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Project Safe Neighborhoods: Assessing the Effectiveness of ShotSpotter in Omaha: Addendum to 2016 Final Evaluation Report

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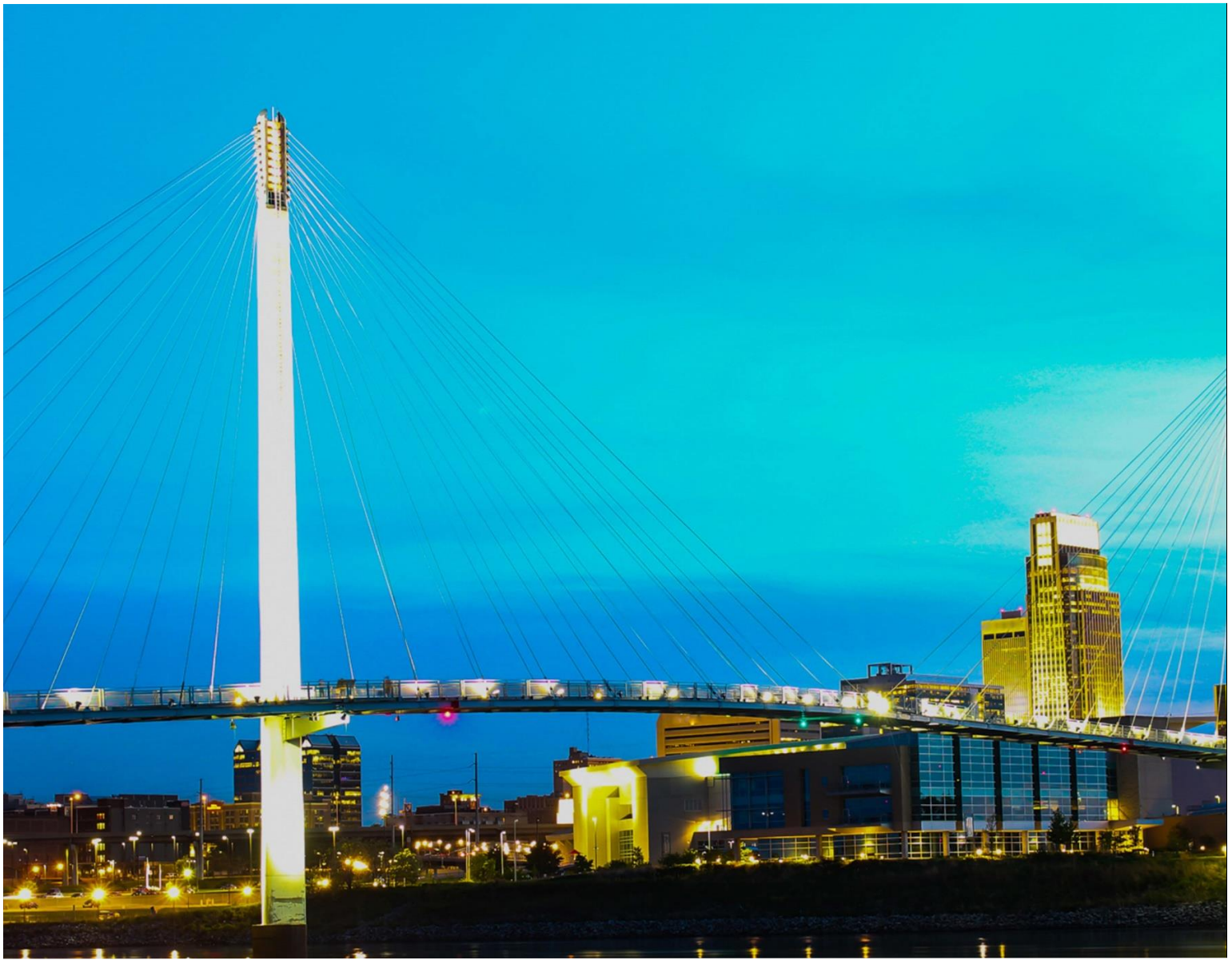

University of Nebraska Omaha

Assessing the Effectiveness of ShotSpotter in Omaha: Addendum to 2016 Final Evaluation Report

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Gunshot Detection Technology

Gun violence is a pervasive problem in the United States. In 2016, over 14,000 people were shot and killed, and an estimated 95,000 more were treated for nonfatal injuries resulting from gun violence (Centers for Disease Control and Prevention, 2016). Historically, law enforcement's response to gun violence has been hindered by factors such as (1) non-reporting, (2) little physical evidence, (3) lack of witness cooperation, and (4) lack of victim cooperation (Biderman & Reiss, 1967; Choi, Librett, & Collins, 2014). This is especially true of nonfatal shootings (Alvarado & Massey, 2010; La Free, 2005). For example, a study of gun violence in three cities conducted by the Urban Institute found that 80% of gunshot incidents were never reported to 911 (Irvin-Erickson, Bai, Gurvis, & Mohr, 2016; see also Carr & Doleac, 2016).

