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Evaluation of the Cleveland Division of Police's Implementation of ShotSpotter

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Key Findings

Beginning in the Summer of 2023, the City of Cleveland contracted with researchers from the Criminology Research Center in the Levin College of Public Affairs and Education at Cleveland State University on an approximate two-year evaluation of the Cleveland Division of Police's (CDPs) implementation of ShotSpotter, a gunfire detection system. The system was first piloted in a three-square-mile area of Cleveland in the Fourth District that was selected based on having a relatively high rate of gun-related violent crime. Coverage areas expanded to the other four police districts in 2023 and 2024.

This evaluation presents details regarding the implementation process, the outcomes associated with ShotSpotter, and feedback from the community. *However, it does not include a recommendation about the City's future use of ShotSpotter. Its purpose is to provide information to decision-makers without offering direct advice.*

Below we summarize the key findings based on the multiple methods employed in this evaluation, detailed in this report. We have organized the findings around the goals of this evaluation.

Goal 1: Assessing ShotSpotter's Usefulness

1. ShotSpotter technology is generally accurate.

Based on the available evidence, ShotSpotter is generally accurate in the identification of location and type of gunfire. ShotSpotter touts a 90% accuracy rate. Interviews with CDP officers indicate that, with few exceptions, the data they receive from ShotSpotter's published alerts is generally valid. These findings are also replicated in the officer survey. Some officers in the survey reported experiencing errors with the accuracy of the technology, but most expressed no major concerns about its accuracy. We discuss the identified errors in detection below.

According to the most recent Annual Review presented by SoundThinking to CDP in June 2025, from 5/1/2024 to 4/30/2025, CDP officers reported 21 errors. Of these, 17 were instances where ShotSpotter failed to identify gunfire. The remaining 4 were incidents in which ShotSpotter did not accurately identify the location of gunshots. These errors resulted in 1 false positive alert and 20 false negative alerts. ShotSpotter defines a false positive as an alert where ShotSpotter indicated there was gunfire when there was not. A false negative is when ShotSpotter dismisses a noise that turns out to be gunfire (so that the agency was never alerted).

However, as noted in this report, officers are responsible for disclosing and reporting these errors to ShotSpotter that they have identified. Based on information provided to us in the officer survey and interviews, officers do not always report errors to ShotSpotter. Officers we spoke

with noted a number of mislocated events they identified from video camera footage they reviewed for subsequent investigations resulting from a ShotSpotter alert. That is, they were able to use video evidence to verify that the actual gunfire was several hundred feet from the “dot” indicated by ShotSpotter. These errors were not always reported to ShotSpotter.

In addition to individual officers not reporting errors, *we learned of one particular issue involving ShotSpotter’s placement of sensors that resulted in chronic errors across a part of the ShotSpotter coverage area for a period of time.* About a month after the ShotSpotter coverage areas in the First and Second Districts went live in May 2024, according to SoundThinking, CDP realized that some sensors were placed inefficiently along the border of these districts, which led ShotSpotter to automatically not publish any alerts, instead filtering them into a category called "*suppressed*" alerts. ShotSpotter defines sounds as suppressed when they are recognized by its sensors as being just outside the coverage area. Though the word “alert” suggests that police are notified in real time about suppressed gunfire, this is not the case. Suppressed alerts do not get related to CDP because ShotSpotter does not guarantee the accuracy of sounds detected outside its coverage areas. CDP can, if they wish, view a map of suppressed alerts by adjusting filters to do so; however, the purpose of this function is not at all to guide immediate responses by officers. This issue was identified by a detective in the First District who, while viewing suppressed alerts, noticed a large number of these in their district in the part of the ShotSpotter coverage area that bordered the coverage area in the Second District. In real time, the officer then witnessed an audio incident that was identified as gunfire by ShotSpotter in the First District be immediately removed from the process and filtered into the suppressed alert data because the sensors in the Second District recognized the sound as coming from outside its coverage area (even though it was in fact in the First District coverage area). CDP then realized that all gunshot-like sounds in the First District that occurred in this area along the border of the Second District coverage areas were being essentially cancelled by sensors in the Second District and vice versa. This defect was promptly reported to SoundThinking/ShotSpotter. CDP was able to verify that ShotSpotter had fixed the problem, and the error was resolved within several months, according to CDP. This technological defect resulted in all gunfire-like sounds in the affected area not being reviewed by ShotSpotter from its launch in the First and Second Districts until CDP identified the error, reported it to ShotSpotter/SoundThinking, and it was resolved.

We have no way of knowing how many of the ShotSpotter alerts were essentially canceled by its sensors, nor can we know how many of them, had they been subject to the ShotSpotter review process, ultimately would have been published as gunfire alerts (and therefore be reported to CDP as such). Regardless, there are most likely some that would have been defined as actual gunfire.

2. ShotSpotter alerts are more accurately located than most 911 calls, resulting in faster response times for gunfire-related incidents.

Given the accuracy with which ShotSpotter is able to detect gunfire and the inaccuracy of the location of gunfire in reported calls, officers can respond faster than with 911 calls. The exception to this would be 911 calls where victims/witnesses can provide more detailed location information to officers.

The time from actual gunfire until CDP is notified by ShotSpotter is typically less than one minute. In the first quarter of 2025, the vast majority of ShotSpotter alerts in Cleveland (96%) were identified in less than 60 seconds (SoundThinking, June 2025).

After receiving an alert, CDP is usually able to dispatch an officer in less than 90 seconds. The average time from published ShotSpotter alert until officer dispatched (based on CAD creation time) for alerts in Quarter 1 of 2025 was 81 seconds (Median: 78 seconds).

In our evaluation, it was not possible to evaluate ShotSpotter alerts separately from 911 calls. Only 10% of ShotSpotter calls included 911 calls; however, all but one of the 53 incidents where CDP administered first aid/life-saving measures in connection with a ShotSpotter alert also had a corresponding 911 call. Additionally, officers reported that a shots-fired alert paired with a citizen's call held greater importance and was more likely to result in positive contacts with citizens.

3. Residents are not frequently calling in shots fired.

Residents said when hearing gunfire, they do not always call the police because they are unable to determine the location of the gunfire, if it was, in fact, gunfire, do not want or trust police involvement, or do not want to be associated with the crime.

Officers generally agree that gunfire is underreported to 911. Receiving information about gunfire not reported to them is a key benefit of using ShotSpotter.

The quantitative data provided to ShotSpotter indicates a steady rate of associated 911 calls– hovering between 10 and 13% between 2023 and 2025, according to descriptive data provided by CPD. **Therefore, without some type of gun detection technology, police would likely not know about 90% of the shots fired.**

4. Most of CDP's responses to ShotSpotter alerts do not result in any actionable next steps.

Despite that, without ShotSpotter alerts, police would not know about the vast majority of shots fired in the city. **Most alerts do not result in actionable next steps, such as evidence collected, witnesses, suspects, or victims on the scene, or any investigative leads**. Arrests were rarely made on scene. Based on data provided to us by ShotSpotter, there were 126 arrests made in connection with a ShotSpotter alert in 2023 and 2024. Approximately 10% of alerts resulted in an offense report.

5. ShotSpotter aids in evidence collection.

While the vast majority of the ShotSpotter alerts do not result in evidence collection, evidence collection is more likely with ShotSpotter than without. This is because ShotSpotter can pinpoint with much greater accuracy the location of the shots fired, allowing for shell casings and other evidence to be collected.

In fact, when further investigative steps were taken, officers and other key stakeholders said that the information ShotSpotter provided was useful–or at least was one source of forensic intelligence, often among several.

6. ShotSpotter results in a substantial increase in the volume of calls, putting additional strain on an already strained police force.

Based on data provided to us by ShotSpotter, across all districts, CDP had an average of 21 alerts per day in 2023 and 2024.

Resource strain is particularly relevant given that roughly during the same time that ShotSpotter was implemented, CDP experienced a considerable drop in the number of officers.
In fact, CDP had the largest percent decline in officers from 2019 to 2024 among all US city police departments that had between 1,000 and 3,000 officers in 2019.

Interviews and surveys of officers suggest that the **ability for CPD to respond to ShotSpotter alerts effectively is severely limited due to staff shortages and high call volumes**. We observed this as a factor that affected officers' ability to consistently complete nearly all tasks listed in the General Police Order (GPO). For example, while officers always or almost always follow some parts of the GPO when responding to a ShotSpotter alert (such as looking for victims, people in general who might be responsible for the gunfire, or potential witnesses), they less often adhered to other parts of the GPO, like community canvassing or data management. Similarly, while most officers say they usually look for physical evidence, officers differ in how often and how much time they spend on this activity. A number reported that their likelihood of

completing this step depends on how busy they were.

7. ShotSpotter likely increases response times for other crimes

While all ShotSpotter alerts in Cleveland are dispatched as Priority/Level 1 (immediate threat to life or safety—the highest priority level assigned to calls for service), depending on the overall Priority 1/Level 1 call volume and staffing levels at any point in time, police responses, even among Priority/Level 1 alerts, must necessarily be prioritized. Despite ShotSpotter alerts receiving the highest priority level, individual alerts may not always be addressed with the same level of urgency, especially if Priority 1 call volume is high and staffing levels low.

Officers reported that the high volume of ShotSpotter calls increases response times for calls categorized as Priority/Level 2, even though Priority/Level 2 incidents include potentially serious crimes such as burglar alarm alerts and some domestic violence calls. **The volume of calls resulting from ShotSpotter and the decrease in staffing at CDP suggest response times are likely increasing as a result of ShotSpotter.**

Additionally, longer response times strain police-community interactions. Community residents frequently reported frustrations with CDP's response times for lower priority calls for service. In fact, this was cited by residents as one key factor in why they do not call in shots fired—not wanting their call to contribute to the already long response times.

8. ShotSpotter is largely a stand-alone technology.

CDP is not able to take advantage of many functions provided by ShotSpotter. However, many of these features are not necessarily integrated into their workflows and therefore serve as additional administrative or analytical tasks to be completed. These tasks, on top of the resource constraints placed on the officers in responding to the ShotSpotter alerts and their other calls for service, are difficult given the current number of officers employed by CDP.

Interviews and surveys of officers suggest that they rarely use the forensic features and services provided by ShotSpotter. Even officers with specific investigative duties say that they rarely, if ever, request detailed forensic reports from ShotSpotter. Indeed, according to SoundThinking, CDP requested a total of 4 detailed forensic reports in the last year (5/2024 to 4/2025).

CDP is similarly unable to meaningfully use the data trend information offered by SoundThinking/ShotSpotter to inform future strategies. To assess the specific role of ShotSpotter in helping police more effectively or efficiently do their job, data must be collected on the outcomes specific to ShotSpotter alerts. These data should be compiled for the areas with ShotSpotter and those without that have similar levels of gun-related crime. Ideally, the

outcomes produced from ShotSpotter alerts should then be compared to the results derived from calls for service that employed policing techniques other than ShotSpotter.

For ShotSpotter to produce value reports to illustrate successful outcomes of their technology, they must have information about any tangible result of their alerts (such as, did an alert result in a life saved, arrest made, evidence recovered) as well as information about whether or not the gunfire identified by ShotSpotter was also reported by to CDP via 911. Officers already enter this data in CDP record systems, but SoundThinking requires that the client (CDP) enter this same data separately in their own company-specific data entry portal. To use SoundThinking's record system to track information related to ShotSpotter alerts, officers must complete the same data entry tasks twice, therefore *doubling the time and effort on the part of CDP*. Based on our process evaluation and the interviews and surveys of officers, we learned that mainly due to a dearth in human resources, CDP does not consistently relay this information to SoundThinking.

We also learned that, despite having a department-wide GPO that instructs police to record and maintain data related to ShotSpotter, there are variations in how and whether data collection is actually completed. In sum, while officers report attempting to sections of the GPO regarding reporting of ShotSpotter data, they report that time/personnel constraints limit their ability to do so.

9. By itself, ShotSpotter does not directly reduce crime.

ShotSpotter is not designed for crime prevention, as it is an after-the-fact type of technology, lacking key components necessary for crime prevention. Additionally, given the response times in most cases and the nature of these crimes, the technology precludes officers from discovering crimes in progress and apprehending offenders, as suspects are rarely still on the scene by the time officers are able to respond.

Over a quarter of the respondents to the community survey on ShotSpotter said they were not familiar with ShotSpotter. Almost half said they were somewhat familiar, and the majority of the residents participating in community events that we observed were also not familiar with ShotSpotter. Thus, it is unlikely that potential lawbreakers are familiar with the ins and outs of ShotSpotter, such as where it is and how it works to alter their behavioral patterns–especially if they have already fled the scene by the time officers arrive.

Gun laws around discharging firearms within city limits also reduce any potential deterrent effect of ShotSpotter, as it limits officers' ability to arrest people for discharging a weapon when suspects are on scene or fled the scene but can also be later identified.

10. ShotSpotter is difficult to incorporate with other types of policing technology.

Beyond the initial response to the alert, ShotSpotter is rarely used as a stand-alone technology. It is often paired with intelligence provided by other technology, frequently provided by the Real Time Crime Center (RTCC), such as cameras or license plate readers *for investigative purposes.* Therefore, this evaluation cannot accurately assess the effectiveness of ShotSpotter by itself because it is not often used in isolation.

However, aligning ShotSpotter with other technology is difficult. We learned from observations of ShotSpotter use in Cleveland's RTCC and interviews with officers, particularly those working intimately with technology, that while ShotSpotter may be used in conjunction with other technology by staff in the RTCC, **the frequency of this is low because other technologies are not intentionally placed near ShotSpotter sensors for several reasons:**

- Following best practices, CDP video cameras are placed based on analyses of micro-areas of crime (for example, near a particular street corner with a history of recent high crime activity). Video cameras, along with License Plate Readers (LPRs) are placed in high traffic areas and street intersections identified as having high crime activity. In contrast, the number and location of ShotSpotter sensors is determined by SoundThinking with the goal of providing full audio coverage across a specified physical area. This means that most sensors are necessarily placed on side streets and areas of the city not typically monitored by video cameras or LPRs. We conducted a non-scientific physical canvass of ShotSpotter coverage areas in Cleveland and noted that indeed, most of the sensors we observed were not on or near main roads.

- CPD routinely reviews changes in crime across the city to determine future placement of video and LPR technology, and equipment is or can be moved accordingly. Some LPR technology used by CPD is mobile in design, allowing for frequent tactical changes. In contrast, SoundThinking will only move or add sensors if the City requests additional/new coverage areas. For reference, the pricing quoted by SoundThinking in the *Price Proposal to Expand Subscription-Based Gunshot Detection, Location, and Forensic Analysis Service for the City of Cleveland, Ohio May 11, 2022 (Proposal ID: CLEOH051122)* was*:*

One-time service Startup Fee (Device Installation):	*$10,000 per square mile*
Annual Subscription Fee:	*$70,000 per square mile*
Expert Witness Services (available upon request):	*$350/hour*

- Finally, SoundThinking does not provide their clients with the locations of the sensors, nor do they allow CPD to move sensors. Based on our interviews with representatives of the company, this is because the strategies used to determine the placement of sensors are

proprietary information. Furthermore, SoundThinking at this time does not offer services to specifically align their sensors with other technological equipment used by their clients. While the sensors can be located based on sight as we confirmed by personally canvassing ShotSpotter areas, CPD would have to move their current video or LPR equipment or add additional equipment specifically to align with ShotSpotter sensors.

There are limitations in the location information provided by ShotSpotter. ShotSpotter provides information on the location of gunfire, including a physical location (dot) on an aerial map, the nearest address to the dot (based on Google Maps), and the GIS coordinates (latitude/longitude) of the location. There is also an option for the responding officer to connect to a visual view of the location (based on the *Google Street View* function in Google Maps, if it is available). However, unless officers review the *Google Street View* en route, **officers are not able to identify additional information about the physical characteristics of the location that would shape their tactical responses upon arriving at the "dot."** Since officers are instructed to respond to the "dot" and not the street address provided by ShotSpotter, officers do not necessarily know whether the gunfire occurred at or near a private residence, apartment building, park, commercial or industrial area, etc.. This is information that would be important for those responding in order for them to plan an appropriate response upon arrival; however, because ShotSpotter utilizes only audio technology and does not have video capabilities, it is limited in this respect.

Goal 2 - Assess Community Input on ShotSpotter

1. There was no evidence that identified significant 4th amendment concerns regarding ShotSpotter as implemented by the Cleveland Division of Police.

Community members expressed concerns through public comments, interviews, and surveys about the recording of personal conversations, the use of ShotSpotter recordings by law enforcement to screen for additional criminal behavior, and the sale of personal information gathered by ShotSpotter.

Interviews and conversations with key stakeholders, including SoundThinking, **did not reveal any evidence of these actions**. When asked, no key stakeholders reported hearing any recorded conversations associated with alerts (only gunfire) or any instances where any of the above residents' concerns occurred. However, we could not independently verify the above claims by SoundThinking or key stakeholders.

SoundThinking claims that due to the sensors' locations (high in the air), they rarely, if ever, record voices in the course of recording noises similar to gunfire. Several CPD officers and other key stakeholders we spoke with in interviews noted that they have rarely heard voices on the audio snippets provided by ShotSpotter. When they have, the voices are muffled/the person's

words are imperceptible. Interviews of CDP similarly did not reveal any evidence of this. CDP officers are not able to spend as much time as they would like on cases related to the ShotSpotter-detected gunfire itself. So, even if they had perpetual access to these types of recordings, they would be unlikely to use them for this purpose.

2. Public opinion on the Cleveland Division of Police's use of ShotSpotter was mixed.

Results from our community survey provide detailed information on overall public sentiment regarding CDP as well as residents' opinions specifically as they relate to CDP's implementation and use of ShotSpotter. **Community members are concerned that ShotSpotter is not as useful as other policing/crime control options.** These data reveal some similar themes.

Residents expressed two general perspectives about ways to address violent crime/gun crime.

- One general sentiment is that the crime problem in their community is a combination of CDP not having enough resources (people and cameras) and judges/prosecutors being too soft.

- A second, equally common opinion is that the City should invest in the root (social) causes of crime.

Less commonly expressed feedback:

- Concerns around equity–either privacy concerns/unequal treatment in communities of color

- The opinion that it is unfair that ShotSpotter is only in some places and not all

In sum, residents would prefer the city do something else to improve policing, given the cost of ShotSpotter, question its usefulness compared to other policing techniques, and prefer a focus on other issues, such as public order offenses and social welfare.

3. General satisfaction with Cleveland Division of Police is not contingent on the implementation of ShotSpotter

We identified an increase in positive public opinions about CDP, particularly in 2024, suggesting overall increases in community trust since recent changes in CDP administration. Many residents generally think that CDP is currently doing everything it can to address gun violence. **Their "blame" for violent/gun crime centered more on the latter steps in the criminal justice process.** This is also evidenced by the lack of public commentary specific to ShotSpotter in the

content analysis (for example, drones were frequently discussed in 2025). Alternatively, **for residents who expressed general dissatisfaction with CDP, they did not specifically relate it to CDP's use of ShotSpotter.**

Recommendations

Below we provide recommendations for policy and practice based on the summative key findings from the evaluation.

We do not provide a conclusion on whether the benefits of the ShotSpotter outweighed the costs. However, ShotSpotter enabled the CDP to respond to more confirmed gunfire incidents and to do so more quickly than relying on 911 alone. While the vast majority of alerts do not result in any actionable next steps, CDP's increased response to gunfire was somewhat effective in terms of evidentiary outcomes. The value of this enhanced service to the community should be balanced against the associated budgetary, opportunity costs, and staffing resources.

Should the City decide to continue using ShotSpotter, we offer the following recommendations to utilize this technology going forward more effectively:

1. Current staffing levels are not sufficient for Cleveland Division of Police to improve its use of ShotSpotter going forward.

At present, CPD is unable to use the vast majority of functions offered by ShotSpotter effectively. **We found that nearly every potential benefit of ShotSpotter was severely limited by a dearth in human resources.** Accordingly, continued use of ShotSpotter should be accompanied by more personnel to:

- Respond to ShotSpotter alerts
- Alleviate response times that are intrinsically exacerbated by ShotSpotter alerts
- Track the long-term outcomes of ShotSpotter alerts
- Collect, maintain, and analyze data on these outcomes
- Use this data strategically towards proactive policing strategies
- Ensure community members' support of ShotSpotter

2. Revise policies regarding the use of ShotSpotter.

The effectiveness of any technology, ShotSpotter included, is necessarily limited by the actions of the people who use it. As noted, CDP staffing levels certainly contribute to the limitations we observed in how ShotSpotter is currently being used. We found that many of the current policies and procedures are either unreasonable, unattainable, and/or lack the support of both officers and community members.

Revisions in policy should include attainable goals for officers and clearly define the limits on how officers can use the tools at their disposal.

3. Solicit input on revised policy based on current staffing levels

We learned that throughout this study, Cleveland's Community Police Commission (CPC) was working with CPD to revise the ShotSpotter GPO. Based on decisions made by the CPC and eventually ratified by the Consent Decree committee regarding the content of the GPO, the above recommendations may or may not be relevant in the future. Assuming CPD continues to contract with ShotSpotter, we provide the following recommendations:

Training

Officers expressed a desire for more training or indicated that they lacked sufficient training on ShotSpotter and/or its GPO. *This is supported by a key theme identified in this evaluation–how ShotSpotter is used necessarily depends on department policy, so effectiveness can only be defined within these parameters.* We recommend, as applicable, CDP provide additional/continued training on ShotSpotter, specifically what is needed to fulfill the GPO requirements (especially in light of the newly revised GPO).

Additional communication around how ShotSpotter functions and how CPD implements ShotSpotter

In the course of this evaluation, we observed and took field notes during several community sessions specific to CPD's use of ShotSpotter. Therefore, we understand that this is not a novel recommendation; however, the community remains concerned about practices that could be perceived as contributing to biased policing of communities of color and/or violating individuals' civil rights, especially in connection with surveillance technology. Community feedback also suggests that how ShotSpotter works is still largely unknown.

Relatedly, given the number of common concerns among community members about CDP's use of ShotSpotter, going forward, monitoring community opinion about its use would be essential.

Solicit officers' input to identify innovative ways to shift current human resources towards responding specifically to ShotSpotter alerts

Over the course of this evaluation, officers shared with us a number of promising ideas of how the CPD's use of ShotSpotter might be improved, even with current staffing levels. These involved using current resources in innovative ways to maximize responses to ShotSpotter alerts. Should the City retain ShotSpotter, we strongly encourage police leadership to identify and consider their ideas.

Increase officer support for ShotSpotter

While the need for additional resources and positive police-citizen interactions is paramount, officers must be convinced of the value and effectiveness of the technology. Increasing "buy-in" from officers in all roles and ranks can be improved by following up on long-term results of ShotSpotter alerts and communicating successful outcomes to officers.

