, Kovaleski, & Mazzei, 2018; Burch & Mazzei, 2018; Earl & Schallhorn, 2018; Almkhtar, Lai, Singhvi & Yourish, 2018). These shootings lasted longer than they could have because police did not engage the shooter immediately after arriving on the scene or locating the shooter. In the 2017 Las Vegas shooting, police had located the shooter seven minutes into the shooting, whereas in the 2018 Parkland shooting, police were on scene within two minutes (Los Angeles Times Staff, 2017; Flores et al.,

2018). Although it cannot be known exactly how many casualties these shootings would have resulted in if police had engaged the shooter earlier and shortened the shooting duration, the three and four minute differences between the time police were on scene and the shooting durations for these incidents are much greater than the 15 seconds in which one mass shooting in this dataset occurred.

Another important aspect in determining the total number of casualties is the number of people in a given area. However, the drawback to this variable is that it cannot be analyzed uniformly across different shootings. This was further supported in the comparison of a shooting that occurred in and around a building with five people, all of whom became casualties, compared to a shooting that occurred at a college with 35,000 people with only 3 people becoming victims. Even when these values are changed into a percentage to represent the number of people who became casualties, these values are influenced by the number of people in the location of the shooting and as such, cannot be compared in a standardized way.

Policy Discussion

According to the data, a shorter shooting duration would decrease the total number of casualties. This, together with a case by case analysis shows that following the engagement police response protocol would result in fewer total casualties than following the perimeter protocol and suggests that the engagement protocol should be instituted and followed by law enforcement. The cases where police followed perimeter protocol often resulted in a higher number of casualties than cases that followed engagement protocol. Examples of these cases are Columbine (1999), San Ysidro's McDonald's shooting (1984) and the Parkland shooting (2018). In each of these instances, the shooting was ongoing when police arrived on scene, created a perimeter and called in SWAT teams to neutralize the shooter. In the Columbine shooting, the

time between police arrival and SWAT entry directly resulted in the death of a teacher who slowly died from his wounds (Erickson, 2001). In the San Ysidro McDonald's shooting, the police arrived 10 minutes into the shooting, but the shooting lasted 77 minutes and 40 of the 45 people in and around the store became casualties (Liotta, 2015). In the Parkland shooting, police arrived on scene within two minutes and created a perimeter that the shooter escaped through after another four minutes (Los Angeles Times Staff, 2017; Flores et al., 2018).

Looking Forward

Future studies should take into account the limitations of this study, such as an incomplete data set and little variation in type of police response protocol that was followed. A future study would consider more cases, ideally all mass shootings, determined by the definition of three or more people killed or physically injured, between 1966 with the University of Texas at Austin shooting and the present. It is particularly important to analyze more cases that followed the perimeter protocol, such as the 2017 Las Vegas and 2018 Parkland shootings, which would require the data set to be expanded beyond 2016. Finding the information that would complete an expanded data set would allow this study to provide a more complete understanding of the impacts the control variables had on the case outcomes.

An additional limitation of this study is that it did not account for the number of responding police officers who became a casualty of a shooting. By excluding this value, it is difficult to determine the extent of the risks responding officers will face when arriving on a scene and whether one protocol was more likely to cause responding officers to become casualties.

Conclusion

Although the data does not directly support the differences in the effectiveness of police response protocols to reduce the total number of casualties, this difference is indirectly supported. Since the shooting duration significantly impacts the total number of casualties and the shooting duration can be shortened with police engagement occurring sooner, this supports the claim that the engagement police response protocol combined with short police response and engagement times will decrease the total number of casualties. This means that the engagement police response protocol, in conjunction with quick police response and engagement times, is more likely to produce fewer casualties during ASEs than the perimeter police response protocol. As such, the number of casualties resulting from ASEs can be reduced with more law enforcement agencies instituting, training, and responding in a capacity that follows the engagement police response protocol.

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