Since the 1990s, police agencies – particularly those in urban areas – have increasingly begun utilizing gunshot detection technology (GDT) in an effort to circumvent some of these problems. GDT replaces the human element of detection with acoustic technology designed to identify the sound of a gunshot, determine its location (within a small margin of error), and notify emergency services within sixty seconds (Eng, 2004; Mazerolle, Frank, Rogan, & Watkins, 2000). In theory, GDT should notify agencies of a greater number of shootings than they would otherwise become aware of and allow them to facilitate a quicker response. A general deterrent effect may occur if GDT in fact increases the likelihood that police will respond to gunshot incidents. Ultimately, then, GDT might enable agencies to (1) save more lives, (2) collect more evidence (e.g., shell casings) and (3) identify, arrest, and prosecute a greater number of gun offenders in their jurisdictions.

Is Gunshot Detection Technology Effective?

In the sections that follow, we provide a brief overview of the extant evidence concerning GDT's accuracy, its effect on response times, evidence collection, and case resolutions, and some lingering technical and legal concerns about the technology.

Accuracy

In terms of accuracy in detecting gunshots, the evidence accumulated to date suggests GDT is very effective. One of the earliest field evaluations of GDT, conducted in Redwood City, California in 1997, indicated that ShotSpotter™ (a leading manufacturer of GDT) detected 80% of test shots fired and successfully located 84% of test shots within a median margin of error of 25 feet (Mazerolle et al., 2000).[1] More recently, SECURES® (manufactured by Alliant Techsystems) demonstrated a 97% detection rate during a trial in Hampton, VA. Notably, the technology was much less accurate in detecting rounds fired from .22 caliber firearms – only picking up on 33% of rounds fired (Scharf, Geerken, & Bradley, 2008). During a separate trial in Newport News, only 18% of gunshots resulted in SECURES activations. Possible explanations

[1] For more on ShotSpotter, see the company's website: www.shotspotter.com.

for this anomalous finding include that it may have been a function of the methodology (i.e., "guns being fired…too close to the bullet trap, which might absorb too much of the shock wave and result in fewer activations") and radio frequency interference "interrupting communication between the sensors and the receiver" (Scharf et al., 2008, 23-24).

Response Times

With respect to the effect of ShotSpotter on police response times, the evidence is less conclusive, but promising, nonetheless. In St. Louis, researchers found that GDT was associated with faster dispatch time and less time spent investigating gunshot incidents, relative to citizen-initiated calls about gunshots (Mares & Blackburn, 2012). Similarly, in Brockton, MA, ShotSpotter yielded faster dispatch and response times (Choi et al., 2014). In Dallas, researchers found that GDT reduced dispatch time to random gunfire calls by approximately 16%. However, in the aggregate, response times only declined by about 1 minute, leading the researchers to conclude that there was no significant effect of GDT on response time (Mazerolle et al., 1998).

Evidence Collection and Case Resolution

Regarding the effect of GDT on evidence collection and case resolution, findings are inconclusive. In Brockton, researchers examined 10 possible actions responding officers could log into dispatch upon responding to a shots fired call: unfounded, could not locate, unknown action, investigated, under investigation, report taken, hot sheet, matter settled, complaint filed, and arrest(s). The researchers ordered these outcomes from less to "more desirable," and found that ShotSpotter did not result in more desirable outcomes (Choi et al., 2014, p. 55). Conversely, ShotSpotter reports that "South Bend (IN) has seen an increase in evidence collection from just 5 percent of the 9-1-1 gunfire calls to 50 percent of those calls, when accompanied by a ShotSpotter alert" (Marcroft, 2015). It should be noted, however, that the scientific rigor of this analysis is unknown. In any event, additional research exploring the effect of GDT on evidence collection and case resolution is needed.

Challenges and Concerns

GDT is not without technical and legal concerns. A primary technical concern that has been raised by agencies is false positives (e.g., confusing fireworks for gunshots; see Selby, Henderson, & Tayyabkhan, 2011). Empirically, we know little about the extent of this potential problem, though one study found that GDT frequently activated in response to firecrackers and bottle rockets (Scharf et al., 2008). In the case of ShotSpotter, ambient background noise is filtered out and data from the sensors are analyzed by acoustic experts. To identify shots, ShotSpotter servers apply sophisticated algorithms based on the acoustic telemetry provided by the sensors. If a sound is determined to be something other than a gunshot, the alert is cancelled.

Another challenge facing agencies that use GDT is the difficulty of correctly identifying multiple calls and/or alerts pertaining to the same gunshot event (Irvin-Erickson et al. 2017). Especially troublesome is determining whether a 911 call about shots fired is about an event that has already triggered a GDT alert. This can be problematic when agencies compile crime statistics, potentially leading to an artificially inflated number of shots fired incidents.