Beyond these main recommendations, we offer the following suggestions, though with less enthusiasm:

- *Place-based policing strategies support efforts to regularly review the placement of technology and shift equipment based on this data.* However, after understanding the associated difficulty and cost, we do not necessarily advocate regular shifts in ShotSpotter coverage areas. On the other hand, regularly shifting sensors would help ensure that errors from sensor misplacement (such as the one identified by CPD in the First and Second Districts) do not compromise the technology's functionality for an extended period.

- Similarly, given the speed at which new and improved policing technologies are developed, best practices in policing advise departments to invest in technologies that are easily incorporated. Policing, especially in a diverse city, requires and will continue to require the use of multiple strategies and can similarly benefit from the use of multiple tools in tandem. In the case of ShotSpotter, we found that it is limited in important ways that might be remedied by using it in conjunction with other technologies, such as the lack of integration of the CAD system with ShotSpotter. However, based on what we have learned about the associated difficulty and cost to supplement ShotSpotter in this way, we do not necessarily advocate this pursuit.

- Should the City decide to discontinue using ShotSpotter, we offer the following recommendations based on the information we learned:

    - Prioritize feedback from community members.

    - While the community members we spoke with had mixed opinions about ShotSpotter, they were willing to share their ideas for addressing violent/gun crime in Cleveland. There was substantial agreement on many of these suggestions, including preferences for video technology and hiring more officers. Community members also voiced some common concerns about response times and the need to improve police-community relationships.

    - The vast majority of the residents express interest in working with CDP to tackle crime problems, especially in their immediate neighborhoods. We attended several meetings where CDP engaged with the community around addressing crime. CDP should continue to engage with community members towards this end.

    - If the City decides to discontinue its contract with SoundThinking, we recommend that it receive information about the company’s process for removing

equipment and discontinuing surveillance, given that privacy concerns have been raised in other cities (see https://mirrorindy.org/shotspotter-gunshot-detection-system-indianapolis/).

Introduction

Describing the Technology

ShotSpotter is a gunshot detection system that relies on a network of acoustic sensors to identify, locate, and alert law enforcement to gunfire in real-time. When a gunshot is detected, the system triangulates the sound, determines its precise location (typically within 25 meters), and sends alerts to 911 dispatchers and patrol officers within seconds. This technology is designed to enhance police response times, increase situational awareness, and facilitate evidence collection, even when no one reports this gunfire.

ShotSpotter, rebranded in 2023 to SoundThinking, is a publicly traded American security technology firm that offers a variety of technology-based products and services. In this report, we use the term ShotSpotter to refer specifically to the acoustic gunshot detection system/technology and SoundThinking to refer to the company or company practices.

Current Evaluation

Beginning in Summer 2023, the City of Cleveland initiated a research collaboration with the Criminology Research Center at Cleveland State University (CSU) to enhance the understanding of ShotSpotter's effectiveness and efficiency, as well as its potential impacts on residents of the communities where the technology is deployed. ShotSpotter was initially implemented only in a portion of Cleveland's Fourth Police District, beginning in 2020. However, the technology has been active in portions of all five of Cleveland's Police districts since May 2023.

The following were the goals of this evaluation:

> **Goal 1:** To evaluate evidence of the usefulness and effectiveness of ShotSpotter to CDP.
>
> **Goal 2:** To evaluate the impact on community trust in the police in ShotSpotter by assessing residents' views about CPD's use of ShotSpotter.

In addition, the evaluation will speak to whether and how this technology could be used by the City of Cleveland in the future (for example, through continued or expanded use). CSU will achieve its research objectives by employing multiple qualitative and quantitative methodologies to address the two goals outlined above.

In this evaluation, we also investigated whether these conclusions were applicable in Cleveland.

Background on ShotSpotter

Purpose of ShotSpotter

The stated goal of ShotSpotter is to identify, locate, and notify authorities about gunfire incidents that might not otherwise be reported to the police. An additional claimed benefit of the technology is its ability to pinpoint the location of the gunfire source more accurately than what is typically reported by residents to 911.

Therefore, based on these two stated proposed benefits, ShotSpotter should:

- Result in a police response for gunfire not reported to police or a quicker police response and/or more accurately located police response than 911 calls, leading to a higher number of arrests and victims being helped.

- Result in more effective police responses, leading to a higher likelihood of evidence being discovered and thus crimes being solved.

Review of the Literature

ShotSpotter by itself is not designed to prevent and/or reduce gun violence directly. Numerous studies have assessed its effectiveness in reducing violent crime indirectly. Based on our review of scholarly articles and reports from evaluations of ShotSpotter in other cities, our correspondence with Cleveland's ShotSpotter representative, and informal conversations with law enforcement officials in cities comparable to Cleveland that use ShotSpotter (such as Atlanta, Dayton, Canton, Seattle) in preparation of our evaluation plan, we identified several common conclusions regarding the technology:

- ShotSpotter has a well-documented ability to detect gunfire versus other sounds. An early report of the system used in Redwood City, California, found that ShotSpotter detected 81% of test shots and correctly located 84%, with slight variations depending on the type of gun used (Mazerolle et al., 2000).

- Gunshot detection devices typically increase the number of detected shots fired (Mares & Blackburn, 2020; Ratcliffe et al., 2019; Renda & Zhang, 2019) and, in some locations, have been found to decrease the number of citizen-initiated calls for shots fired (Mares & Blackburn, 2020; Piza et al., 2024). As noted, underreporting of shots fired is a common issue and one of the primary reasons for adopting gunshot detection technology (Renda & Zhang, 2019; ShotSpotter, 2021). Additionally, citizen-initiated calls for shots fired are less likely to provide officers with a more precise location than ShotSpotter alerts (Piza et al., 2024).

- A recently published study using a microsynthetic control method to evaluate Kansas City's implementation of ShotSpotter on gun violence prevention efforts found that ShotSpotter was associated with greater ballistic evidence collection and gun recoveries. However, there was also a reduction in shots-fired calls for service and no influence on several gun-related crimes involving confirmed victims, specifically non-fatal shootings, fatal shootings, and aggravated assaults and robberies committed with a firearm (Piza et al., 2024).

- With very few exceptions, studies reported no significant crime reduction in places that used ShotSpotter (Mares & Blackburn, 2020). Similarly, scholars so far have found no changes in the investigatory outcomes of cases initiated by gunshot detection devices (Choi et al., 2014; Ratcliffe et al., 2019; Renda & Zhang, 2019). These studies focused on changes in confirmed shots (i.e., "founded" cases).

- The use of ShotSpotter leads to police responding to more incidents of shots fired compared to places or periods when ShotSpotter was not used, but the efficiency and effectiveness of increased responses are unclear; that is, increased workload from ShotSpotter does not necessarily produce more meaningful outcomes. This is especially true in municipalities like Cleveland, where discharging a firearm is not necessarily a crime.

- ShotSpotter considerably increases the number of calls officers must respond to, thereby producing a substantial strain on department resources. This is particularly relevant to CDP. According to analyses conducted by this study's researchers with the FBI's publicly available Law Enforcement Employee Data, CDP had the largest percent decline in officers from 2019 to 2024 among all US city police departments that had between 1,000 and 3,000 officers in 2019. On the one hand, ShotSpotter alerts CDP of potential gunfire that would have otherwise not been reported. On the other hand, it is often challenging to confirm that an alert is related to a crime. Even if there is an unlawful discharge of a firearm, without additional evidence like video footage or witnesses, there is frequently insufficient evidence to confirm. This is because suspects are often no longer at the scene, evidence like shell casings or firearms cannot be found, etc. An audit of the NYPD's use of ShotSpotter indicated that in 2022 through 2023, the vast majority (between 80 and 92%) were not confirmed to be shootings (New York City's Comptroller 2024).

- Little is known about how communities perceive ShotSpotter. A recent evaluation, similar in scope, was conducted by the Wilson Center for Science and Justice at Duke Law, examining community perceptions of ShotSpotter in Durham, North Carolina, for a

one-year period (Kelly et al. 2024). The study revealed widespread skepticism about the system's utility and fairness. Many residents believed that ShotSpotter did not make their neighborhoods safer, and some expressed concern that it exacerbated over-policing, particularly in communities of color. Trust in law enforcement and the broader decision-making process surrounding ShotSpotter's deployment was notably low, especially given the lack of public consultation prior to implementation. Financial considerations were also prominently mentioned. Many participants viewed the cost as unjustified, particularly given competing needs for community-based violence prevention efforts.

We applied the existing scholarship on ShotSpotter in the development of the evaluation detailed here. Our evaluation differs from past evaluations of ShotSpotter in other cities in that we investigated contextual factors that facilitate or mitigate the effects of the technology to understand how to use ShotSpotter in ways that maximize its success. Past studies note that "This [approach] would provide additional guidance to public safety agencies looking to maximize return on investment. Continued adoption of GDT [Gun Detection Technology] should perhaps be contingent upon the development of such research, given the high cost of the technology." (Piza et al, 2024, p. 863). Additionally, our evaluation includes extensive community feedback.

Methodology

Goal 1

As detailed below, our approach to this evaluation involved collecting data using various methodologies, thereby increasing the diversity of our data points and voices in our analyses via the methodologies described below.

The evaluation began with an exhaustive **literature review** on the relevant outcomes of ShotSpotter technology, a summary of which is included in the previous section. Additionally, we continued to assess the literature throughout the entire evaluation period.

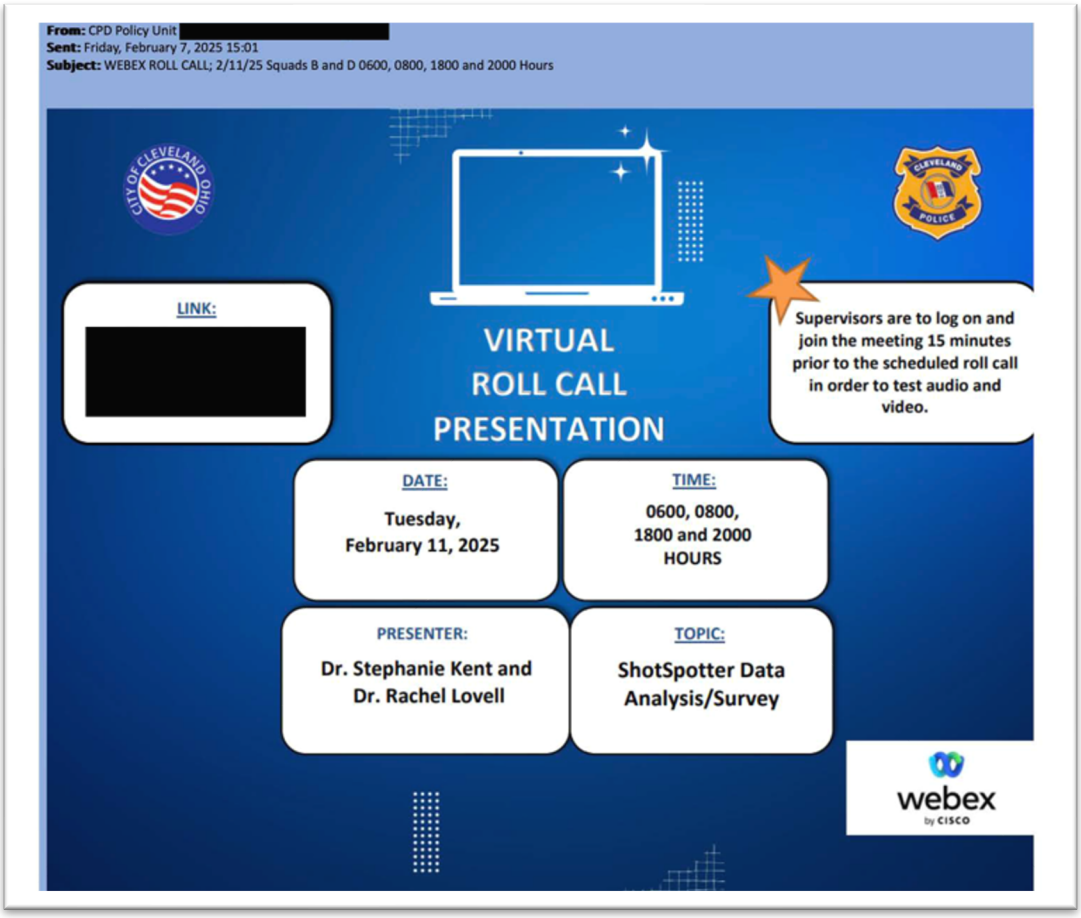
In formulating our evaluation design, after conducting an initial review of the literature, we also performed several other activities that informed our evaluation. We contacted researchers who conducted similar evaluations. Through a review of media coverage of ShotSpotter, we also identified cities similar in size to Cleveland that had used ShotSpotter at some point but no longer had an active contract for this service with SoundThinking. We spoke with representatives from these agencies to gain an understanding as to why they did not renew their contracts. We were also introduced to Cleveland's representative from SoundThinking at the start of the study, and met with this representative in person five times, with regular email communication. Throughout the study, we were introduced to three additional SoundThinking employees, either in person, via email, or both. The information from SoundThinking employees during these interactions was generally consistent across all interactions. Table 1 provides the methodological details on the **officer survey and interviews** under Goal 1.

Table 1. Methodological Details for the Officer Survey and Interviews, Goal 1

Contact Lists:	Officer survey: List of CDP officers and analysts' email addresses (n = 1560 contacted). All officers had an equal opportunity to participate. Interviews: Purposive, snowball sample, intentionally sampled participants based on the criteria that they use ShotSpotter or the data produced by ShotSpotter in their role/position. List began with researchers' personal connections and snowballed based on recommendations of participants.
Sample Size:	Officer survey: 187 completed responses, a 12% response rate Interviews: 25 completed

Recruitment:	Officer survey: Online, anonymous survey. Conducted from December 2024 through February 2025 via Cleveland State University (CSU)-branded email solicitations in Qualtrics based on CDP-provided lists of all CDP peace officers and analysts. CDP distributed an email in advance of the recruitment email informing officers that a ShotSpotter survey would be coming from the CSU Crim Center, so officers would know it was a legitimate survey (e.g., not a phishing attempt, was a known/sanctioned CDP survey). Several reminder emails were distributed. The CDP-provided email addresses were identifiable (based on derivatives of first and last name); therefore, to ensure anonymity, we checked options in Qualtrics that would not link their responses to their emails. This meant that we could not see who had responded to the survey when sending reminder emails to complete the survey. We were also therefore not able to further break down the responses to the survey for generalizability. Participants were also recruited virtually by the research team via CDP roll call. See Figure 1 below. Interviews: Sent via CSU-branded emails based on personal contacts and recommendations, diversifying by role/position from June 2024 to June 2025
Measures:	Officer survey and interview questions were developed by CSU. CDP leadership provided feedback and guidance on revisions based on CDP implementation of ShotSpotter. Snowball sampling was used to recruit CDP officers to pilot survey questions and adjust based on feedback. See report and appendix for interview questions and survey items.
Analysis:	Open-ended survey questions and interviews responses were analyzed via hand-written notes to identify key themes and/or converted to text files and analyzed through iterative coding using ATLAS.ti, a computer-assisted qualitative data analysis software program. Closed-ended survey responses were analyzed with the use of SPSS, a commonly used statistical software program.

Figure 1. Distributed Email from the Cleveland Policy Unit for Roll Call Recruitment



Under Goal 1, we also conducted a **document review** of CDP's protocols, policies, and reports related to ShotSpotter. The documents were reviewed and used in the development of the research questions, survey, and interview questions, and provided important context for interpreting the study's findings. We analyzed written documentation provided by CDP, ShotSpotter, and publicly available documents relevant to ShotSpotter's policies, protocols, and reports. These included:

- CDP's General Police Orders (GPOs) related to ShotSpotter, which underwent several substantial changes over the course of the evaluation
- Copies of reports and presentations about ShotSpotter produced by CDP throughout the study period
- Copies of reports and presentation materials produced by SoundThinking over the course of the study period

- Regular reviews of materials about ShotSpotter on SoundThinking's website and other publicly available marketing materials provided by CDP Command staff with CDP.

We also conducted in-person **participatory observation** of the use and/or implementation of ShotSpotter. Following standard practices in ethnographic field research, we kept hand-written field notes that were typed for analysis. No identifying information was documented in the field notes.

We received the following **quantitative datasets** from CDP on ShotSpotter alerts:

- List of ShotSpotter calls from November 2020 until April 2025. This data was derived from Computer Aided Dispatch (CAD) and included the date, time, location, type of ShotSpotter alert, and details on evidence (property) collected in connection with the alert. This dataset contained a total of 87,029 alerts. In subsequent analysis, we cleaned the dataset to ensure only one alert per CAD. We also removed alerts on July 3rd and 4th, and December 31st and January 1st, as these days had an abnormally large number of alerts due to fireworks. Thus, these numbers may differ from those reported previously by CDP or ShotSpotter.

- List of ShotSpotter calls from the first quarter of 2025 for all districts, derived from ShotSpotter's Ground Truth Tracker (ShotSpotter's app). This dataset included the date, time, address, weapon and gunfire details, whether there was a correlated 911 call, whether aid was rendered to a victim, whether a report was generated, whether a canvass was conducted, whether there were several types of victimizations, and evidentiary outcomes in connection with the alert (number of casings, whether gun was recovered). This dataset included a total of 877 alerts. We also cleaned this dataset in subsequent analysis to have only one alert per CAD and removed alerts on July 3rd and 4th, and December 31st and January 1st. Per CDP feedback, we also removed alerts with no ID provided when it was a duplicate event. Thus, these numbers may differ from those reported previously by CDP or ShotSpotter.

- List of CADs with associated ShotSpotter alerts that included lifesaving/first aid rendered by CDP. This dataset contained a total of 53 alerts.

- Descriptives (already analyzed metrics) of ShotSpotter alerts from 2022 through 2024 from the Ground Truth Tracker app. This dataset included already analyzed metrics pertaining to weapon and gunfire details, whether there was a correlated 911 call, whether aid was rendered to a victim, whether a report was generated, whether a canvass was conducted, whether there were several types of victimizations, and evidentiary outcomes in connection with the alert (number of casings, whether gun was recovered).

Goal 2

To assess whether and how the implementation of the ShotSpotter technology's practices can build community trust in law enforcement, we employed the following methodologies (detailed in Table 2):

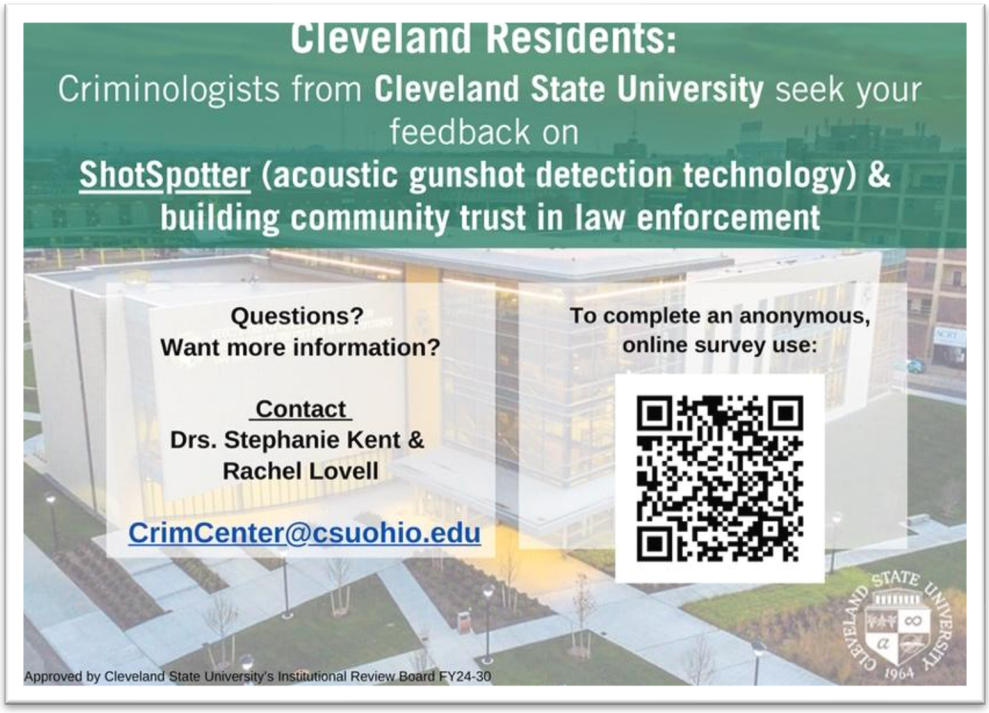
Table 2. Methodological Details for Community Survey and Interviews, Goal 2

Sample:	Community survey: Online and in-person surveys of community members who live, work, or otherwise visit ShotSpotter areas of implementation. Participant observation: those who attended community meetings, trainings, and informal gatherings, in particular CDP's district meetings. Content Analysis: Population of video-recorded public meetings (City Council, Community Police Commission, Civilian Police Review Board) in which community members were able to participate in some way (e.g., discussion/public comment/Q&A) from May 2020 until June 30, 2025. Time frame chosen in order to observe pre-/post-ShotSpotter implementation.
Sample Size:	Community survey: n = 132 completed responses on the survey online. Researchers attended meetings in all areas of the city, using response rates to determine which areas to focus on along the way. We are unable to determine a response rate since we did not have a contact list for this survey. Participant observation: n = 76 individuals Content analysis: n = approximately 480 public meetings that typically allow for public comment and/or questions from the public. These include all City Council meetings, meetings of the Community Police Commission, and the Civilian Police Review Board that fit these criteria. Additional relevant public meetings regarding CDP activities were also included (i.e., those related to the Consent Decree).

Recruitment:	Community survey: Beginning in September 2024, Cleveland residents were recruited by advertising the study and providing a QR code to the online survey through local media (e.g., an article in *Signal Cleveland*) and CSU's and the Crim Center's social media outlets. See Figure 2 for the distributed recruitment flyer. For residents who preferred not to use the online survey option, researchers provided their contact information to complete surveys by speaking directly with them. We attended community meetings to solicit participants and distributed flyers with a QR code to allow residents to access the online survey. Residents were able to complete a paper version of the survey or answer survey questions posed in person by the researchers. We encouraged residents to distribute flyers to neighbors/acquaintances who might be interested in completing the survey. Participant Observation: Intentionally sampled participants based on their civic participation, attendance of CDP's district meetings, familiarity with ShotSpotter, and personal connections to civically engaged community members. Content Analysis: All recorded meetings of the Cleveland City Council, including subcommittee meetings, meetings of the Community Police Commission, the Civilian Police Review Board, and additional relevant public meetings in which residents were able to comment publicly about the CDP (ie community meetings related to the Consent Decree).
Measures:	CSU developed surveys and interview questions. See the appendix for interview questions and survey items. Participant observation: Often began by using the community survey as an initial guide for the informal feedback/conversations. Content analysis: Using individuals whose comments/questions were related to CDP as the unit of analysis, we coded comments as generally positive regarding CDP, negative, or neutral.
Analysis:	Open-ended survey questions and interviews responses were analyzed via hand-written notes to identify key themes and/or converted to text files and analyzed through iterative coding using ATLAS.ti, a computer-assisted

	qualitative data analysis software program. Closed-ended survey responses were analyzed with the use of Excel and two commonly used statistical software programs, SPSS and SAS. Participant observation: Initial interviews were coded using grounded theory analysis (Strauss & Corbin, 1997) that informed purposive sampling of subsequent interviews. Subsequent interviews were coded using the constant comparison method. Content analysis: One coder was used to ensure reliability and validity. To address potential error or bias in this methodology, since some people are willing to speak publicly while others may not be (but still have relevant opinions about ShotSpotter), we conducted in-person surveys and distributed information on how community members can complete an online survey.