Legal scholars have raised concerns about ShotSpotter infringing on citizens' Fourth Amendment protection against unreasonable searches and seizures (Gecas, 2016). Critics have included the ACLU, the Center for Media Education, and the Seattle Privacy Coalition, who fear the technology could be used as a surveillance tool to eavesdrop on private conversations and monitor residents of high crime neighborhoods (Benjamin, 2002; Chen, 2014). In New Bedford, the District Attorney argued that ShotSpotter data should be inadmissible in cases where recordings also pick up ambient noise not produced by gunshots (e.g., conversations; see Goode, 2012). Yet, ShotSpotter's privacy policy maintains that the technology cannot pick up conversations at normal decibels.[2]

Defendants have also challenged the reliability of ShotSpotter, noting that the unquestioned admissibility of "evolving technology…is rare" (Gecas, 2016, p. 1101). As but one example, in August 2014, the Nebraska Supreme Court upheld Thylun Hill's murder conviction, whose appeal questioned whether the sensor was functioning properly on the night of the murder and challenged the objectivity of ShotSpotter employees who review the alerts (Stoddard, 2014). The high court rejected his appeal, calling his argument "somewhat dubious," as officers had also heard the gunshots and encountered him where ShotSpotter had pinpointed the sound (*State v. Hill,* 2014).

To date, the courts have generally ruled that GDT data is admissible evidence (see, e.g., *United States v. Thompson,* 2011*; State v. Hill,* 2014). ShotSpotter notes on its "Frequently Asked Questions" webpage that convictions using its data have been upheld in court cases in 17 states and in federal court as of July 2016.[3]

The Current Study: ShotSpotter in Omaha, NE

The City of Omaha has been using ShotSpotter since 2013 and has twice expanded its coverage area since adopting the technology. As is common in other jurisdictions, Omaha does not use ShotSpotter throughout the entire city, but instead strategically installs sensors in areas that experience a high volume of shots fired calls. In the fall of 2018, the Omaha Police Department provided its PSN Research Partner with all its Computer Aided Dispatch (CAD) data from January 2013 through November 2018 as well as a dataset of known ShotSpotter alerts from January 2013 through August 2018. With these data, we sought to answer the following research question:

[2] See https://www.shotspotter.com/privacy-policy/.
[3] See https://www.shotspotter.com/system/content-uploads/ShotSpotter_FAQ_July_2016.pdf

Do shots fired calls initiated by ShotSpotter differ substantially from shots fired calls initiated by 911 in terms of the case dispositions logged by responding officers?

We wish to be clear at the onset that the initial case disposition logged by the responding officer might not reflect the ultimate case resolution. However, these initial dispositions are easily obtained through CAD and still provide valuable insight about how ShotSpotter initiated calls unfold relative to 911 calls reporting shots fired.

Data and Methods

To examine the research question above, we focused on shots fired incidents occurring between January 1, 2014 and December 31, 2017 as reported in the CAD database. Specifically, we retained calls reporting shots fired or shootings, but removed from the sample any calls in which the initial or modifying circumstances were listed as cold (or inactive). This allowed us to construct a database of gunfire events that were either in progress or had just occurred.

In addition to 911 calls reporting shots fired, the database also contained ShotSpotter alerts that were entered by the operators. These alerts are treated, for all intents and purposes, as calls for service. Thus, it was imperative that we compared calls for service and ShotSpotter alerts that occurred within the same area of the city. Following recent research on GDT (Irvin-Erickson et al., 2017), we further restricted our sample to calls originating in the ShotSpotter coverage zones by spatially joining the geographic coordinates of the calls provided in the CAD database to the polygons of the ShotSpotter coverage zones and creating a buffer zone of .25 miles beyond the coverage boundaries. This resulted in 4,316 calls with unique incident response identification numbers reporting shots fired or shootings.

The main purpose of this research is to analyze how dispositions in these gun events differ depending on the call source. We determined the dispositions for each call by using a hierarchical coding rule for the call dispositions reported in the "ALLDISPOSITIONS" field.[4] The reported dispositions were collapsed into the following categories in which the order listed reports the best call disposition outcome: 1) arrest; 2) citation; 3) report; 4) civil matter (including domestic); 5) assignment complete; 6) unable to locate (including gone on arrival); 7) cancelled; and 8) turned over. Review of the comments led to the following additional coding decisions: 1) calls with missing dispositions were treated as unable to locate; 2) calls in which the disposition was broadcast and false were treated as completed; 3) calls in which the disposition was listed as not dispatched were treated as cancelled. Call dispositions were coded as being turned over if that was listed as the only disposition. The same is true for calls with the disposition of "not dispatched." Finally, we removed from the sample nine calls that indicated ShotSpotter was being tested in the comments field and 28 calls that were cancelled by command for

[4] We chose to use this field instead of the dispositions in the five fields provided because the latter did not always capture the "best" disposition reported (i.e., the disposition that would have been highest on our hierarchy).

administrative or internal reasons.[5] These decisions resulted in a final sample of 4,279 calls for further analysis.

After coding dispositions, we also determined whether calls were dispatched. We treated calls as never dispatched if they did not have either a dispatch or arrival time. An analysis of these calls revealed that most had a disposition of cancelled or complete. Cancelled calls that were not dispatched would occur when the call center received a call from a different party or another ShotSpotter alert, but did not dispatch the call because an officer had already been dispatched, but the call disposition was unknown. This would also occur in the event of a duplicate call or when operators made an error in the call record and a new record was created to provide accurate information for dispatch. Completed calls that were never dispatched often reflect duplicate calls in which the officer had already reported a call disposition. Only a few calls reporting other dispositions (n=5) did not have a dispatch or arrival time.

We then classified each call as either ShotSpotter-initiated or not based on information provided in several fields.[6] First, calls were identified as ShotSpotter-initiated if the caller name was listed as “SHOTSPOTTER” or any variant (e.g., “SS”, “SHOTS”). In addition, analysis of the comments associated with the calls revealed that dispatch often copied the geographic location of the gunshot alert and the identification number provided by the city’s ShotSpotter Flex system and entered it into the comments field of the CAD database. This allowed us to extract the ShotSpotter Flex identification numbers from the comments entered and further identify such calls as ShotSpotter-initiated.

Calls were identified as non-ShotSpotter-initiated calls if they met any of the following conditions: 1) the call source was recorded as field-initiated; 2) the call source was listed as “911”; 3) a caller name was entered that was not a reference to ShotSpotter; 4) a phone number was recorded in the caller phone field and the call had not been previously identified as a ShotSpotter call; 5) the comments made a reference to a phone number “402-“ or “(402)”; 6) the comments made a reference to “CALLER”, “CALLING”, or “CALLED” (and any variant); 7) the comments made a reference to activity about a phone line (e.g., “DISCONNECTED”, “HUNG UP”, etc.); 8) a reference was made about the caller being “SPANISH SPEAKING” or “LEP”; 9) the call made reference to a text message, and/or 10) the call taker made a reference a duplicate call (“DUP CALL”).

Of the remaining 4,279 calls, we were unable to classify 62 as being ShotSpotter-initiated or not. Instead of operating on the assumption that the remaining calls were field-, first responder-, or civilian-initiated, we joined the dataset containing known ShotSpotter alerts to the CAD database. We then sorted the gunshot events by both the date and time in which incidents became known to the call center and the date and time of the ShotSpotter alerts. By using the

[5] Our review of the comments field of these calls revealed that most of these calls were ShotSpotter alerts entered into the CAD system.

[6] Operators currently do not use a single indicator to identify a call record as being initiated due to a ShotSpotter notification.

address provided in these datasets and the call comments, were able to identify 29 of these calls as ShotSpotter-initiated as well as assign any missing ShotSpotter Flex identification numbers. We also utilized this strategy to assign any missing ShotSpotter Flex identification numbers to the previously identified ShotSpotter-initiated calls. All remaining calls were treated as non-ShotSpotter initiated calls. Overall, a value of 1 was assigned to calls in which there was a reference to a ShotSpotter alert and a value of 0 was assigned to calls identified as having been only field-, first responder-, or civilian-initiated.

One complication of using the CAD database provided by OPD is that operators often enter information from multiple callers in the comments field for a single call record if the calls have been identified as pertaining to the same incident instead of entering each call as a separate record and subsequently linking any related records.[7] Other times, multiple calls are entered for the same incident and the disposition for that call is changed to "CANCELLED" or "COMPLETED" and the call is never dispatched. This can also happen if multiple operators are taking calls related to the same incident. In these data, we observed that operators sometimes report information associated with the duplicate entry on the dispatched call's record line, but this practice is inconsistent. Thus, removing the the duplicate entry from the data would result in the loss of important information about the caller or ShotSpotter alert.

To overcome these limitations with these data, we employed a strategy similar to one that has been used in recent research by Irvin-Erickson et al. (2017), though we recognized that differences in the research questions and the structure of the datasets required us to modify our approach.[8] Specifically, we identified unique gun events for which one or more calls and/or ShotSpotter alerts were received by selecting time intervals of 20 minutes and identifying the first call within each of these windows based on the recorded incident start time. Then, we identified the call with the best call disposition occurring within each window to be used to represent the gunfire event. In the case that a window had multiple calls and alerts with the same disposition, we identified the call or alert with the earliest recorded incident start time. We retained information about the call sources of the gunfire event (ShotSpotter or not-ShotSpotter) for all calls falling within a given time interval by aggregating the calls by the 20-minute interval and then merging the call source information back to the dataset of unique gun events. This method produced a final sample of 3,519 20-minute gunfire events in which we were able to identify whether an incident contained a ShotSpotter alert, a non-ShotSpotter initiated call for service, or both.

[7] It is unknown if Omaha's CAD system has the capability to link such calls, but according to the Law Enforcement Information Technology Standards Council ([LEITSC], 2006), this functionality is considered a standard function specification of such systems.

[8] The Omaha data comprises a single data source in which ShotSpotter alerts are embedded within calls for service whereas the noted study involves the analysis of separate data sources for calls for service and gunshot detection system alerts).

Results

For descriptive purposes below, in Figure 1 we present the annual number of incidents that were ShotSpotter-initiated in addition to the number of incidents that were classified as being field-, first responder- or civilian-initiated (non-ShotSpotter). We also identified how many of the incidents recording one or more ShotSpotter alert were also accompanied by one or more non-ShotSpotter calls. This straightforward analysis indicates that each year from 2014 to 2017, more than 60% of known gunshot incidents became known solely because of ShotSpotter. In other words, OPD was alerted to an additional 583, 529, 572, and 632 gunshot incidents each year, respectively. All told, these add up to 2,316 gunshot incidents that OPD may not have otherwise been alerted to in the absence of ShotSpotter technology.