Figure 2. Distributed Flyer for Community Survey



Methodological Limitations

Generally, in evaluations with non-random samples, feedback is often provided by individuals with strong opinions (disproportionately positive or disproportionately negative) because they are

typically more motivated to share their views. As indicated in the results discussed later, our findings do not seem to follow this pattern, as we see a variation in the responses. This is likely due to the use of multiple methods in this evaluation.

As detailed above, the expansion prevented us from assessing outcomes in a quasi-experimental design, as we had no "treatment" and "comparison" group per consultation with CDP analysts. Additionally, given the extensive body of literature related to ShotSpotter's nonsignificant relationship with reducing violent crime, we did not assess whether ShotSpotter reduced crime rates. The expansion was already underway when the evaluation commenced. However, it should be noted that other methodologies employed in this study were able to address the study's key research questions in a manner that aligned with the CPD's implementation.

While we were not able to statistically analyze the relationship between various outcomes and functions of ShotSpotter, based on our process evaluation of ShotSpotter, the surveys of officers, and qualitative data from our interactions with officers, we were able to address several important outcomes and conclusions, which informed our decisions about the quantitative data. It was through this process that we identified underreporting of outcomes and expansion issues that prohibited conducting a quasi-experimental design. Lastly, while we did ask about perceived cost compared to benefits, as detailed here, this study cannot speak to the cost-benefit analysis of ShotSpotter, as we did not directly assess this.

Results

Goal #1: Evaluate evidence of the usefulness and effectiveness of ShotSpotter to the Cleveland Police Department

Method 1: The Process Evaluation - How ShotSpotter Works

As part of Goal #1, we conducted a process evaluation to assess how the program or policy is implemented and whether it is being delivered as intended. This evaluation aimed to identify challenges or barriers to implementation and understand how program components interact.

Below, we provide a brief description of how ShotSpotter—the technology—functions, based on a review of the literature conducted throughout the study period and data collected from observations, interviews, and document reviews as part of this evaluation. *However, as with any technology, how it is used substantially affects its degree of usefulness.* Therefore, after describing the technology, we detail CDP's implementation of the ShotSpotter, which informed the subsequent data collection and analysis of this evaluation.

ShotSpotter deploys a network of numerous outdoor microphones throughout each square mile of a pre-determined coverage area. These microphones are commonly installed on light poles, buildings, or utility structures. They continuously monitor for loud, sharp sounds such as gunfire. Their locations are unknown and unmarked, although visible. When a sensor detects a sudden noise, the audio is transmitted to an automated algorithm, an AI-based system, which analyzes the audio for gunshot signatures, identifiable patterns, volume peaks, and other unique traits, such as barks or echoes. If the algorithm identifies a potential gunshot, the information is forwarded to ShotSpotter's central review center, where trained (human) analysts evaluate the clip and interpret the audio before confirming the alert. According to other studies, analysts overrule the algorithm approximately 10% of the time (Burke & Tarm, 2023).

By utilizing timestamps and variations in signal strength from multiple sensors (triangulation), the system identifies the sound's source—typically within a range of tens of meters—and can issue alerts in under a minute. Verified incidents are forwarded to law enforcement officers via ShotSpotter's interface and/or (the agency's) Dispatch, accompanied by map coordinates, time stamps, and audio recordings. According to SoundThinking, agencies have the capability to incorporate these alerts into their dispatch systems, crime databases, and body cameras (soundthinking.com, 2025).

From early interactions with SoundThinking and CDP leadership in designing the study's evaluation plan, we gained additional insights into how the technology works that were not necessarily detailed on the SoundThinking website. These include:

Additional details on the alerting process

- At least four individual sensors must have "heard" a single shot for it to move on to the human verification step. If more than one shot, it must be corroborated by at least three distinct sensors.

- Human reviews are based on a visual display of characteristics of the detected pulses and the incident, such as the number of participating sensors, the waveform, pulse alignment, and the direction of sound and audio review of the gunfire.

- The reviewer categorizes the noise(s) as published (Gunshot or Probable Gunshot) or dismissed (Non-Gunshot). Based on our communications with representatives from ShotSpotter, probable gunfire incidents are those in which the reviewer is more than 85% sure it is gunfire. The location of the gunfire is displayed with a "dot" or bubble with the number of shots indicated on the ShotSpotter interface.

- Once published, the law enforcement agency receives the alert, including location information and an audio snippet via a password-protected application on a mobile phone, in-car laptop, or computer. In addition to the dot on the map and audio, ShotSpotter provides details such as the number of shots fired, whether multiple shooters are involved, and whether high-capacity and/or fully automatic weapons are being used.

- The above process (i.e., recording the impulsive sound, two-factor review, and publishing alerts to authorized users) is designed to be completed in less than 60 seconds.

Additional details on the technology/alerts

- Detection errors can occur at various stages of the process, such as gunfire not being detected by ShotSpotter or being detected but not reported to the agency, or ShotSpotter incorrectly detecting gunfire when there was none.

- ShotSpotter defines a false negative as when ShotSpotter dismisses a noise that turns out to be gunfire (so that the agency was never alerted), which could be due to human error or limitations in AI/technology. According to ShotSpotter, most of these types of errors are caused by human mistakes in detection and/or alerting. In these cases, ShotSpotter reviews audio and discusses the error with its staff.

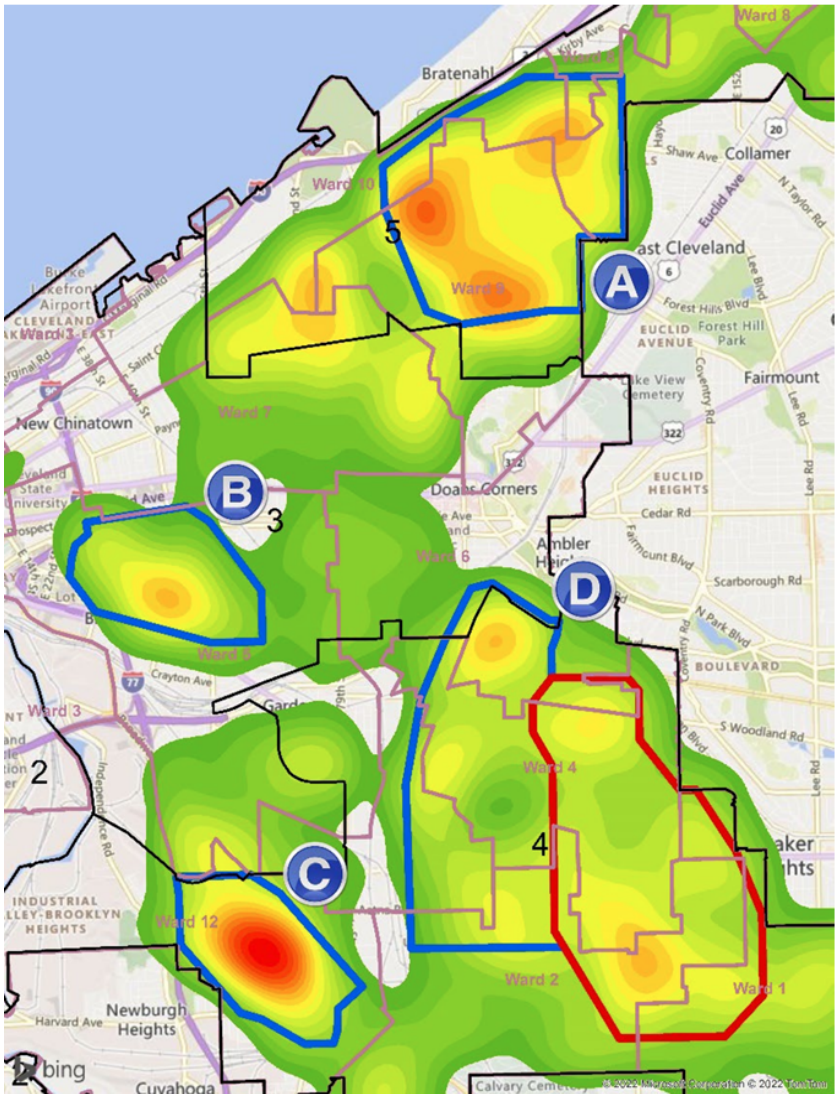
- Officers and/or supervisors are responsible for reporting identified errors to ShotSpotter. In these instances, these errors would be either gunfire that was not detected as such by ShotSpotter or ShotSpotter detecting gunfire when there was none.

- ShotSpotter guarantees an accuracy rate of 90%.
- The technology has several known limitations in detecting gunfire:
    - Gunfire sounds can be muffled by several factors, such as being inside a building, in a vehicle, or on a porch, which can lead to actual gunfire signals being misclassified as probable gunfire or “suppressed”.
    - Actual gunshots may also be categorized as "suppressed" if they fall outside of the coverage area.
    - Officers can see the geospatial locations of gunfire (via Google maps, but these are not always accurate).
    - Actual location of sound may be affected by foliage, wind/weather, and topography.
    - Officers are not aware of the land use of the location, such as whether it is a residence or a commercial building.

Cleveland Division of Police’s implementation of ShotSpotter
An important component of understanding how any technology is implemented is understanding how it is utilized. In the case of ShotSpotter, cities have varying procedures and practices regarding how and when it is used (such as prioritizing all alerts as high priority, responding only when confirmed by cameras, and evidence collection) and how it is used in conjunction with other types of law enforcement technology (such as only responding to shots fired that have been confirmed by cameras).

Implementation timeline and coverage
According to ShotSpotter, Cleveland currently has a 13-square-mile ShotSpotter coverage area. ShotSpotter was first piloted in Cleveland's Fourth District in November 2020, covering an area of three-square miles. In 2022, ShotSpotter (now SoundThinking) proposed a seven-mile expansion using the following coverage boundaries based on data provided by CDP for criminal homicide, aggravated assault, and 911 calls for shots fired from January 1, 2019, through November 8, 2021. These seven-square miles were installed in the Spring of 2023. Finally, in June 2024, three additional square miles were added. Thus, coverage areas across the city had expanded at the start of this evaluation and continued to expand in the evaluation period (Figure 3).

Figure 3. Proposed Expansion Coverage Areas, Cleveland Division of Police, May 2022



Source: SoundThinking.

According to the *Price Proposal to Expand Subscription-Based Gunshot Detection, Location, and Forensic Analysis Service for the City of Cleveland, Ohio, May 11, 2022, Proposal ID: CLEOH051122, "*ShotSpotter systems are deployed to provide coverage for one or more specified areas, each bounded by a specific coverage area perimeter. ShotSpotter will design the final coverage area based upon the Division of Police's requirements and based upon analysis of historical crime data."

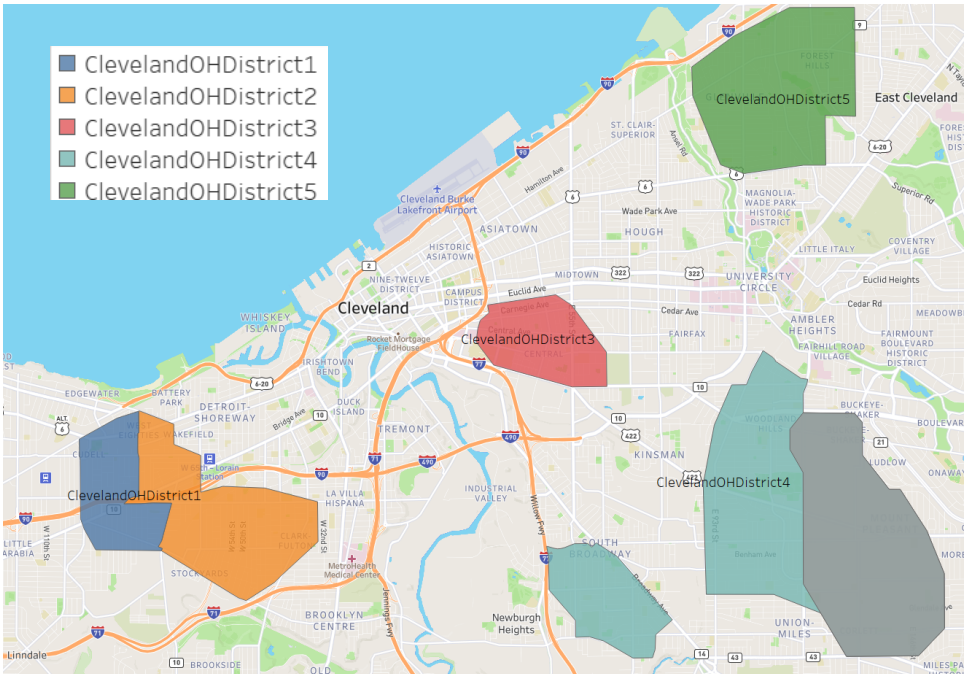
The area delineated in Figure 3, defined by a red boundary, is the City's original three-square-mile coverage area. The areas delineated by a blue boundary are rough estimates of the proposed coverage areas based on analysis of the Division of Police-provided crime data as described above. The proposal notes that "The precise size of each area (i.e., in square miles) can only be verified with actual acoustic propagation information; therefore, the final coverage area may vary. ShotSpotter will perform this verification during the installation process."

While Figure 3 indicates the coverage areas ultimately installed in 2023, in 2024, two additional coverage areas were added (one in each of the First and Second Districts). Documents provided by CDP and independently reviewed by the research team indicate that the final coverage areas represented the areas with the highest numbers of criminal homicide, aggravated assault, and 911 calls for shots fired *in each district* from January 1, 2019 through November 8, 2021, as reported by CDP. We independently reviewed crime heat maps across the city and verified that the ShotSpotter coverage areas in Cleveland represent the places in each district that experience the highest levels of violent crime.

Additionally, the research team independently canvassed these areas across the city to verify the existence of ShotSpotter sensors in those locations.

Information provided in Figure 4 and Table 3 was provided by SoundThinking to CDP and the researcher team, illustrating the physical location of coverage areas across the city by district. For reference, the total area of the city of Cleveland is 82.48 square miles. Currently, the Fourth District has the largest coverage area at 6.5 square miles. The Fifth District has a coverage area of 2.5 square miles. The First and Third Districts each have a coverage area of one square mile, and the Second District has a coverage area of two square miles.

Figure 4. Current ShotSpotter Coverage Area, Cleveland Division of Police Current ShotSpotter Coverage Area, Cleveland Division of Police



Source. SoundThinking. *Note.* The grey area, not indicated in the legend, was the original (and still currently active) three-square-mile coverage area in the Fourth District.

Table 3. Details on the ShotSpotter Expansion, Cleveland

District	Date activated	Area (sq mi)
4	11/3/20	3
5	4/10/23	2.5
3	4/24/23	1
4	5/31/23	1.83
4	6/30/23	0.67
1	5/15/24	1
2	5/15/24	2

Source. SoundThinking

Based on our conversations with CDP leadership and our review of the General Police Order (GPO) 5.08.04 (4/5/2023), below is our understanding of how CDP immediately responds to ShotSpotter alerts in a typical scenario:

- ShotSpotter notifies the agency of gunfire or probable gunfire. The alert is received simultaneously by police Dispatch, all active patrol officers in the district in which the alert was identified, and the Cleveland Police's Real Time Crime Center (RTCC)

- Patrol officers are notified via the ShotSpotter interface, which is accessible on a computer terminal or an officer's mobile device. Each officer has an individual account with a password-protected login to this interface. "Probable gunshots" are distinguished from "gunshots" on the interface.

- Dispatch is instructed to categorize all ShotSpotter alerts as Level 1 (Priority 1) and assign officers to these events accordingly. Level 1 events are the most urgent and take precedence over calls considered Levels 2 or 3.

- Upon dispatch, an individual CAD (Computer Aided Dispatch) record is automatically created to identify the call for service. The ShotSpotter alert is attached to it so that police can later identify which calls for service were initiated by a ShotSpotter alert. Police can analyze these data or follow up on specific ShotSpotter calls.

- The ShotSpotter electronic interface provides officers with location information (address), an aerial "dot" representing the gunshot(s) on a map, an audio snippet, and details such as the number of shots fired, whether multiple shooters are involved, and whether high-capacity and/or fully automatic weapons are being used. The interface also

provides officers with a link to Google Maps, allowing officers a street view of the scene. Officers have been instructed to respond to the dot rather than the address for best accuracy.

- Officers are instructed to listen to the audio snippet and review the information provided by ShotSpotter (e.g., type of weapon, number of shooters) before or while responding to the alert, in case it informs tactical decisions upon their arrival to the location.

- Based on the information from the ShotSpotter alert, staff in the Real Time Crime Center can employ other technologies such as city-owned video cameras (if there are any in the vicinity of the alert) and communicate any additional information they obtain to dispatch and the responding officers.

- Upon arrival, officers are instructed to, within a physical radius around the "dot," identify potential victims, offenders, witnesses, and physical evidence.

- Finally, officers are instructed to conduct a "community canvass" of the surrounding area. The GPO defines a community canvass as follows: "Members shall attempt to contact residents of at least six addresses nearest the ShotSpotter alert" to "advise the resident police are investigating a ShotSpotter alert, inquire about any injuries or damage due to the gunfire, inquire about suspect information and provide the resident with a Gunfire Incident door hanger." The door hanger (Figure 7) alerts residents that officers were responding to a ShotSpotter alert and provides a number for Crime Stoppers in case the resident would like to offer any further information about the gunfire.

Below we detail key processes after an officer responds to a ShotSpotter alert:

- If, after following the steps above, the officer has not discovered any information related to the gunfire alert, the call for service is complete, and the record (CAD) associated with this call for service is closed and logged.
- If an officer discovers a crime in progress, a criminal offender (regardless of whether or not an arrest is ultimately made), or a victim of a crime, police handle the situation accordingly. In most of these cases, officers must generate a police report. Police reports are stored in a computerized record management system (RMS). When a police report is filed in RMS, it receives an RMS identification number (called a case number in CDP's electronic management system).
- If an officer speaks with a potential witness to the gunfire, this information would most likely be documented in the offense report.
- If an officer recovers physical evidence, they must record information about it. But, this information is not necessarily recorded in both the offense report and SoundThinking's Ground Truth Tracker (the company's data entry component).

Figures 5 and 6 are photographs of ShotSpotter Screeners. Figure 7 is a photograph of the doorhangers. Figures 8 and 9 are screenshots of ShotSpotter's interfaces from CDP's 1st District.

Figure 5. Photo of a ShotSpotter Screener, Cleveland, 2025

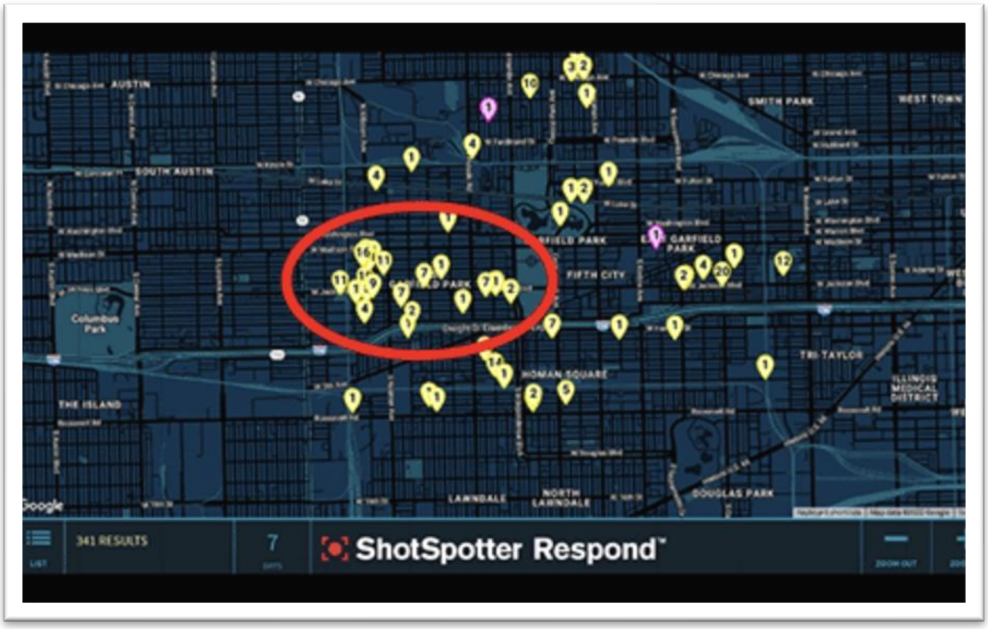
Photo Credit. Fiona G. Kosarko

Figure 6. Additional Photo of a ShotSpotter Screener, Cleveland, 2025.

Photo Credit. Penelope A. Kosarko

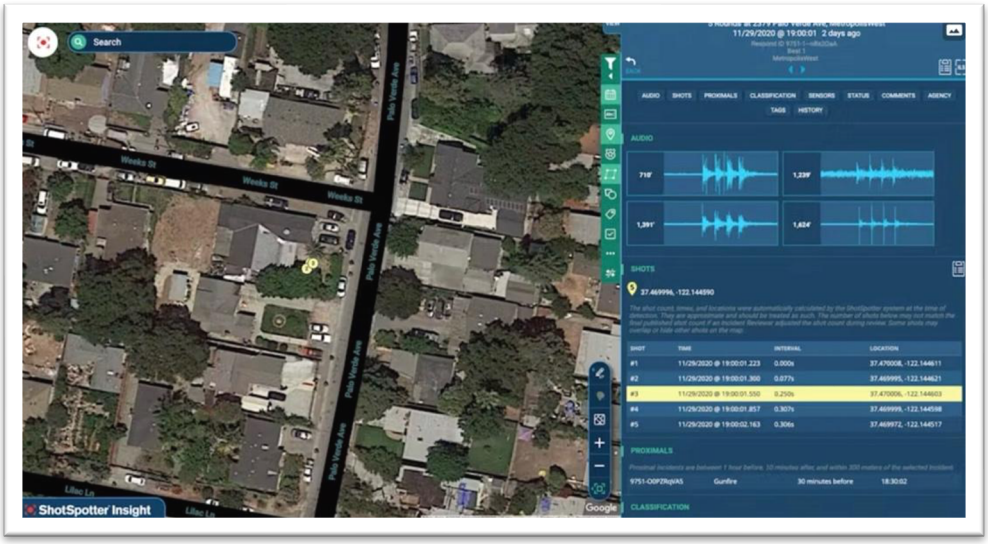
Figure 7. Image of the Cleveland Division of Police's ShotSpotter Doorhangers

Figure 8. Example Screenshot of ShotSpotter Respond



Source. SoundThinking

Figure 9. Example Screenshot of ShotSpotter Insight



Source. SoundThinking

An important note that was frequently mentioned as part of this evaluation is that discharging a firearm is lawful within the City of Cleveland, except in prohibited areas such as cemeteries, near schools, churches, or inhabited dwellings, on public roads, or within certain distances of parks or recreation centers, unless specific exceptions apply, such as self-defense or acting within the scope of law enforcement or security duties (§ 627.09 Improperly Discharging a Firearm on or near Prohibited Premises) (City of Cleveland, 2015). This affects CDP's implementation of ShotSpotter in that not all responses to gunfire are unlawful, and unless there are cameras to verify, it is often difficult to determine the direction of the discharge.