Figure 1.

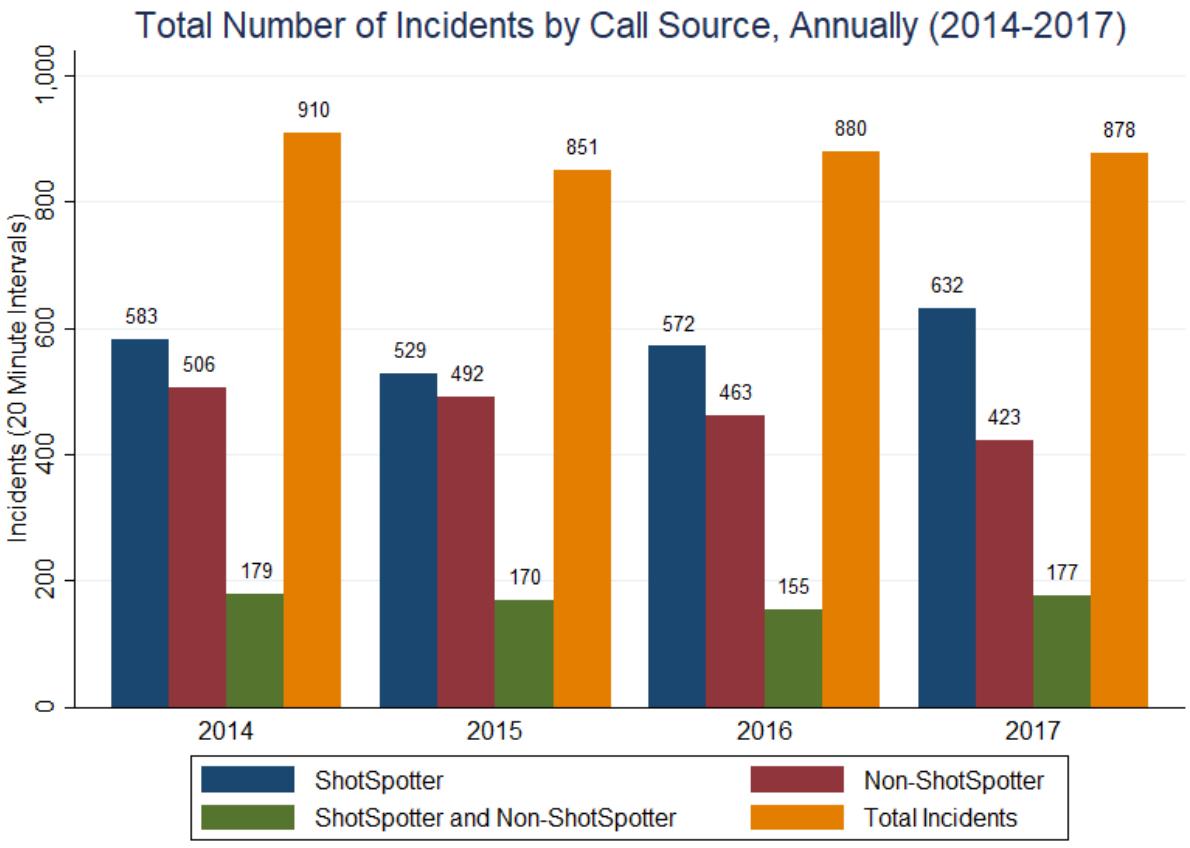


Figure 2 provides a monthly breakdown of calls reporting gunfire events in Omaha during the study period. On average, there were approximately 161.17 unique events reporting shots fired or shootings and 197.50 unique events in which ShotSpotter alerts were reported. The average number of unique gunfire incidents in which both ShotSpotter- and non-ShotSpotter-initiated

events were received by the call center was 54.83. Across the study period, June was the busiest month for gunfire events and February was the slowest. Figure 3 reports the total number of calls by day of the week across the study period.

Figure 2.

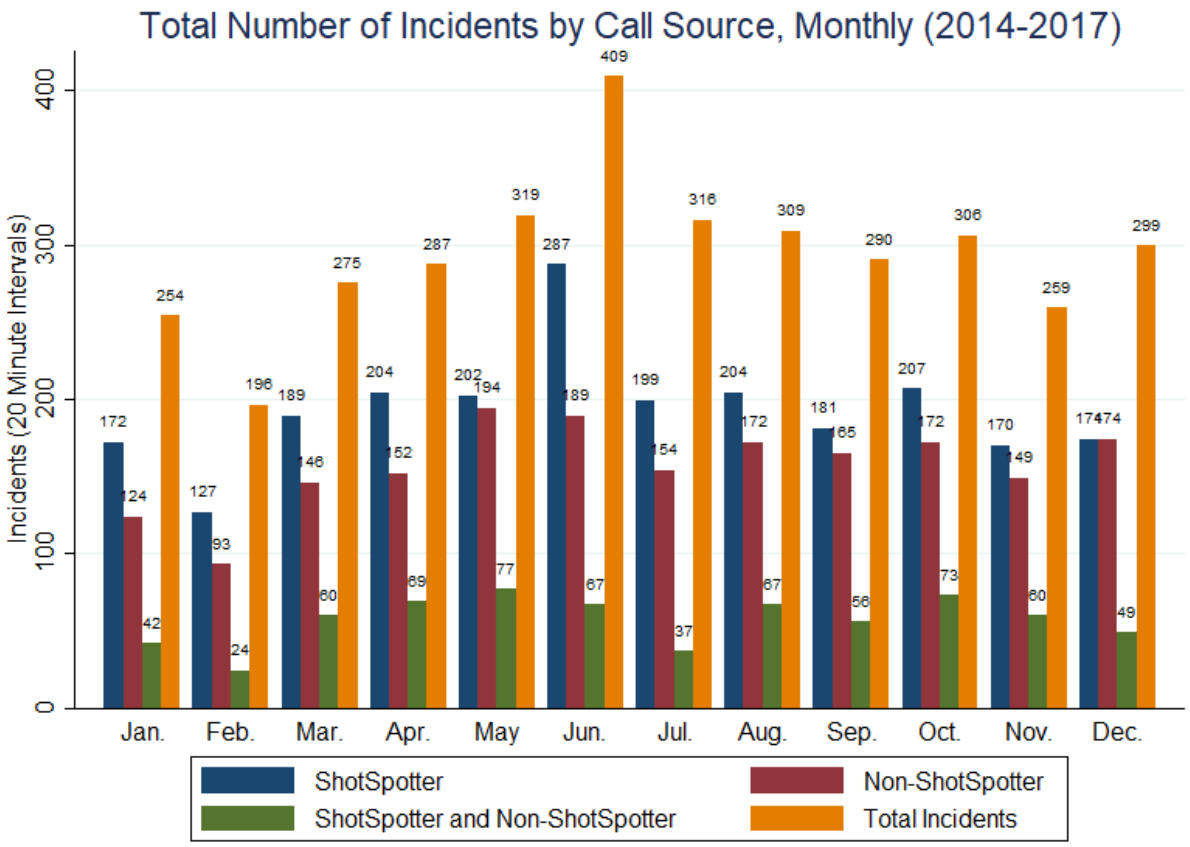
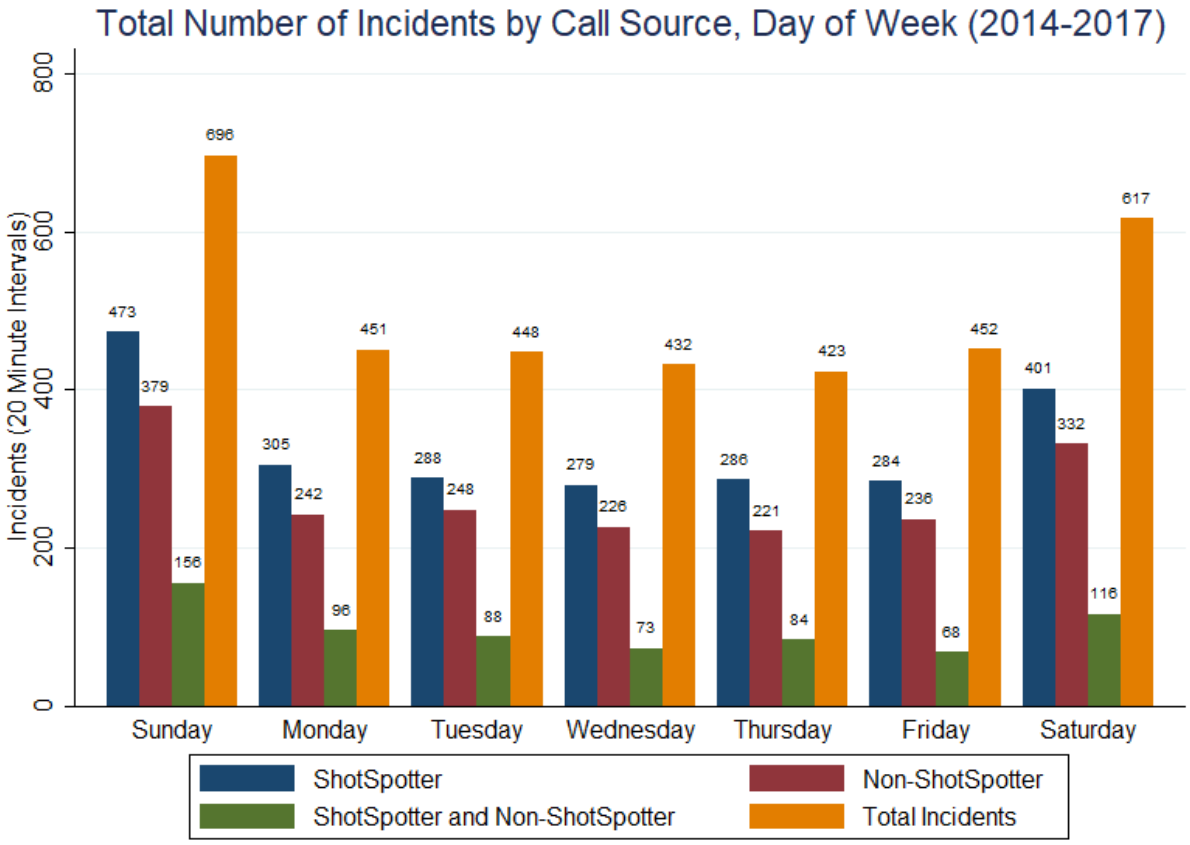


Figure 3.