Method 2: Survey of CDP Officers

From December 2024 to February 2025, we administered an online survey about ShotSpotter to CDP police officers. To assess Goal 1, we included general questions that gauged officers' overall opinions of the ShotSpotter technology.

To determine how officers use ShotSpotter, we used items included in the published General Police Order (GPO) 5.08.04 (04/05/2023) to create questionnaire items.[1] This document outlines the steps to be followed by CDP members based on their role. Thus, we developed distinct sets of questions pertaining to each role, as defined in the GPO. Officer survey respondents were sorted into these subsets of questions based on their self-identification in these roles. That is, while the GPO states that all members of the Division must follow general guidelines in their use of ShotSpotter, there are additional policies that must be followed by certain members of the Division depending on their role (e.g., crime analysts have specific duties the use of ShotSpotter that are unique to them, command staff have a different set of duties, etc.)

A total of 187 officers completed the officer survey. The survey included several skip patterns, so that if a respondent answered, for example, "no" to a question, they would not see specific subsequent questions (e.g., passively skipped). These have been labeled as missing. The percentages below represent non-missing data. *Below we present the results of the survey.*

Officer's General Feedback on ShotSpotter
We asked all officer respondents an open-ended question about whether they had any additional feedback or suggestions for us to consider in our evaluation. We received a strong response rate to this question.

[1] The CDP's GPO related to ShotSpotter was recently revised, as of 07/17/25, replacing the GPO that was assessed in this evaluation. Source: https://www.clevelandohio.gov/sites/clevelandohio/files/Public%20Safety/Police/5.08.04%20Gunshot%20Detection%20System%20-%20Shotspotter.pdf

From this item, we identified a wide range of insights and viewpoints from law enforcement professionals. Here are some main themes and responses derived from their feedback:

1. Need for More Coverage

Many respondents suggest expanding ShotSpotter systems throughout the city, emphasizing areas with high gun violence but currently lacking coverage.

> There are some areas where ShotSpotter is needed and somehow is not installed, even though gun violence is prevalent in these areas—for example, Garden Valley in the Fourth District. There have been times where I have heard gunfire in the direction of Garden Valley, but since no ShotSpotter is installed, I have no exact area to patrol or proof that it came from there.

Another officer mentioned this as well, especially as it relates to the use of other technologies: "More coverage with more camera coverage would be beneficial. Quicker NIBIN responses would be helpful."

2. Financial Concerns

There is significant discussion about the cost of ShotSpotter relative to its effectiveness. Several respondents argue that funds could be better spent on improving working conditions, equipment, and other technologies, such as the Real-Time Crime Center (RTCC) and Flock cameras.

Several mentioned that they could not determine whether it was "worth" it because they did not know what it cost. While another officer said:

> ShotSpotter is a valuable tool, however the estimated cost of it compared to what else could be utilized by the division is not worth it. We need police cars to respond to calls. A study should be done on the condition of police vehicles and the maintenance behind it. The division should prioritize on getting safer vehicles for officers and a new system to keep new, safe vehicles maintained at the districts. ShotSpotter is ultimately a novelty-like gimmick.

3. Effectiveness of the Technology

While some officers view ShotSpotter as a valuable tool—especially for tracing shell casings and corroborating incidents—others argue that it does not effectively reduce gun violence or assist in solving crimes.

Many feel that it does not provide much more than data on the number of shots fired. One respondent said:

> ShotSpotter is a helpful tool in building criminal cases. It is an unbiased way to document areas and addresses that are problems. Another unsung hero of ShotSpotter is the ability to notate "Full-auto" shootings, which are prioritized for investigations due to the higher threat level to the community.

Another said:

> It is a great tool for officers on the ground to get a better sense of what is going on at a shooting before we arrive that improves officer and citizen safety, the GPO might need some work door hangers and knocking on doors for every shot spotter is not always feasible.

And another respondent had mixed feedback on its effectiveness:

> The technology doesn't deter gun crime, it just aids in investigating whether on patrol or in a detective bureau. It also adds a level of legitimacy to a shots fired call. I have also found that the location of the gunshot or the "dot" tends to be somewhat inaccurate, sometimes by up to 50 yards.

4. Legal Issues

In jurisdictions like Cleveland, where discharging firearms on personal property is legal, several officers mentioned that the effectiveness of ShotSpotter as a tool for law enforcement is diminished. Responses emphasize the complications this creates for policing. As one respondent stated:

> There needs to be a way to document non-crime shot spotter alerts compared to crime-related shot spotter alerts. Responding to an alert for someone legally shooting in their backyard takes resources away from the community and negatively impacts the relationships with police and the community.

5. Operational Strain

Many officers mentioned the added strain that ShotSpotter places on already stretched law enforcement resources, with some suggesting that calls generated from ShotSpotter alerts can divert attention from higher-priority calls. One responded this way:

> I believe ShotSpotter to be an excellent tool for municipalities to utilize. However, if we're going to prioritize ShotSpotter alerts as the highest priority, we must have the manpower to support it. In smaller cities where the calls for service aren't so high, ShotSpotter is fantastic because there are officers to send.

6. Response Protocol

Some officers propose adjusting the priority of ShotSpotter calls to better align with real-time crime data, suggesting that these alerts should not always be assigned the highest response priority.

As ShotSpotter calls are generally the highest priority calls, one respondent summarized CDP's implementation of ShotSpotter this way:

> ShotSpotter is a good tool; however, it has increased the number of priority calls. We have less officers to respond to the calls. ShotSpotter should not be a code 1. It should only be a code 1 if it is followed up with a citizen calling. Otherwise it should be a code 3 that we get to when we can. It is inconceivable to think that a citizen calling for help as a victim of a violent felony would have to wait, because a single shot fired that shot spotter picked up in a higher priority. In the City of Cleveland it is not illegal to shoot a gun off on your own property so why would it be a code 1? Responding to a citizen in need of police should always come first. The volume of ShotSpotters in the area I work has watered down the response from the officers. It has increased the amount of code 1 assignments on average by 25% maybe more on some days.

7. Technology Limitations

Several comments highlight limitations in ShotSpotter's accuracy, such as misidentifying sounds (e.g., fireworks vs. gunfire) and sometimes providing incorrect locations.

> There have been multiple inaccurate calls for ShotSpotter that I have relayed to the company and CPD supervision that have never been followed up on. There are dead zones and echo areas that cause issues with ShotSpotter that have been dismissed. On 3 (or more) occasions, I have reviewed cameras in areas that ShotSpotter called for shots and notified them, by phone, that their locations were bad and they would make a new spot, but it was also wrong. I have run into too many inaccurate "spots" for me to believe this is an accurate and useful tool. I can only say that it "helps" but with all the inaccuracies it's not relied on as a useful tool.

8. Need for Training and Resources

Feedback indicates a need for more training on using ShotSpotter effectively and better integration with existing technology like NIBIN to enhance its utility. As indicated in the other survey responses, some of the other features in ShotSpotter are not frequently used due to constraints on officers' time. One respondent summarized it this way,

> Unable to use a lot of features due to lack of training, support/encouragement from leadership and old technological equipment. Officers would use those features more if they received more support from leadership and had equipment that could handle it.

Another respondent said:

> Whoever at ShotSpotter determines if it's gunfire or not cannot tell the difference between fireworks and gun fire. They need training in what gunfire sounds like compared to fireworks.

Many others mentioned ShotSpotter's usefulness when used in connection with other types of technology like ballistics (NIBIN).

> . . . Shot Spotter is one of the most valuable tools we have . . . giving us valuable information through NIBIN and allowing us to map out where the gunfire is continually occurring. Without ShotSpotter, we would lose that ability because sadly, many citizens do not call in to report shots fired any longer. ShotSpotter has been a valuable instrument used in my investigations and it would be a great loss if it were no longer available to us.

> ShotSpotter assists officer and detectives the ability to find casings we traditionally would not be able to locate without this data. Shell casings are a huge part of a criminal investigation, and with NIBIN, they can link trigger-pullers to other shooting incidents and articulate the "life" of a firearm. ShotSpotter audio also allows us to hear when a firearm is firing Fully automatic, which are guns we prioritize. Again, without ShotSpotter, we would not have this data to work with.

> ShotSpotter technology only works with all the appropriate systems in place and working effectively like NIBIN, follow up and information sharing. None of that happens here in the Division of Police. It is all piecemeal and places an undue burden on our patrol section, which is severely understaffed. I believe it is an ineffective tool in the city of Cleveland.

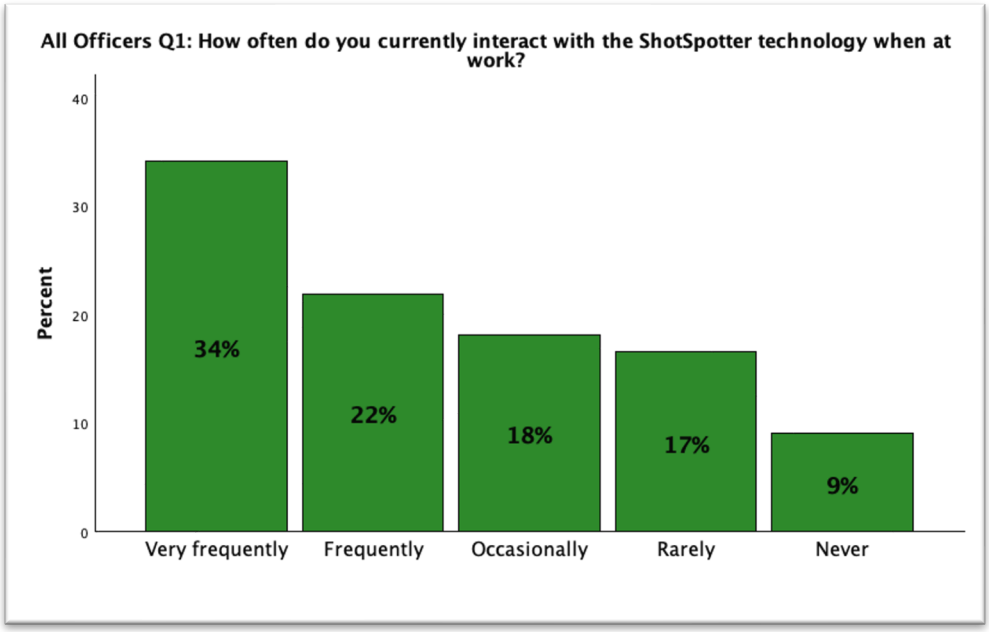
9. Overall Value Assessment

There is a division of opinion on the overall value of ShotSpotter. Some officers find it indispensable, while others deem it a "waste of money," arguing for reallocation of resources to other, more impactful crime-fighting technologies. One respondent summarized like this,

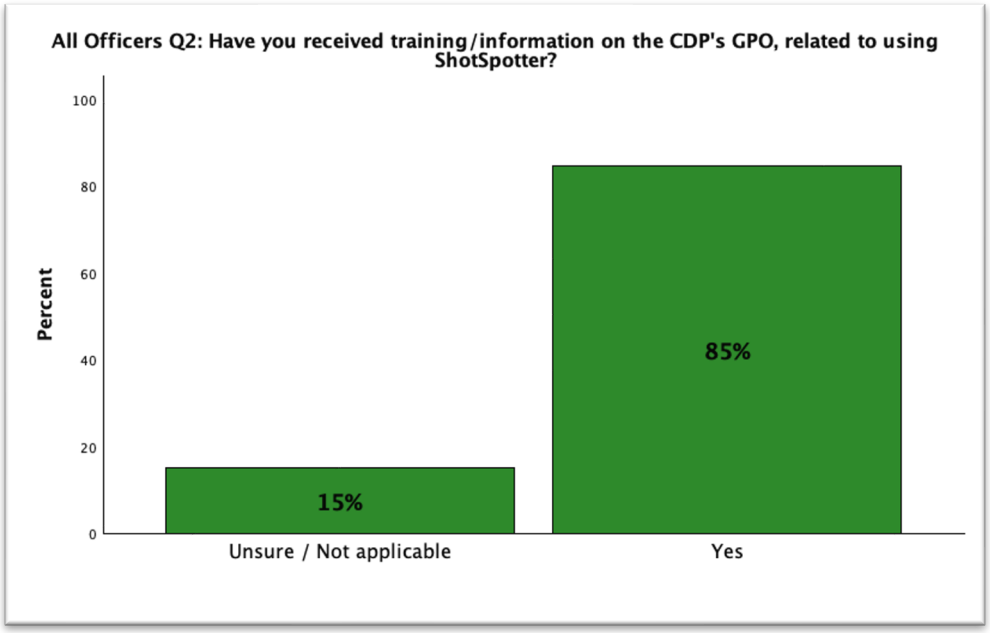
> While ShotSpotter has corroborated in-progress shootings, those incidents (from my perspective) are so far and few between, and those are also calls where there are multiple citizen calls as well so CDP would still respond accordingly. For the price tag ShotSpotter comes with, I think other brands like Flock Safety's Raven (which can be combined with LPR [license plate reader] technology and real time video clips from their cameras) would be more worth the investment and it would probably be cheaper even with all the additional features combined. It is helpful when officers can locate casings to put them into the NIBIN database, but I personally think ShotSpotter is more buck than bang.

Officer Survey Responses

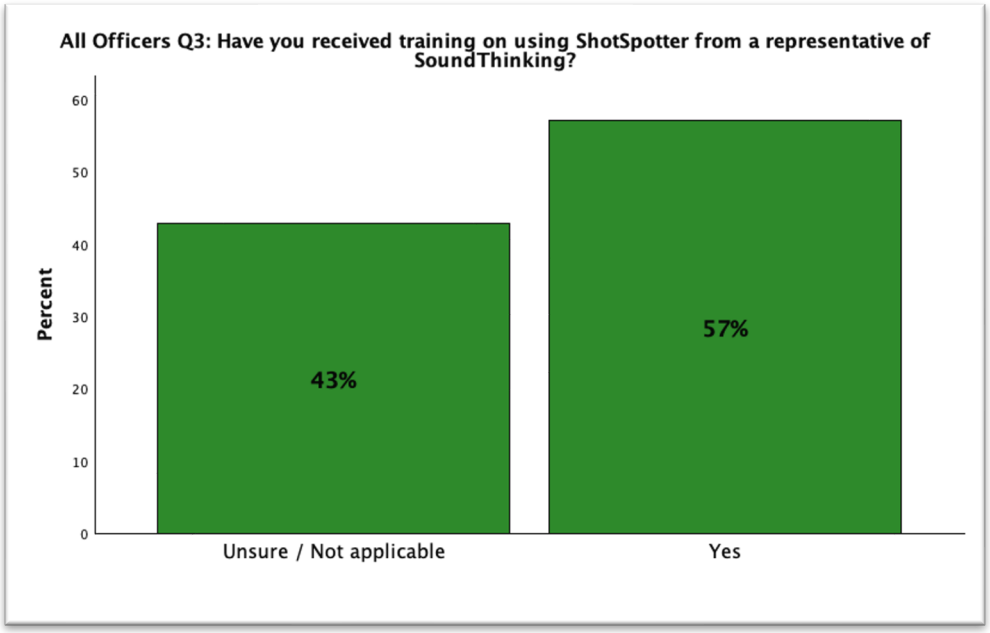
A majority of respondents reported interacting with ShotSpotter technology very frequently or frequently. This suggests that those who completed the survey were knowledgeable about ShotSpotter, at least according to their self-reported knowledge.



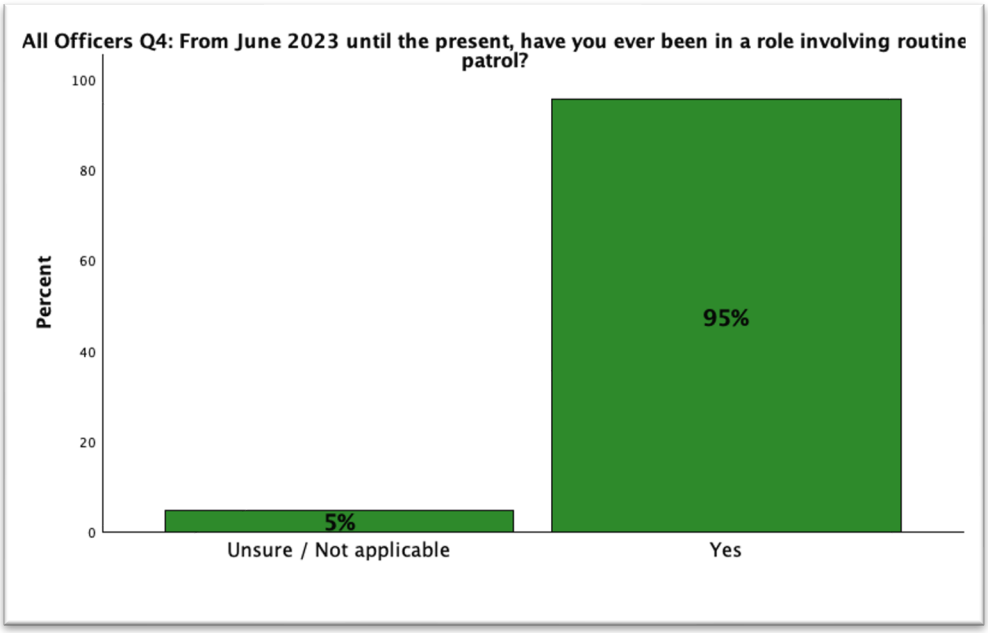
The overwhelming majority of respondents also received training on CDP's General Police Order (GPO) related to using ShotSpotter.



Over half of the respondents reported receiving training on ShotSpotter from a representative of SoundThinking.

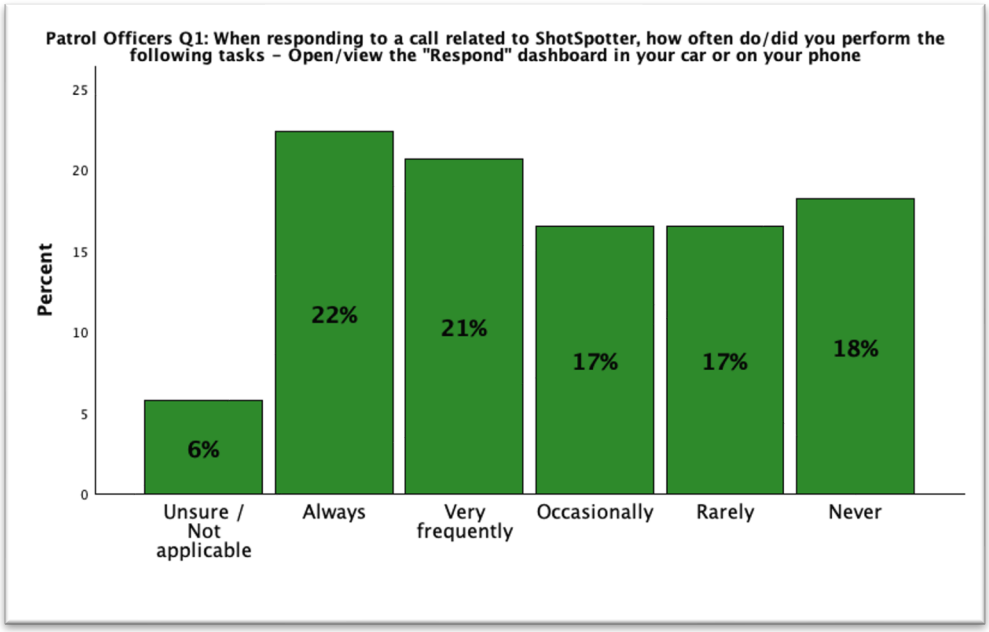


Of the respondents, 126 (95%) said that from June 2023 (the approximate ShotSpotter expansion date) to the present, they had been in a role involving routine patrol. Another 6 (5%) respondents answered unsure/not applicable.

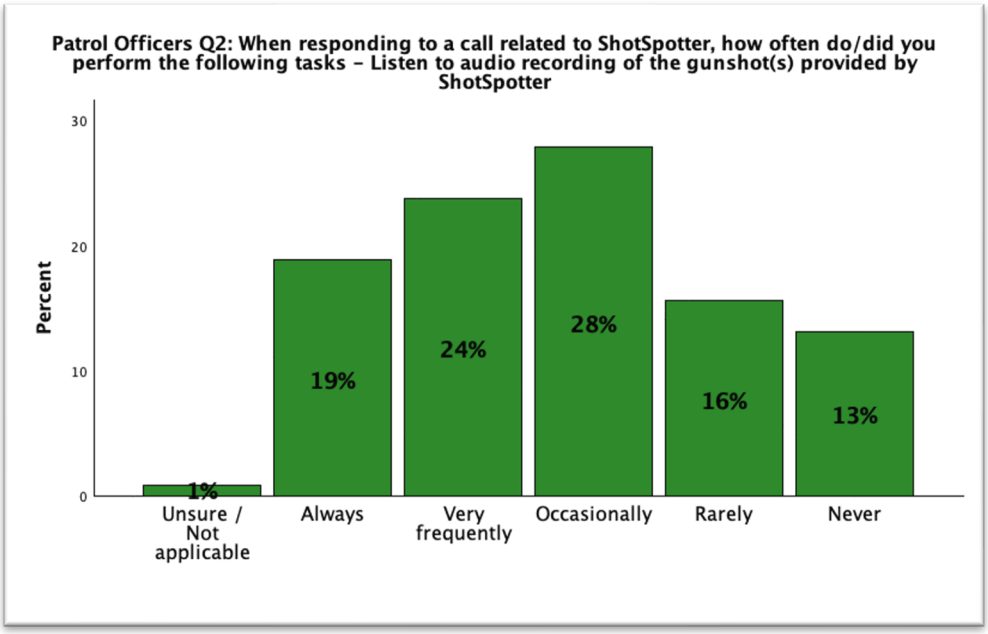


Next, we asked those who had the most contact with the implementation of the ShotSpotter technology—those who had worked as patrol officers since June 2023—a series of questions pertaining to technology, derived from CDP's GPO. For reference, we have provided a screenshot of this interface in Figure 8.