In order to determine whether ShotSpotter initiated calls significantly differed from non-ShotSpotter calls in terms of their dispositions, we created odds ratios using the following formula,

$$\frac{(\#\ of\ SS\ calls\ resulting\ in\ disposition\ X) \div (total\ \#\ of\ SS\ calls)}{(\#\ of non-SS\ calls\ resulting\ in\ disposition\ X) \div (total\ \#\ of\ non-SS\ calls)}$$

where *X* refers to 1) arrest; 2) citation; 3) report; 4) civil matter (including domestic); 5) assignment complete; 6) unable to locate (including gone on arrival); 7) cancelled; and 8) turned over. The formula returns a positive number, whereby:

- Values less than 1 indicate SS calls are LESS likely to end on disposition X
- Values greater than 1 indicate SS calls are MORE likely to end on disposition X
- Values equal to 1 indicate SS and non-SS calls are EQUALLY likely to end on disposition X

Table 1 displays the odds ratios for each of the 8 dispositions in our hierarchy.

Table 1. Dispositions following ShotSpotter-initiated calls and non-ShotSpotter-initiated calls, 2014 – 2017 (N = 3,431).*

Disposition (X)	SS	Non-SS	Total	Odds Ratio
Arrest	85	54	139	0.796
Citation	5	0	5	—
Report made	512	186	698	1.391
Civil Matter	2	5	7	0.202
Assignment Complete	399	264	663	0.764
Unable to Locate	1,247	623	1,870	1.012
Cancelled	7	4	11	0.885
Turned Over	22	16	38	0.695
Total	2,279	1,152	3,431	—

** Note: Gunfire events that were never dispatched were excluded from this analysis. The numbers presented here were obtained using 20-minute time intervals. We replicated the analysis using 10-minute time intervals and the results were substantively the same.*

The results can be interpreted as follows:

1. The odds that a SS call resulted in an arrest were about 20% less than the odds that a non-SS call resulted in an arrest.
2. Five SS calls resulted in a citation, versus 0 non-SS calls (note that it is not possible to calculate an odds ratio here, as it is not possible to divide by zero).
3. The odds that a SS call resulted in a report being made were about 39% greater than the odds that a non-SS call resulted in a report being made.
4. The odds that a SS call resulted in a disposition of “civil matter” were about 80% less than the odds that a non-SS call resulted in the same disposition. Note, however, that the small numbers being compared (i.e., 2 vs. 5) make the odds ratio highly unstable. In other words, if just 3 additional SS calls had resulted in a disposition of “civil matter,” the odds ratio would equal 1.
5. The odds that a SS call resulted in a disposition of “assignment complete” were about 24% less than the odds that a non-SS call resulted in the same disposition.
6. SS calls and non-SS calls were about equally likely to result in a disposition of “unable to locate.”
7. The odds that a SS call resulted in a disposition of “cancelled” were about 13% less than the odds that a non-SS call resulted in the same disposition.
8. The odds that a SS call resulted in a disposition of “turned over” were about 30% less than the odds that a non-SS call resulted in the same disposition.

Discussion

Based on our experience working with these data, we offer several suggestions below in the spirit of enhancing OPD's analytic capabilities with respect to gunfire events.

Item 1: Linking multiple call records to a single incident

- Observations:
  - Currently, operators record caller information in the caller identification fields (e.g., caller name, caller address, caller phone number) for only one caller per incident. If multiple callers report an incident (and do not need police service), the operators record the additional phone numbers in the comments field.
  - In addition, we observed records in which caller information was entered in the comments field, but there was no reference to the caller provided in the other caller identification fields (e.g., the call source was listed as "Phone" and the caller name was listed as "SHOTSPOTTER"). Sometimes this information is reported in another incident record, but not always. We made similar observations for some incidents in which the call source was listed as "Field-Initiated."
  - In our assessment, the current record keeping practices may lead to the loss of important caller information. At best, when only phone numbers are provided in the comments line, officers must follow up on any potential leads by calling the numbers listed. If the caller gave a false number or the operator recorded the number incorrectly, there is rarely other information provided that can be used to identify the caller (e.g. caller address).

- Suggestion:
  - We encourage OPD to work with Douglas County to determine whether their CAD system has the capacity to link multiple call records as being related to the same incident (see the standard functional specifications outline by LEITSC, 2006). If this functionality is available, operators should enter distinct records for all calls (field-, first responder-, civilian-initiated) and ShotSpotter notifications. This would allow for all caller information to be retained, which could improve police response in following up on any leads.