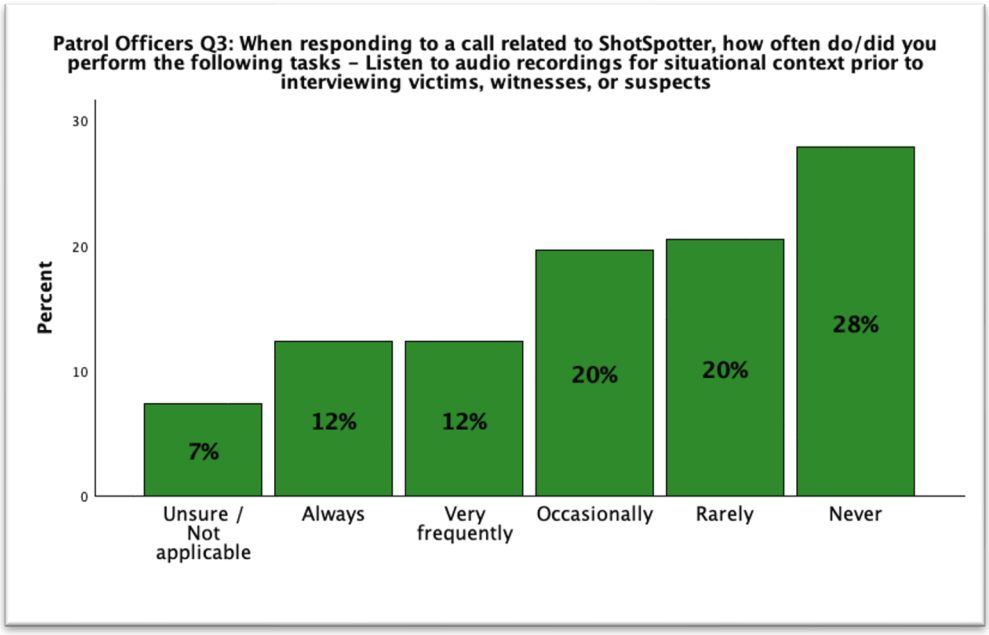
Almost half (43%) said they always or very frequently opened or viewed the ShotSpotter "Respond" dashboard in their car or on their phone (Figure 8).



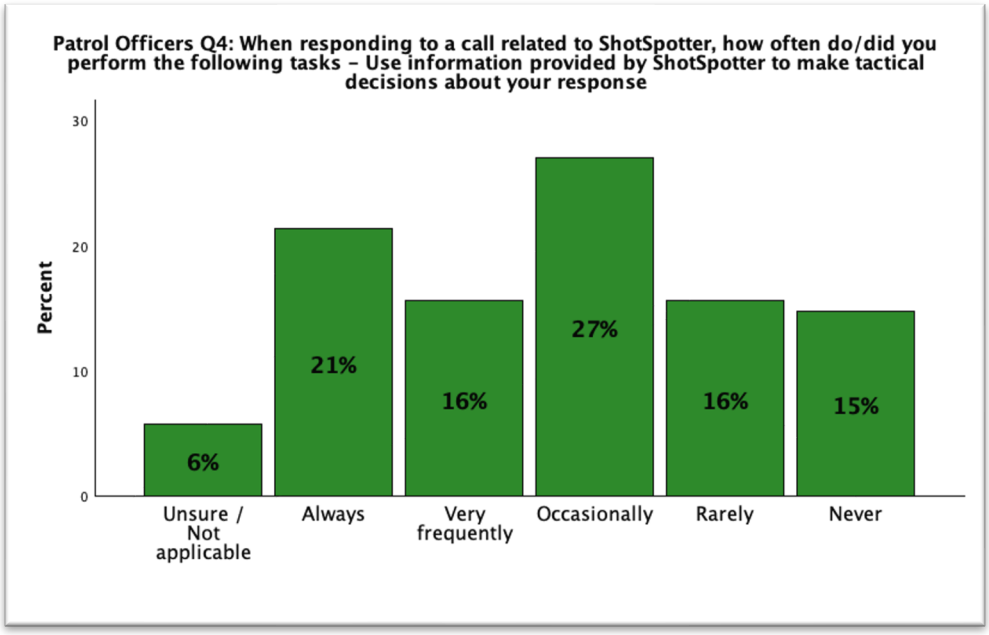
Almost half (43%) also said they always or very frequently listened to the audio recording of the gunshot provided by ShotSpotter, which includes information on the number of rounds and the number and type of weapons at the scene.



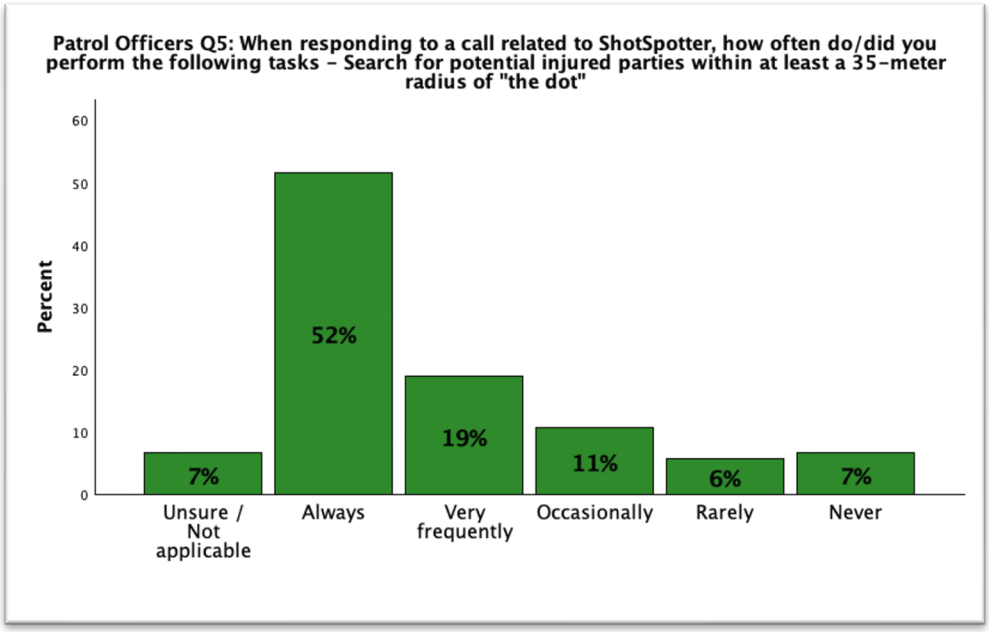
About a quarter (24%) said they always or very frequently listen to audio recordings for situational context before interviewing victims, witnesses, or suspects. However, an additional 20% said they occasionally listen to this audio, while nearly half rarely or never did.



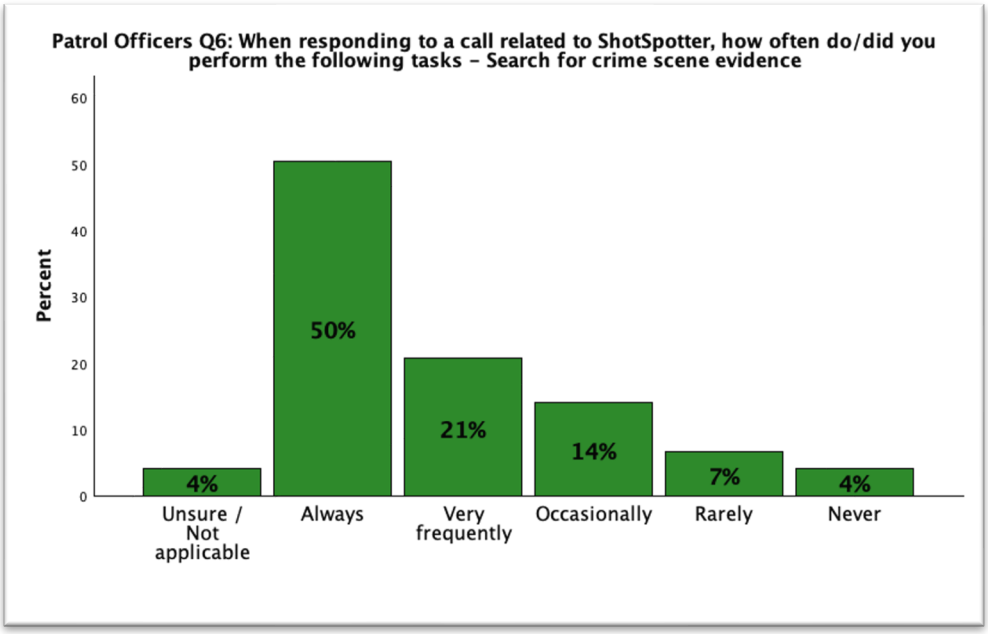
More than a third (37%) said they always or very frequently use information provided by ShotSpotter to make tactical decisions in their response. Moreover, an additional 27% said they occasionally do this.



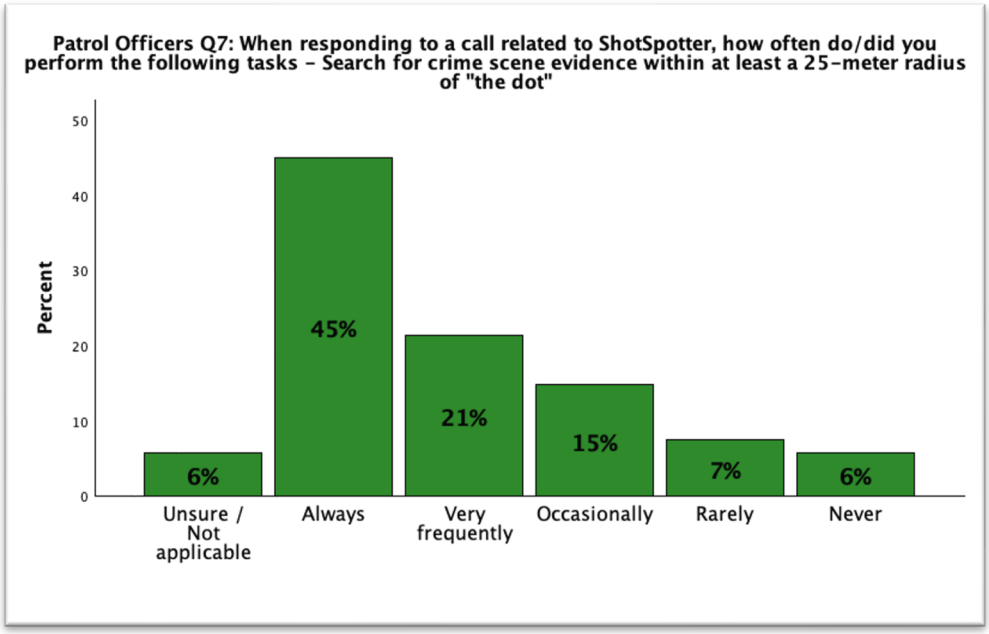
Over 7 in 10 (71%) said they always or very frequently searched for injured parties within at least a 35-meter radius of “the dot” (the location of the gunshot according to the ShotSpotter alert). An additional 11% said they occasionally did so. Only 6% (n = 7) said they rarely did, and 7% (n = 8) said they never did.



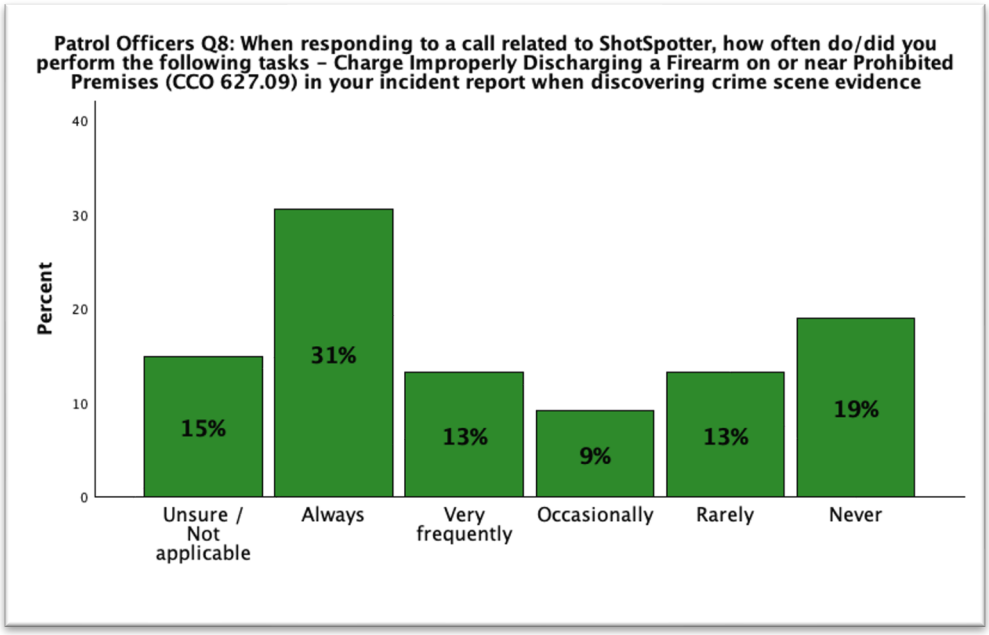
Over 7 in 10 (71%) reported searching for crime scene evidence always or very frequently. An additional 14% said they occasionally did so. Only 7% (n = 8) said they rarely did, and 4% (n = 5) said they never did.



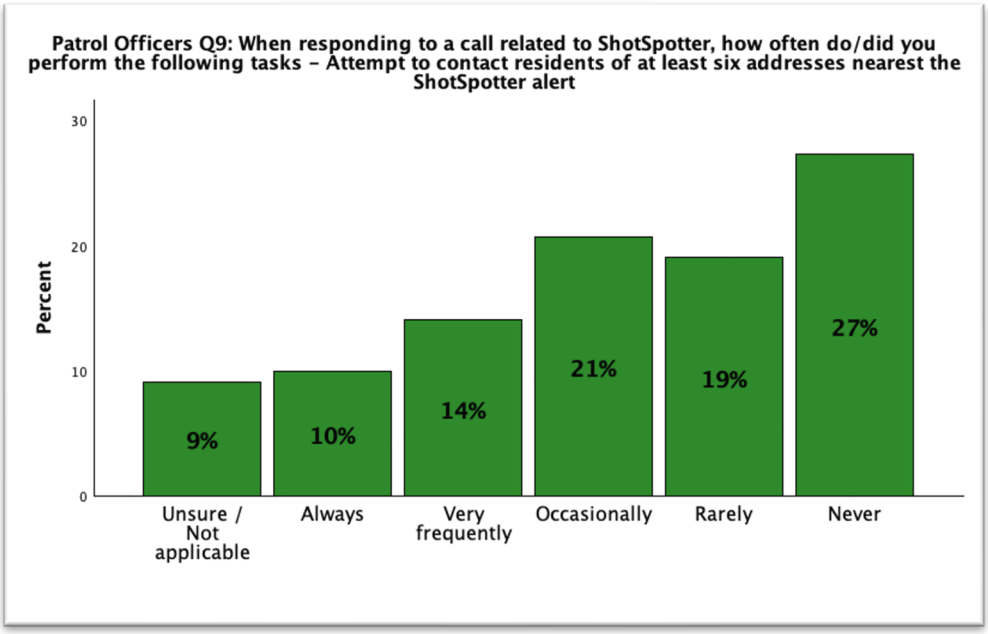
Almost 7 in 10 (66%) reported always or very frequently searching for crime scene evidence specifically within at least a 25-meter radius of "the dot." An additional 15% said they occasionally did so. Only 7% (n = 9) said they rarely did, and 6% (n = 7) said they never did.



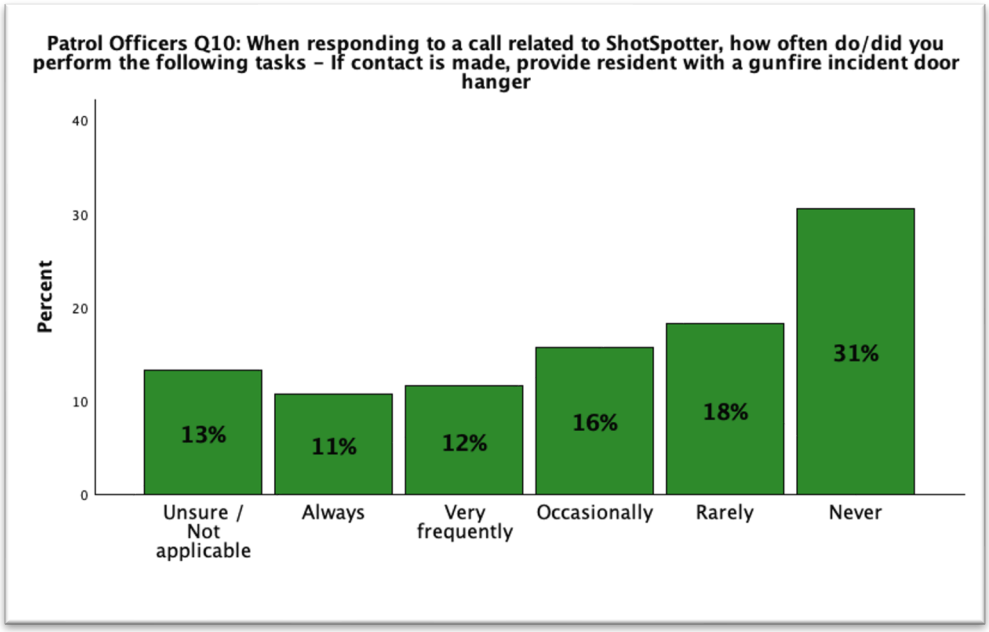
Over 4 in 10 (44%) reported always or very frequently charging Improperly Discharging a Firearm on or near Prohibited Presence in the incident report when discovering crime scene evidence. An additional 19% said they never did.



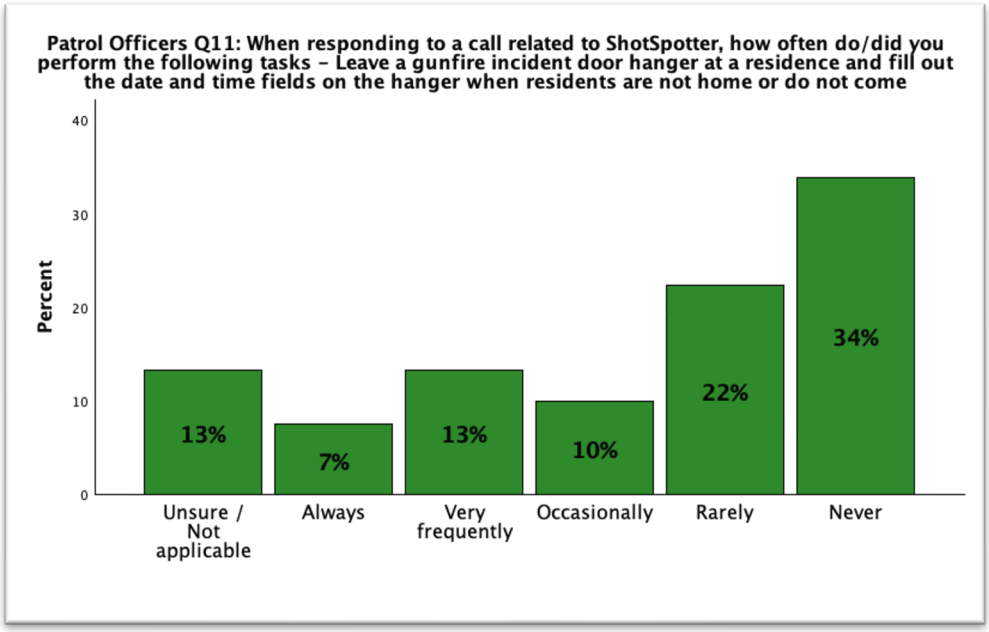
Attempting to contact residents was less commonly reported by patrol officers—10% said they always contacted at least six addresses near the ShotSpotter alert, and another 14% said they very frequently did so. In comparison, 19% rarely did, and 27% reported never doing so.



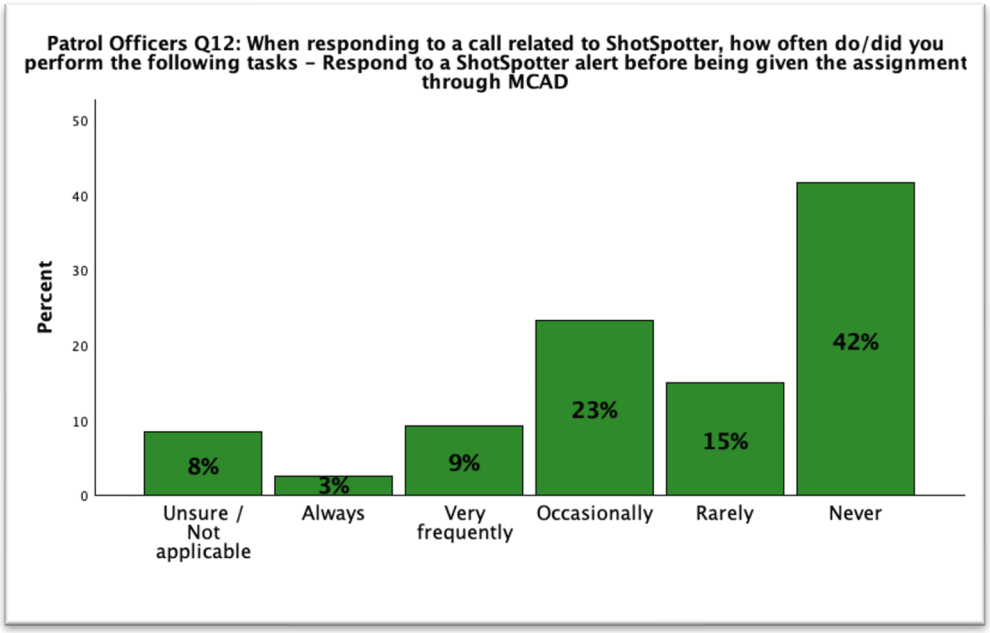
Providing residents with an incident door hanger when contact was made was also not commonly reported - 11% said they always did this. Another 12% reported very frequently doing this, while 19% rarely did, and 31% reported never doing so. Additionally, 13% answered unsure/no answer to this question.



Leaving a gunfire incident door hanger at a residence with the date and time fields filled in when residents were not home was also not commonly reported—7% said they always did this, and another 13% reported very frequently doing this, 22% rarely did, and 34% reported never doing so. Additionally, 13% answered unsure/no answer to this question.



Most patrol officers reported rarely (15%) or never (42%) responding to a ShotSpotter alert before being given the assignment through MCAD (Mobile Computer Aided Dispatch).

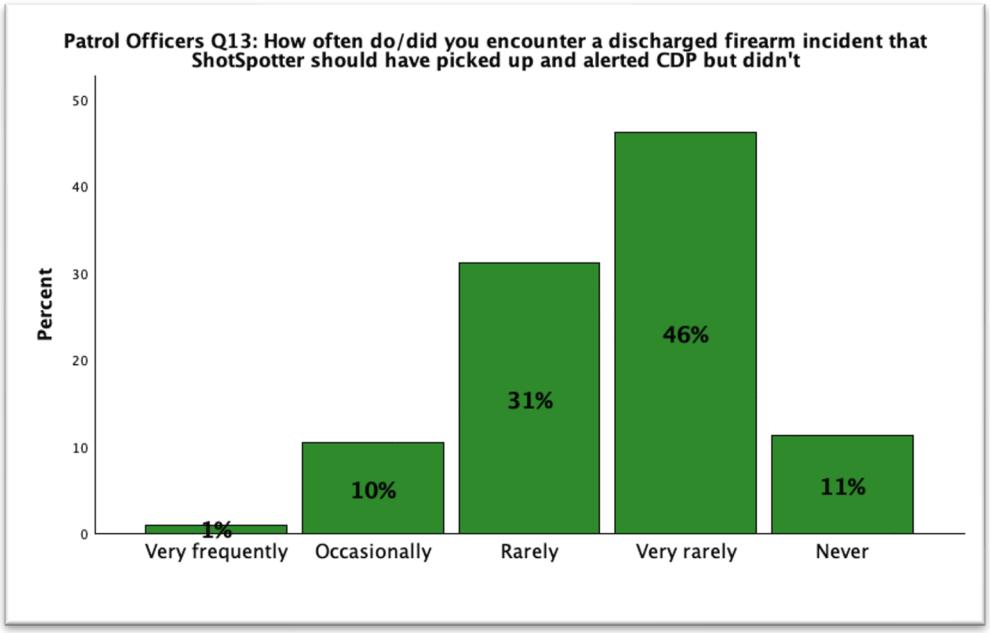


We asked those serving as supervisors to briefly describe the process for ensuring that reports created from evidence collected in a ShotSpotter alert are routed to the District Detective Unit for review.

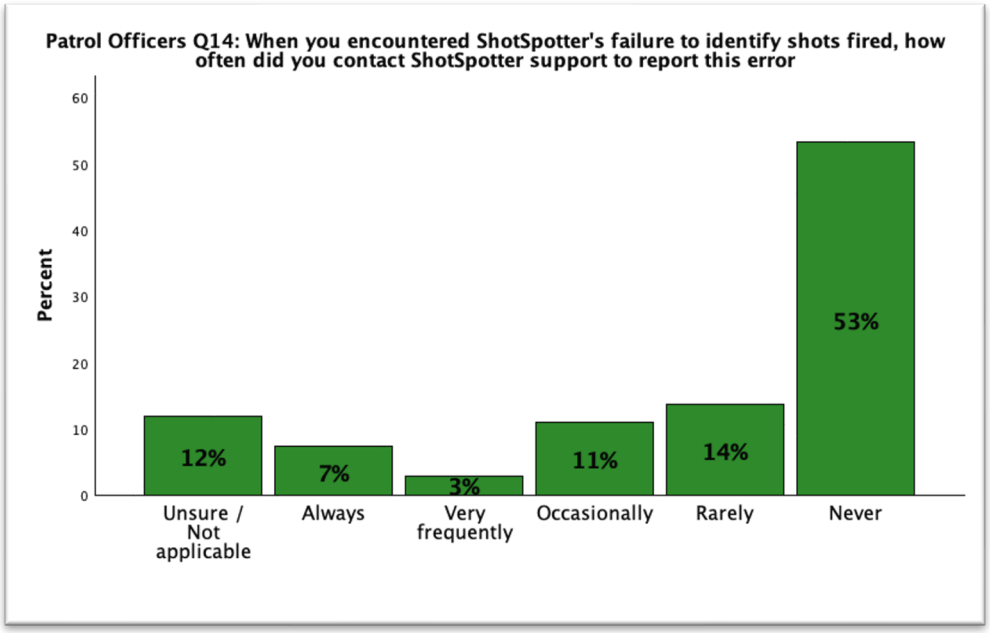
- Most supervisors would not respond to this open-ended prompt.
- For those who did, there were variations in how they said they documented dispositions via MCAD and inconsistencies with ShotSpotter.
- Regarding inconsistencies, many respondents indicated that they would ask their officers to report any known errors to ShotSpotter.
- Regarding dispositions via MCAD, a few supervisors reported that they reviewed reports, but with varying processes and results. One described it like this: “All officers are required to complete MCAD, and Sergeants check this regularly when able to,” And another like this: “I would check MCAD occasionally, as most of the dispositions were always the same: GOA. UTL.” (Gone on Arrival. Unable to locate.)

We also asked supervisors to briefly describe the process for assisting the Communications Control Section (CCS) and patrol in prioritizing calls for service, including ShotSpotter alerts, when call volumes are high.

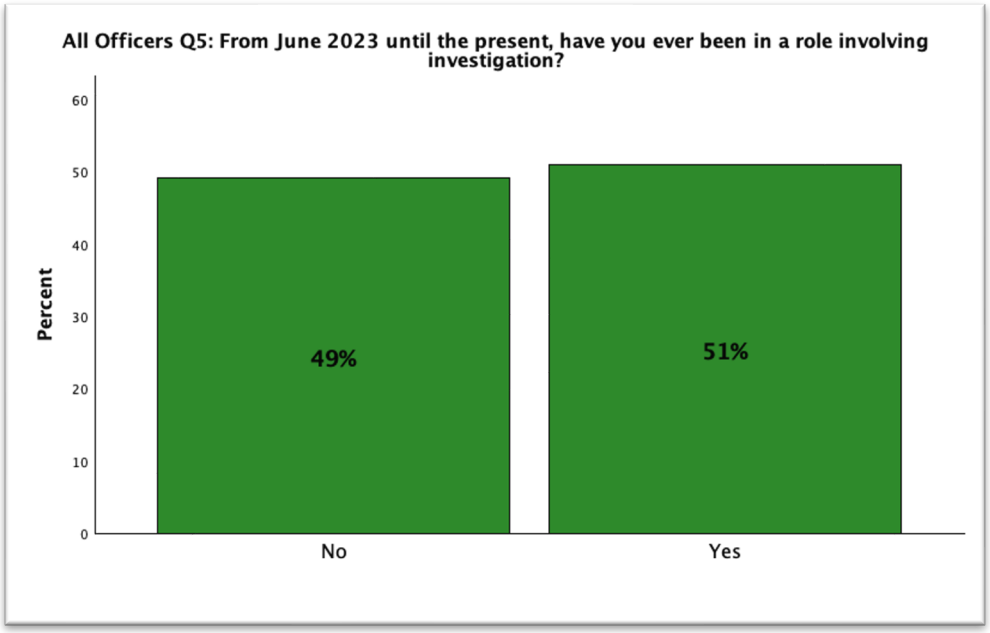
The majority of patrol officers reported that they very rarely (46%) or never (11%) encountered a discharged firearm incident that ShotSpotter should have picked up and alerted CDP, but did not.



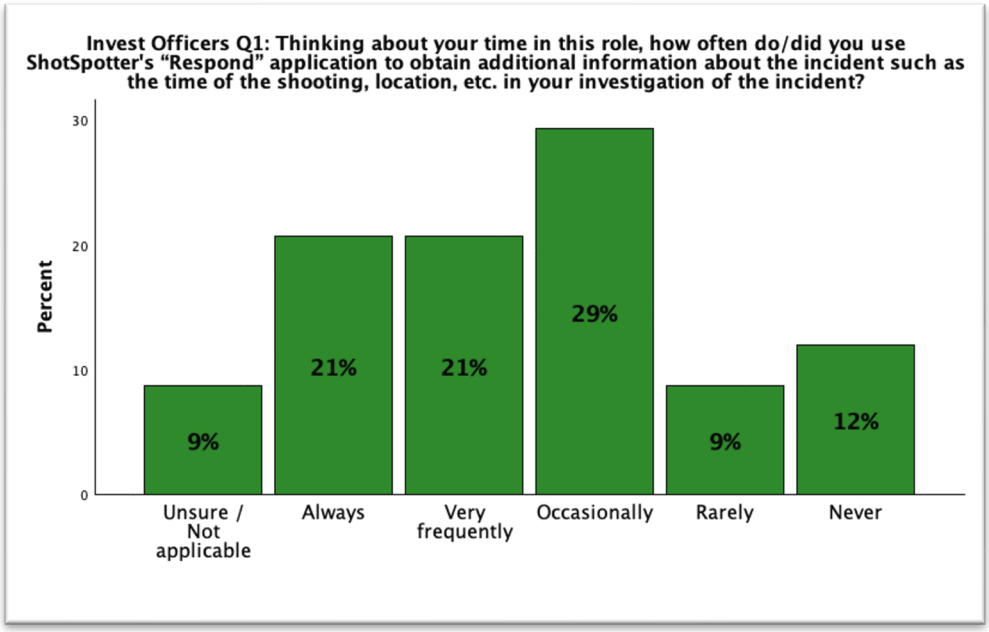
When an error was identified, the majority of patrol officers reported that they very rarely (14%) or never (53%) contacted ShotSpotter support to report this error.



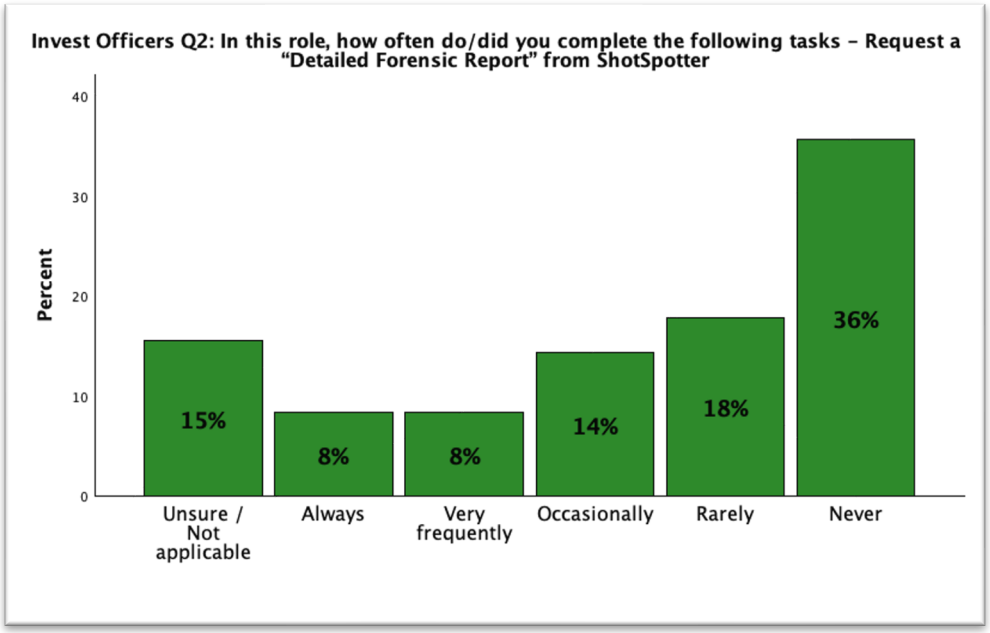
Of the respondents, 83 (51%) said that from June 2023 until the present (the approximate ShotSpotter expansion date), they had been in a role involving investigation.



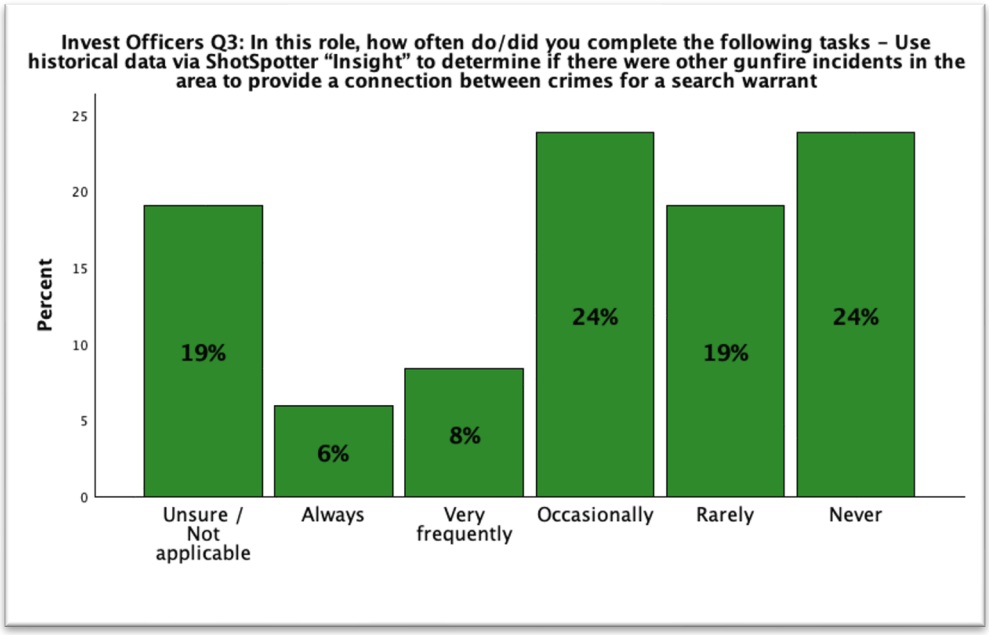
Next, we asked those who had investigative contact with ShotSpotter questions about how they used the technology. Almost half (42%) said they always or very frequently used the "respond" application to obtain additional information about the incident. Another 29% said they occasionally did.



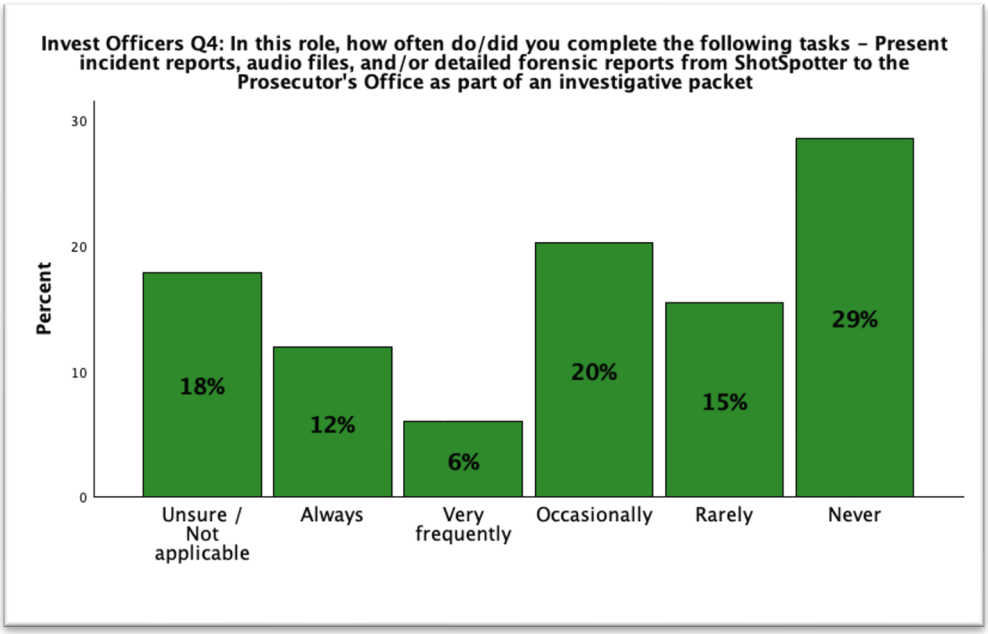
However, most investigators did not request a “detailed forensic report” from ShotSpotter (36% said never, 18% said rarely).



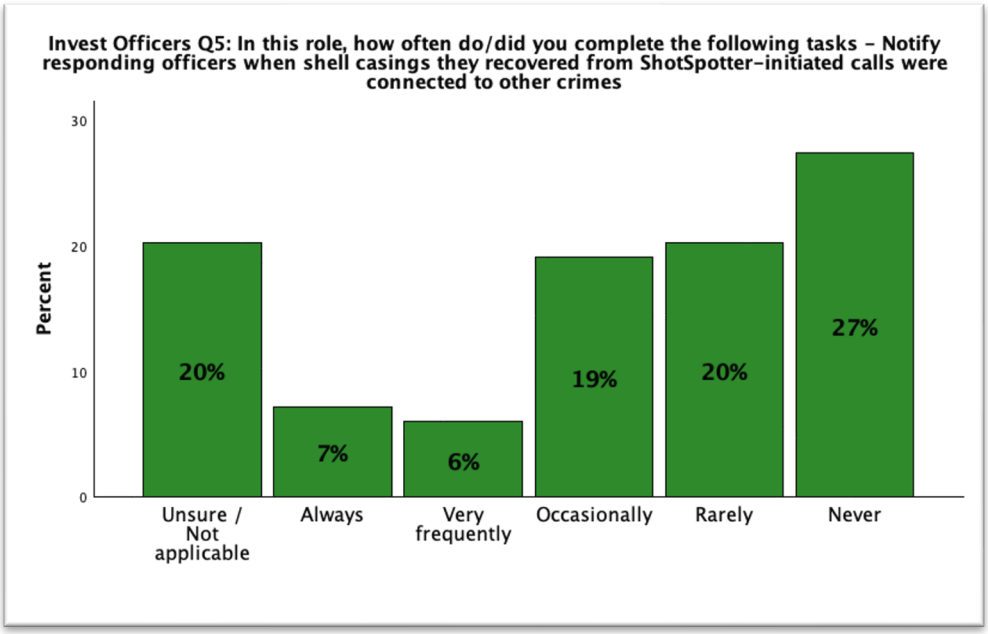
Investigators also did not report using historical data via ShotSpotter's "Insight" to determine if there were firearm incidents in the area to provide connections between crimes for a search warrant (24% never, 19% rarely, 24% occasionally).



Investigators also did not report frequently present incident reports, audio files, and/or detailed forensic reports from ShotSpotter to the Prosecutor's Office as part of an investigative packet. (29% never, 15% rarely, 20% occasionally).



Investigators did not frequently report notifying responding offices when shell casings were recovered from ShotSpotter-initiated calls that were connected to other crimes (27% never, 20% rarely, 19% occasionally).



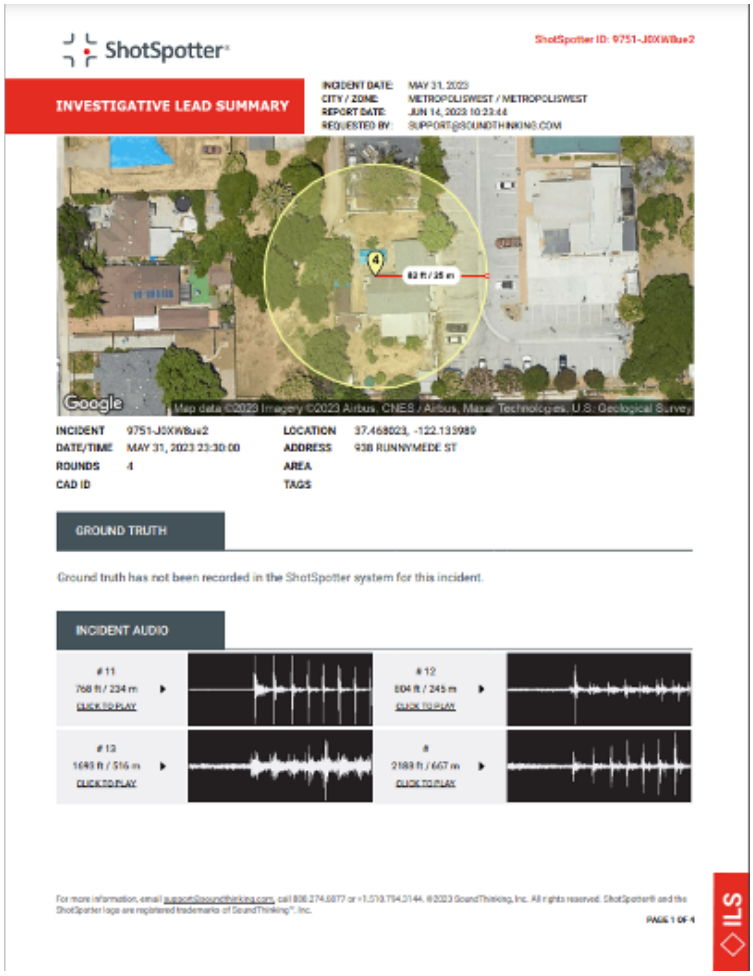
In an open-ended question to those serving in a detective/investigative role, we asked them about ShotSpotter's Investigative Lead Summary (see Figure 10 as an example).

Although there is a wide range of roles that fall under the umbrella of "detective,"

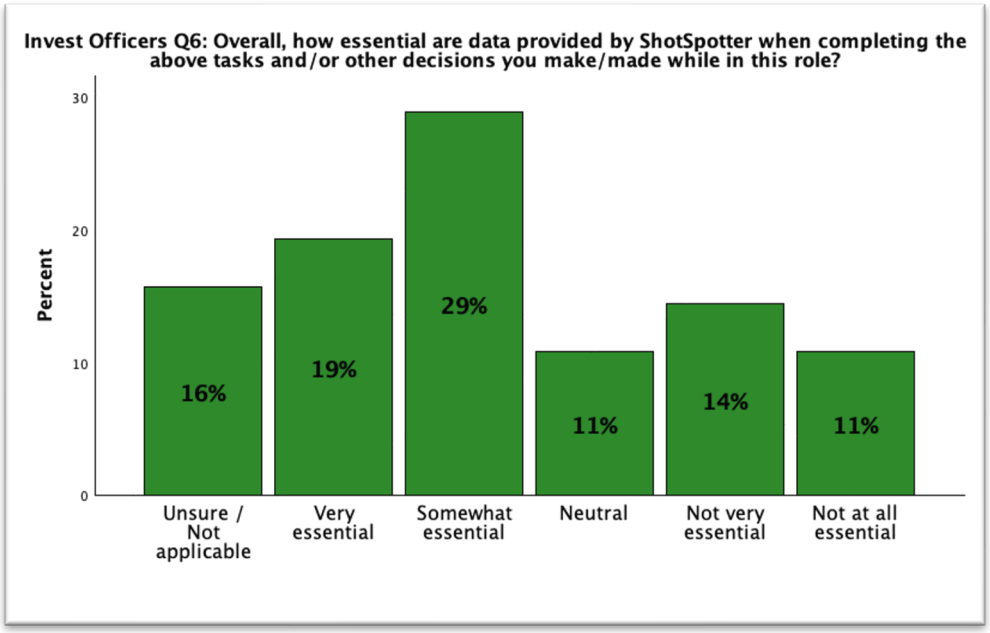
- The majority of those serving in detective roles were unaware of and/or were not utilizing ShotSpotter's Investigative Lead Summary report in their decision-making. For example, one respondent said, "I usually just look on the map for the pin on the map and listen to the audio for how many shots were fired."

- For those who did use this report, most reported using it to see where the shooting took place and to help find evidence, or as one respondent said, "Helps find evidence, prove or discredit witnesses/suspects/victims." One said they used "ILS to solidify a shots fired incident, and is generally a piece of the puzzle, and not the main driving force behind a case." And another said, "I checked to see where the shots originated from to cross that with any possible cameras in the area." Finally, another said, "I collect the data and am able to provide the report to other investigators and units for use in determining areas that require more patrol due to ShotSpotter incidents.