Item 2: Distinct call source identifiers

- Observations:
  - Currently, operators enter the call source for ShotSpotter notifications as "Phone." However, if they do not also enter the caller's name as ShotSpotter, it can be difficult to determine whether a call is ShotSpotter-initiated or not.
  - Operators, however, are consistently entering the information from the city's ShotSpotter Flex System into the comments field. We were able to extract this information to link the CAD data to other OPD datasets (e.g., ShotSpotter

incidents). However, according to communication with OPD, this information does not always copy into the field.
    - On a related note, our analysis of the data revealed that sometimes officers are calling into dispatch and their call source is identified as “Phone” and their call-in identification is sometimes entered in the caller name field. These calls are difficult to distinguish from other calls from first responders (e.g., Omaha Fire Department).

- Suggestions:
    - We recommend distinct call source indicators to identify different call records. This will aid in identifying the different call types. In a linked incident CAD system, this can be achieved using a single field (“CALL SOURCE”) in which we recommend the following categories: Phone, 911, Field-Initiated, Officer Phone, SS (ShotSpotter), FR (First Responder).
    - Under the current record keeping system, it is strongly recommended that separate fields be added to the CAD database where operators can record the call source information for multiple alerts and calls. Although there would still be a risk of losing caller and/or alert information, these fields would allow for accurate and efficient identification of the call types, even when information in the other fields is incomplete or inaccurate. Instead of the “CALL SOURCE” field, operators would reply to several fields: “PHONE” (Non-911), “CIV 911” (911), “FIELD”, OFF PHONE” (Officer Phone), “SS” (ShotSpotter), “FR” (First Responder). We propose a default response of “No”. Operators would then change the response to “Yes” in the fields that describe the type of calls and alerts that they received for this incident.

Item 3: Identifying false ShotSpotter alerts

- Observation:
    - Operators sometimes report false alarms in the comments field of a ShotSpotter call. This is extremely useful, but it is unclear if this is reported consistently.

- Suggestion:
    - We recommend a field (e.g., FALSE) that allows the operators to report the source of the false ShotSpotter alerts. Our analysis revealed several false alarms, including fireworks, drums, cars backfiring or other vehicle noises, track meets, etc.). Thus, operators can enter this information by using the following response categories: FW, DRM, CAR, TRK, etc. This will allow for future analyses of police resources and the information can be provided to ShotSpotter to enhance their technology.

Item 4: Accurately identifying call records made in error

- Observation:
    - There appears to be a protocol for operators to enter the disposition as “ERROR” if a call record has been created in error or if invalid location or call detail information has been entered. However, it is not being utilized consistently. Our analysis revealed multiple errors in which the disposition was coded as “CANCELLED” and never dispatched. This is problematic because call dispositions are often “CANCELLED” and never dispatched for other reasons, including the identification of false ShotSpotter alerts (e.g., fireworks, car backfiring, etc.).

- Suggestion:
    - We recommend that operators utilize the “ERROR” disposition in the event that an error in call entry has been made and refrain from using the “CANCELLED” disposition.

Item 5: Identifying additional call dispositions

- Observation:
    - Currently, operators are entering the “TURNED OVER” disposition when calls are turned over due to a change in officer shift, unit, or police boundary. In addition, a review of the comments indicates that “TURNED OVER” is also used if the call is being handled by another agency.

- Suggestion:
    - We suggest using more specific dispositions to capture these different possibilities. For example, “TURNED OVER-SHIFT”, “TURNED OVER-UNIT”, “TURNED OVER-DISTRICT”, “TURNED OVER AGENCY”.

Item 6: Consistent use of existing dispositions

- Observation:
    - We observed instances in which operators are entering the disposition “CANCELLED” or “COMPLETE” interchangeably when the calls are never dispatched. For example, in some instances, call dispositions were entered as “CANCELLED” when a ShotSpotter notification was determined to be a false alarm instead of “COMPLETE”. Other times, this type of code was coded as “COMPLETE.”

- Suggestion:
    - It is recommended that procedures distinguish between when a call is “CANCELLED” and when it is “COMPLETE” and that operators follow the definitions established.

Item 7: Identifying duplicate calls

- Observation:
    - Currently there is not field to accurately identify duplicate calls in the event that multiple call records have been entered for the same incident. Sometimes a reference to duplicate calls are made in the comments, but this is inconsistent. In addition, sometimes the operators are making the reference in all call records.

- Recommendation**:**
    - We recommend a separate field ("DUPLICATE") with a default response of "No". In the event that the call record is entered by multiple call takers for a single incident, for example, the response for the duplicate call (or non-dispatched call) can be changed to "Yes."

Conclusion

Over a four-year period from 2014 to 2017, OPD was alerted to over 2,300 gunshot events that, in the absence of ShotSpotter, they might have never detected. Our results indicate that while ShotSpotter initiated calls were roughly 20% less likely than non-ShotSpotter-initiated calls to result in an initial disposition of "arrest," they were almost 40% more likely to result in a report being made. The value of the intelligence gained, or amount of evidence collected, by officers responding to ShotSpotter alerts could not be quantified with the data we were given, but should be kept in mind as additional metrics that can be used to gauge the value of ShotSpotter to Omaha. In any event, it is clear that ShotSpotter brings hundreds of gunfire events to OPD's attention each year. Our hope is that if OPD can implement some or all of the suggestions laid out above, thereby reducing uncertainties in their data, they will be in a better position to use the data to aid in their violence reduction efforts.

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