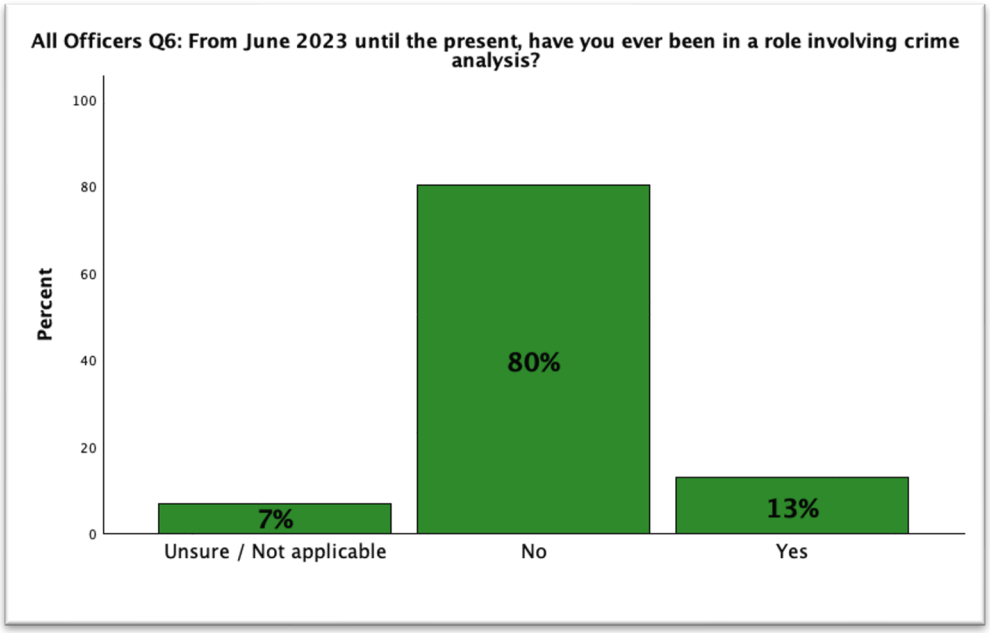
Figure 10. Screenshot of an Example Investigative Lead Summary Report



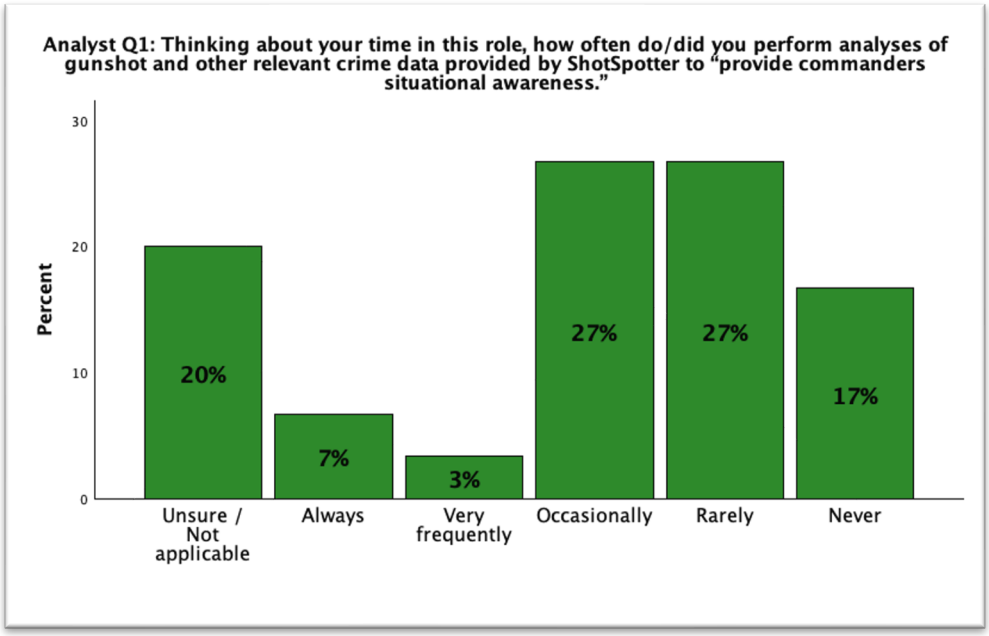
However, a little over a third (35%) of investigators reported that ShotSpotter was very essential or somewhat essential when completing the above-described tasks and/or other decision-making.



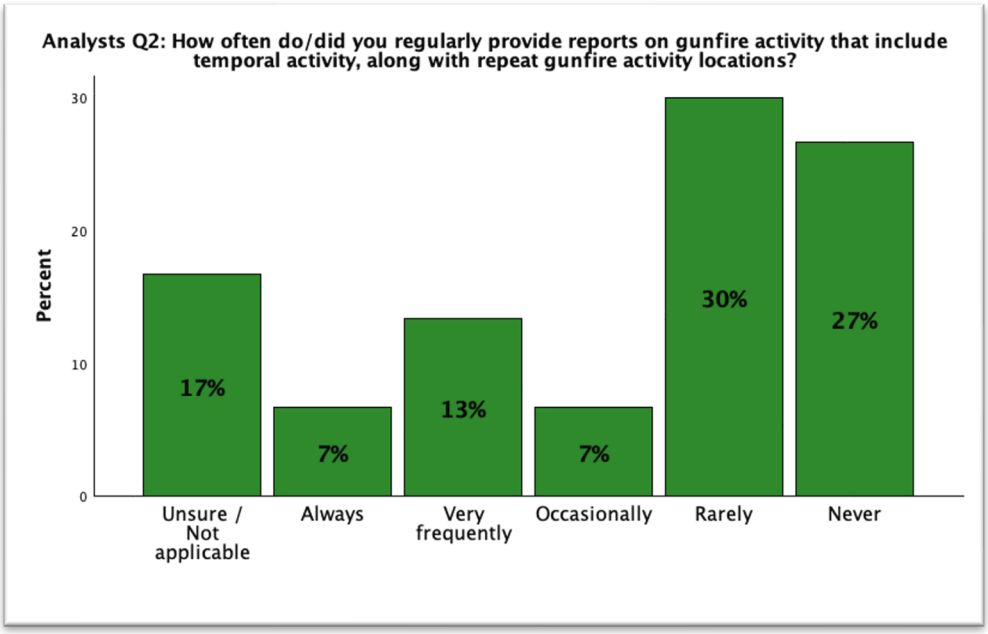
Of the respondents, 21 (13%) said that from June 2023 until the present (the approximate ShotSpotter expansion date), they had been in a role involving crime analysis.



Analysts did not frequently perform analyses of gunshot and other relevant crime data provided by ShotSpotter to “provide commanders situational awareness” (17% never, 27% rarely, 27% occasionally).



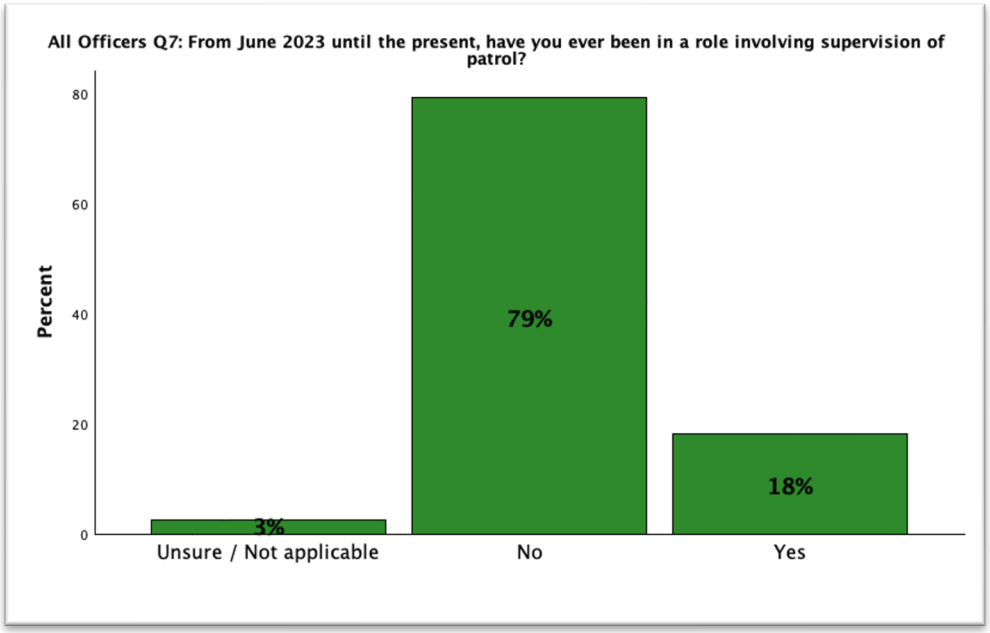
Analysts also do not frequently provide reports on gunfire activity that include temporal activities along with repeated gunfire activity locations (27% never, 30% rarely, 7% occasionally).



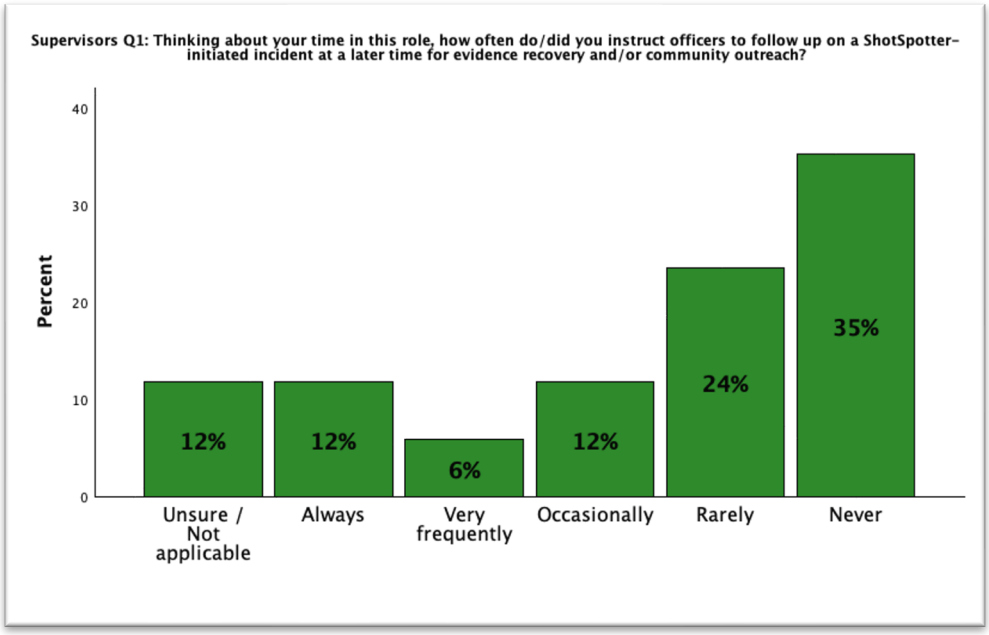
We asked those who reported working in the role as a crime analyst to describe the process for ensuring that reports created from evidence collected from a ShotSpotter alert are routed to the District Detective Unit for review.

- Some crime analysts reported not performing this task, with one suggesting it is likely due to a lack of training on how to use it.
- Several others reported creating these reports and sending them to the district detective units for review.
- A few others suggested creating “hot spot” reports for the crime gun intelligence center to receive gun ballistics notifications from ATF.

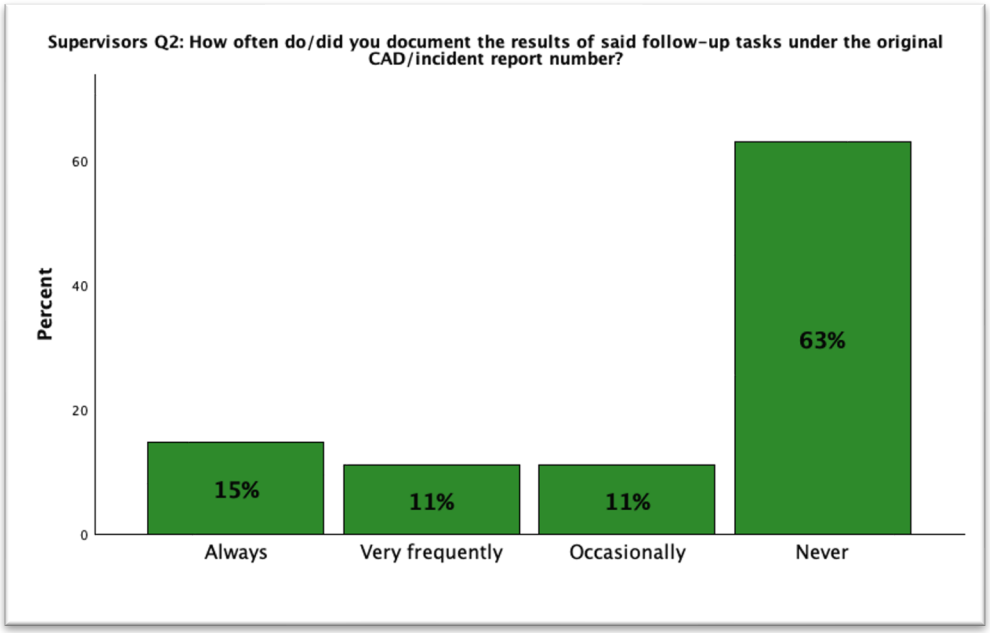
Of the respondents, 29 (18%) stated that from June 2023 to the present (the approximate date of ShotSpotter expansion), they had been in a role involving supervision of patrol.



Supervisors did not frequently report instructing officers to follow up on a ShotSpotter-initiated incident at a later time for evidence recovery and/or community outreach (35% never, 25% rarely, 12% occasionally).

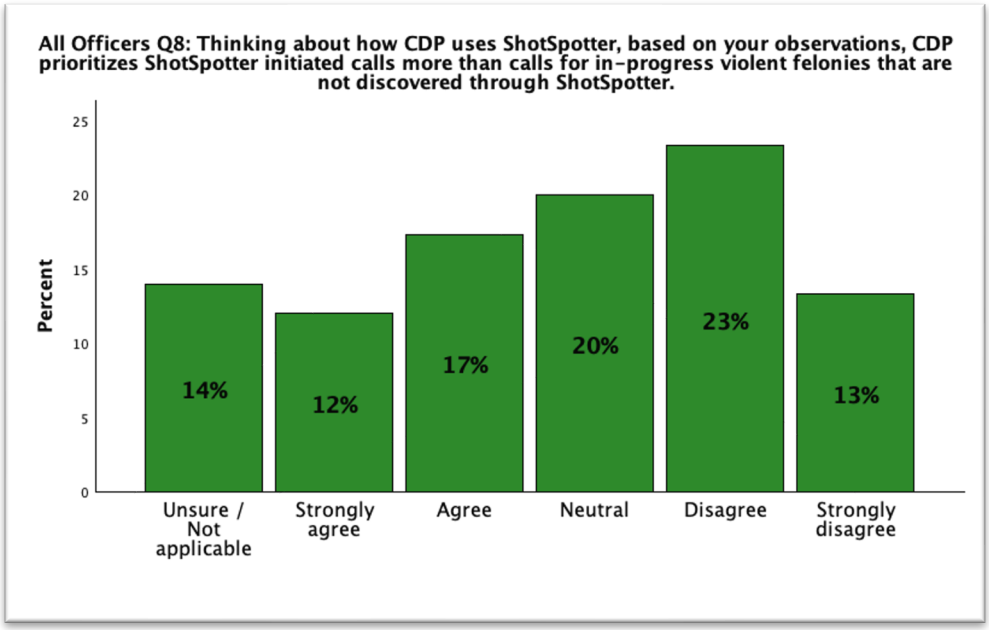


Most supervisors did not document the results of the follow-up tasks under the original CAD/incident report (63% never, 11% occasionally).

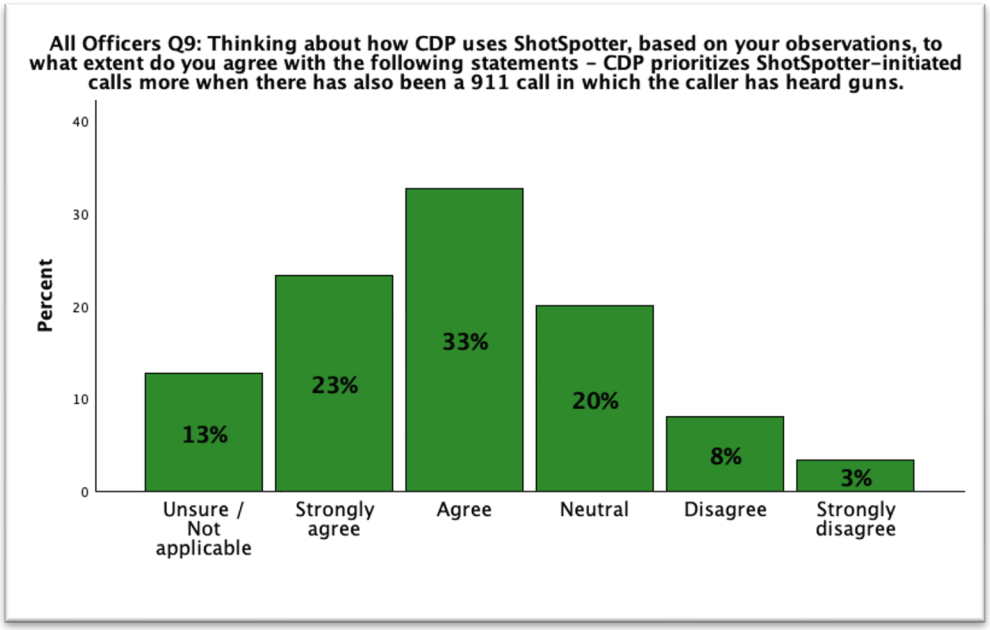


Next, we asked a series of questions to all respondents about ShotSpotter based on their observations.

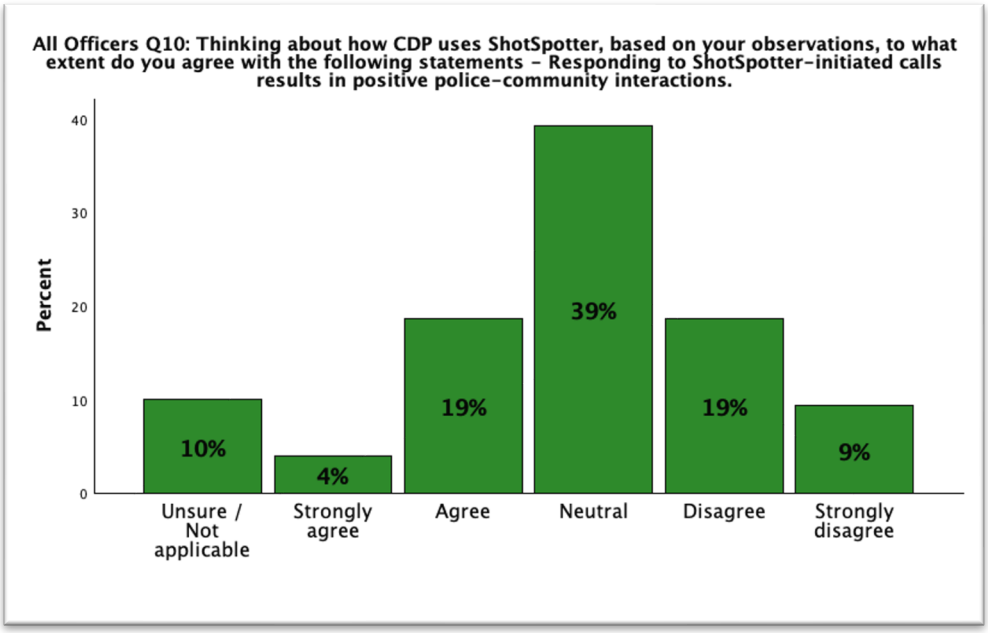
Officers were almost evenly divided when asked about whether CDP prioritized ShotSpotter-initiated calls more than calls for in-progress violent felonies that are not discovered through ShotSpotter—about 29% agreed, about 36% disagreed, 20% were neutral, and 14% were unsure/not applicable.



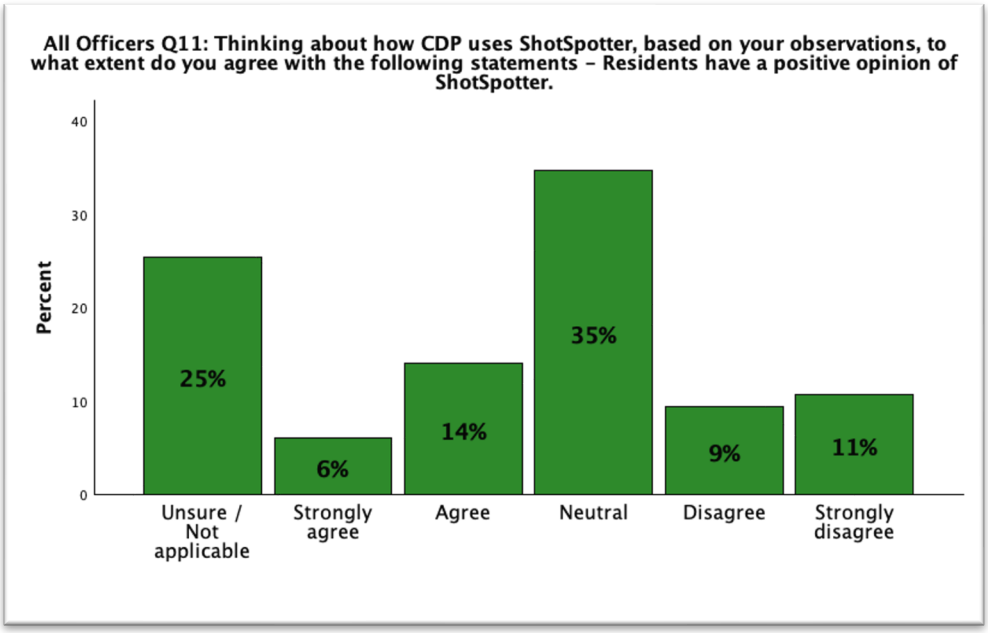
Most officers agreed (56%) that CDP prioritized ShotSpotter-initiated calls when there had also been a 911 call for gunfire.



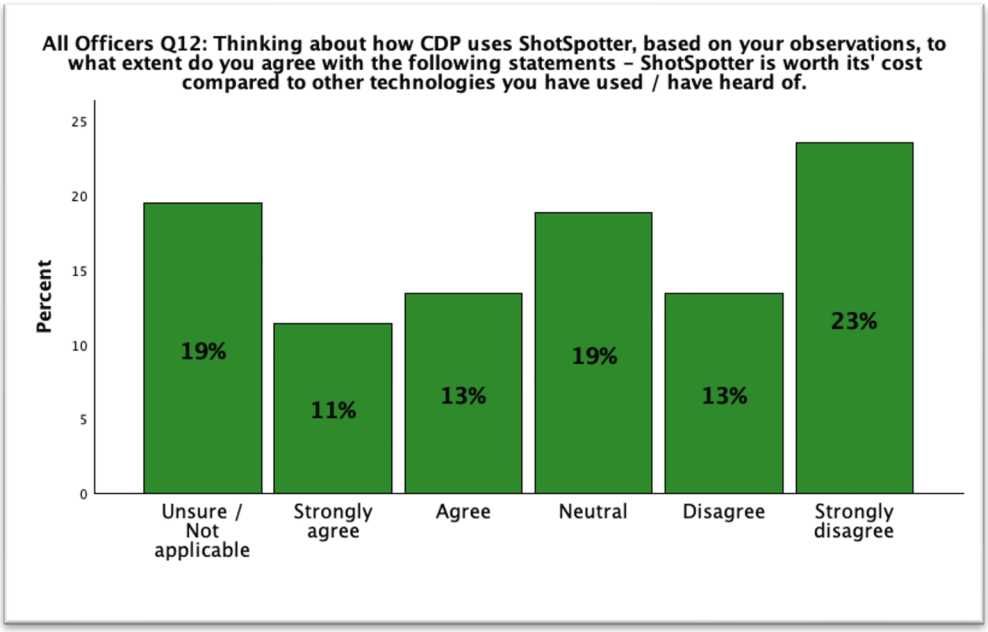
The modal response was neutral (39%) to the question about whether responding to ShotSpotter-initiated calls results in positive police-community interactions, while 19% disagreed and 19% agreed.



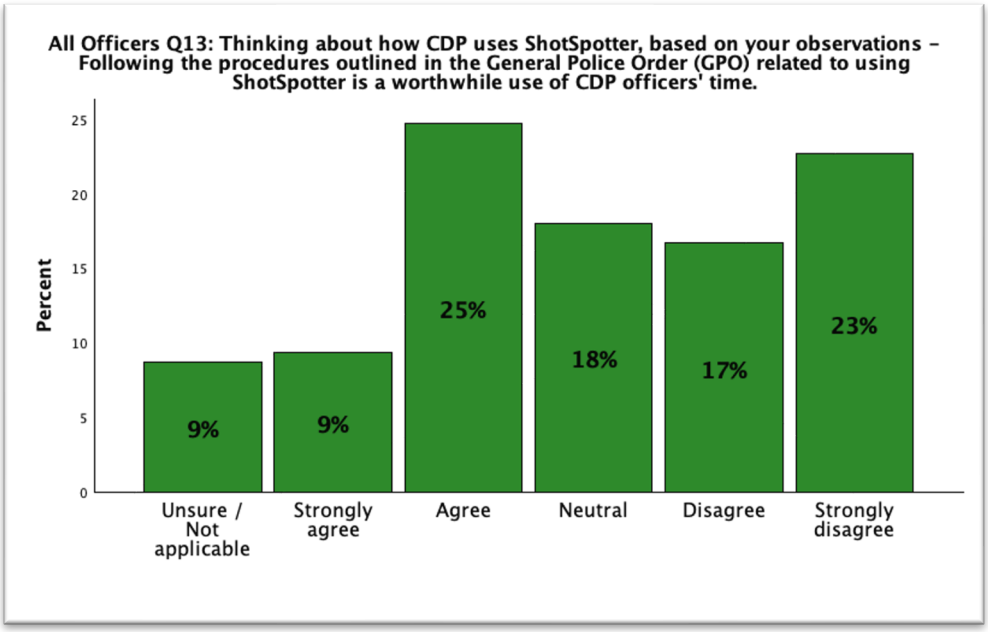
The modal response was neutral (35%) to the question about whether residents have a positive opinion of ShotSpotter. However, another 25% responded unsure/not applicable, 20% agreed, and 20% disagreed.



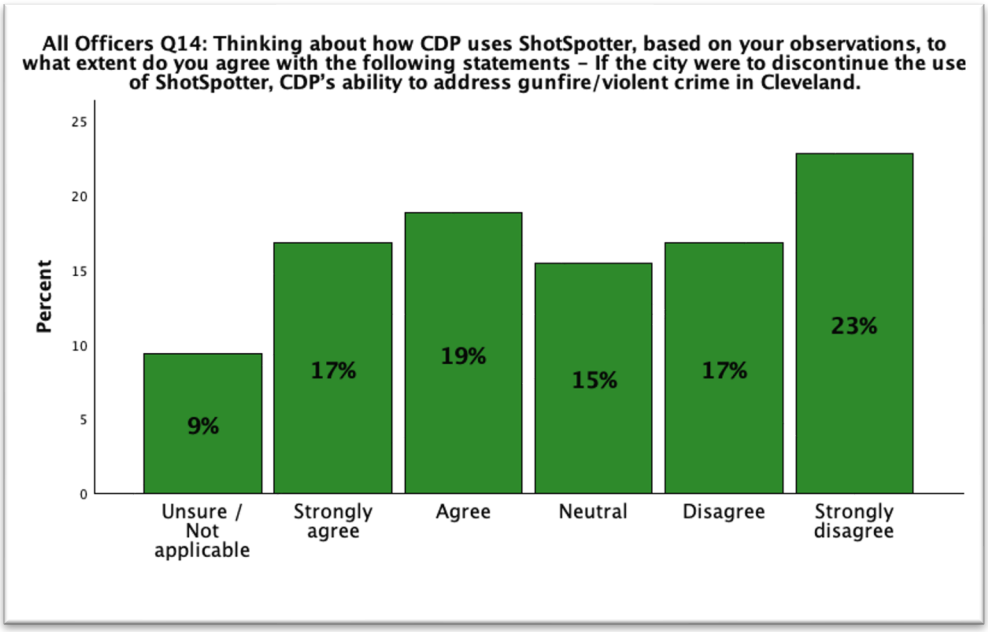
Responses were mixed when asked about whether ShotSpotter was worth the cost compared to other technologies. About 1 in 5 were neutral. About 1 in 5 were unsure/not applicable. About 1 in 4 agreed, and about 1 in 3 disagreed.



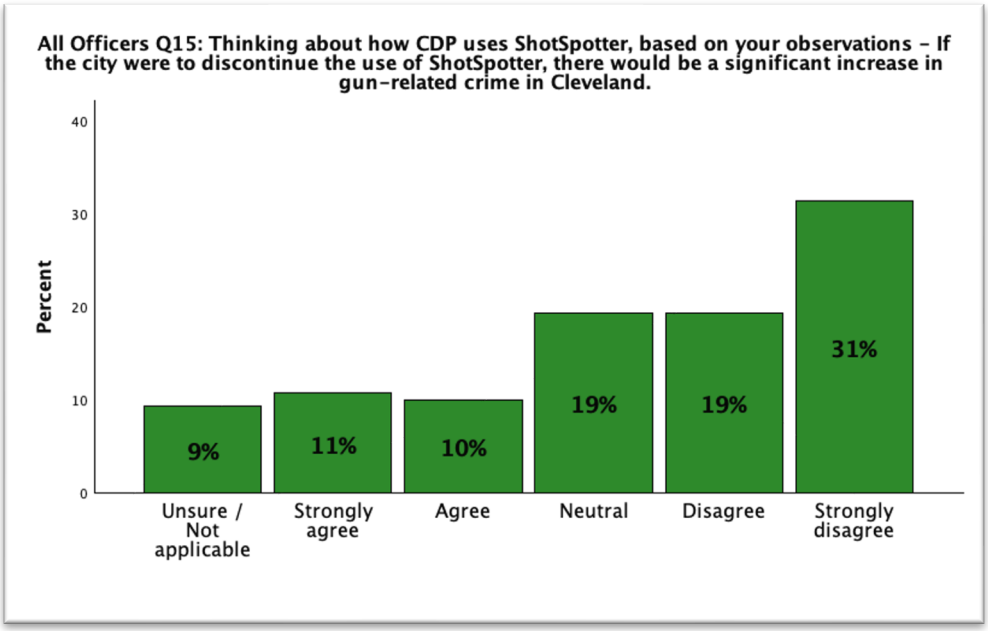
Responses were also mixed on whether following the procedure outlined in the GPO related to ShotSpotter was a worthwhile use of CDP officers ' time—35% agreed, 40% disagreed, 18% were neutral, and 9% were unsure/not applicable.



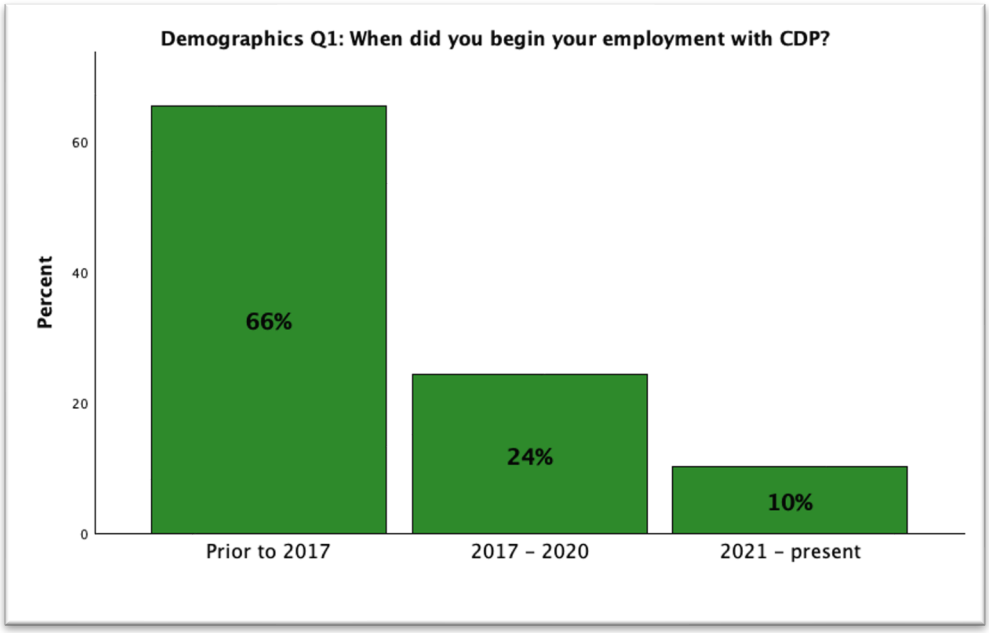
There was a lack of consensus on whether discontinuing the use of ShotSpotter would affect CDP's ability to address gunfire/violent crime in Cleveland—36% agreed, 40% disagreed, 15% were neutral, and 9% were unsure/not applicable.

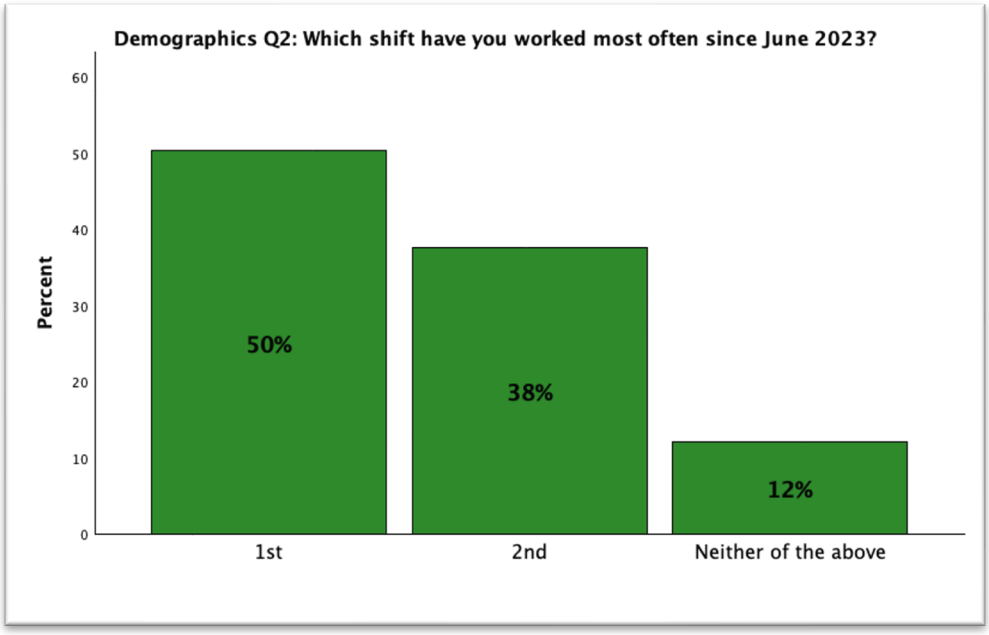


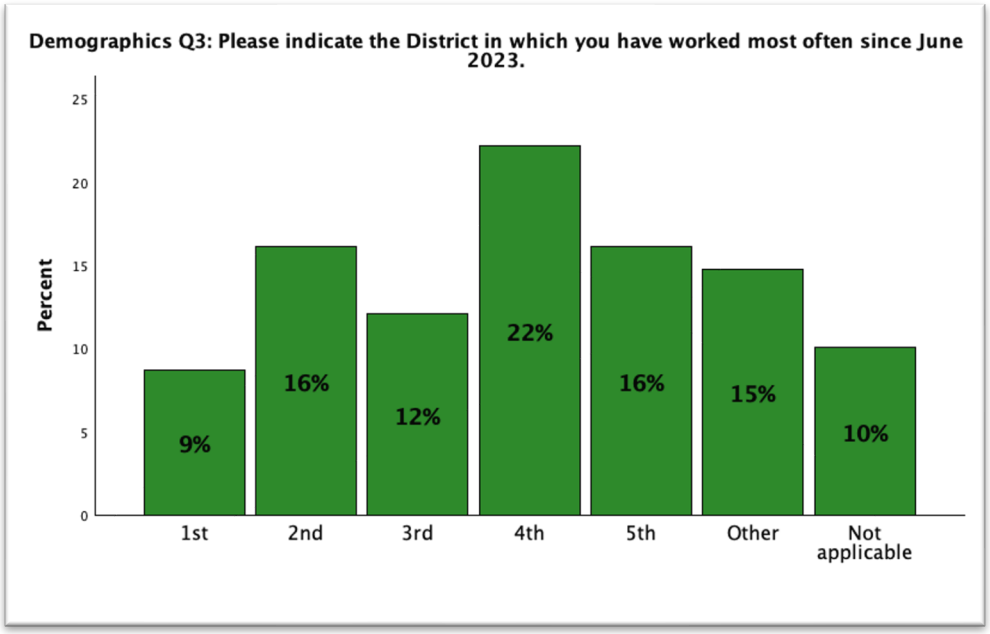
Lastly, the majority of officers did not agree that there would be an increase in gun-related crime in Cleveland if ShotSpotter were to be discontinued—50% disagreed, 21% agreed, and 19% neutral.



In terms of demographics, two-thirds of respondents were hired prior to 2017. The survey had representation from all five police districts, with the lowest representation from the First District and the largest representation from the Fourth District. Half of the respondents reported working the first shift. The survey also had representation from those not associated with a specific district.







Method 3: Interviews with ShotSpotter Users and Observations of Trainings

For data triangulation, a research method used to increase the credibility and validity of results by using multiple sources of data to study the same phenomenon or research question, we conducted 25 qualitative interviews with those who use ShotSpotter in the course of their job, including CDP officers and other key stakeholders, to assess CDP implementation of ShotSpotter.

Overall, officers and other key stakeholders reported mixed support for ShotSpotter. They said that ShotSpotter was beneficial because any spending on crime reduction is positive. However, they also expressed the need for more of "everything" to improve the investigation and follow-up on crimes.

Below we provide greater detail on the key themes/findings from these interviews.

1. Knowledge about ShotSpotter is not widespread.

As supported by the online officer survey, knowledge about ShotSpotter within the CDP appears limited and varies significantly by officer role and training received. Command staff, sergeants, Real-Time Crime Center (RTCC) personnel, and detectives are most likely to have received formal training provided either directly by SoundThinking or by CDP command staff. Patrol officers, by contrast, report inconsistent training, with some uncertain whether they have received any formal instruction at all.

We observed training provided by SoundThinking to CDP within CDP offices during the observation period, which allowed us to observe officers' use of the technology. In one session, there were approximately 20 Cleveland officers present—all at the level of Sergeant, Detective, or in roles other than regular patrol—approximately one-third of CDP attendees struggled with logging into the ShotSpotter system, some for the first time, thereby suggesting varying levels of familiarity with using the technology that has already been fully rolled out. This mirrors our finding from the online officer survey, suggesting that CDP officers want or need additional training on the technology.

However, officers we spoke with who had been trained directly by SoundThinking generally found the sessions lacking in valuable new information, often highlighting a focus on less relevant functions. In particular, they noted the training's focus on specific functions that did not seem particularly relevant to their duties. One officer told us,

> They [SoundThinking] showed us how we could save our common searches, so you don't have to search on a particular place every time you want to run a report. You can schedule it to automatically send a saved report monthly to you and others via email. But I have never used it to search for anything, so I'm not sure if I will use these additional tools.

Similarly, an officer said,

> Maybe it does things I'm not aware of, but the training showed us how to change the colors of icons on the screen. They said it was a time saver to use the tool to draw around areas of the map and save them for later. I don't know.

Officers trained internally by CDP noted that, while they were instructed to follow the actions specified in the GPO, they otherwise were not encouraged to interact with ShotSpotter or utilize the technology on their own accord. One officer who was trained by CDP command staff admitted:

> I couldn't tell you what the sensors look like, let alone where they are.

When asked in the interviews, CDP officers reported generally believing ShotSpotter was useful or being told anecdotally about how ShotSpotter was useful in making arrests or discovering evidence, for example, though primarily for specialized roles within the department, such as the ATF task force.

2. Most officers do not report having discovered errors in the technology.

Most officers reported not personally encountering errors in the ShotSpotter technology, though RTCC personnel occasionally identify inaccuracies using alternative technologies, but rarely report these to SoundThinking. Accuracy is perceived as higher in initial pilot areas compared to later expansions, with apparent limitations noted during peak activity periods like New Year's Eve or the Fourth of July.

However, officers reported an issue to us. As shown in Figure 3, the First and Second Districts have neighboring coverage areas. After ShotSpotter was installed in both districts, a detective from the First District noticed that shots were being suppressed by sensors in portions of the First and Second District that border each other. That is, noises being detected by sensors in one District were suppressed by sensors in the other District because they were identified as outside of the coverage area of the latter District. The information the research team received indicated that this error was reported to ShotSpotter, leading them to adjust the sensors. This issue was identified within several months of ShotSpotter's implementation in both districts and has not been considered an ongoing problem. However, because of this issue, the number of shots fired in these districts during that period would be underreported.

3. Police and prosecutors also cited several potential benefits.

Several police officers and prosecutors we spoke with cited multiple potential benefits of ShotSpotter, based on their understanding of the advertised functions of ShotSpotter. These include: (a) reducing reliance on civilian 911 calls, which are most often either not called in or, when called in, are inaccurate in terms of the location of the gunfire, and (b) improving evidence collection, such as locating bullet casings. The ShotSpotter software (Insight) also provides investigative tools, such as integration with Computer-Aided Dispatch (CAD), identifying electronically monitored probationers near incidents, and establishing incident timelines for investigators. Investigators can use ShotSpotter information to establish a time frame for the incident, which can help identify the potential shooter's location and time of occurrence. Officers also appreciate advanced notice on incident specifics, enabling mental preparation en route, such as rapid fire, automatic weapon, drive by, multiple shooters, etc. Prosecutors report that ShotSpotter by itself is not used often in the courtroom but can be useful when combined with other evidence to support their case.

4. Substantial increase in Priority 1 calls for service

ShotSpotter has led to an increase in Priority 1 calls, negatively affecting response times for less urgent but still serious incidents, such as burglaries and specific domestic violence calls. Some officers referred to this as “congesting the board.”

While command staff expressed concern over additional stress and workload from these alerts, patrol officers attributed their stress primarily to broader staffing shortages rather than ShotSpotter specifically. Some officers reported that ShotSpotter made them more cautious when responding to alerts, as they could anticipate encountering a shooter at the scene, which led to an

"adrenaline dump". Some officers also reported that the alerts can heighten concern about potential active shooter situations, but that these encounters are rare in practice.

5. Variation in response to alerts

Officer adherence to the ShotSpotter-related GPO varied significantly. All officers reported checking for individuals and physical evidence (mostly shell casings) at alert sites, but rarely proactively engaging in community canvassing or next-day follow-ups, despite GPO guidelines. When asked about the "vicinity" where they searched for evidence, officers reported checking for evidence from wherever they could see from the vantage point of the "dot." As supported in the officer survey, there was reported variation in leaving door hangers and knocking on the six closest doors (per GPO). Offices did report conducting some of these activities, but more informally. They reported canvassing by talking to people they saw outside when responding to a ShotSpotter alert, and that they might approach a nearby house and knock on the door of a nearby house if they saw a person looking out a window (although they did not report ever being in this situation when responding to ShotSpotter alert specifically). None of the patrol officers we spoke with reported following up the next day on a ShotSpotter alert. However, several detectives expressed doubt that next-day follow-ups would yield any useful evidence that would allow them to connect a ShotSpotter alert to a crime. All agreed that it would be impossible, given current staffing levels, to prioritize next-day follow-ups. Even with more officers, the command staff stated that without a daily review of ShotSpotter incidents, they wouldn't be able to prioritize which ShotSpotter alerts should be followed up on so that they could dispatch officers accordingly.

The patrol officers we spoke with said they relied on dispatch instructions rather than independently responding to nearby alerts. None recalls ever being told to do so. As an aside: the GPO uses the phrasing, "Members may respond to an alert before being given the assignment through MCAD; however, the unit responding shall notify the dispatcher via radio." Some were not aware of the existence of this option for responding to ShotSpotter. When asked why they did not proactively respond, they noted that they are instructed to follow the instructions of Dispatch and the supervising officer, who are tasked with deploying officers/cars based on current needs. A few noted that this function might be useful in a place where officers receive few calls for service. Supervising officers noted the necessity of accounting for the activities of officers at all times, which would preclude officers from taking it upon themselves to seek out crimes (unless they were specifically told to do so by a supervising officer). They similarly noted that calls for service overwhelmingly occupy officers' time. Interviewees told us that supervising officers distribute resources based on immediate need (such as emergency traffic situations) and do have some discretion to assign officers to special duties, such as walking patrol around the community, but are not encouraged to assign officers specifically to respond to ShotSpotter alerts prior to dispatch.

The GPO states that "Members responding to the scene for investigation should view the alert information and listen to audio files for situational context prior to interviewing victims,

witnesses, or suspects." None of the officers we spoke with personally looked at details from the ShotSpotter interface (or listened to audio), nor were these officers aware that others did so. Instead, they told us that dispatch relays this information (such as type of firearm, number of shooters, etc.) to officers while they are en route. However, they felt that even if dispatch did not do this, they typically do not have time to engage with the ShotSpotter interface accordingly.

In summary, districts vary in their implementation of ShotSpotter and record-keeping practices related to ShotSpotter. This finding is also replicated in the officer survey. It implies that CPD is likely undercounting ShotSpotter outcomes, and thus, the degree of proposed usefulness likely varies by district (as provided and discussed in Method 4 below).

6. ShotSpotter and citizen interactions

Officers unanimously reported that they do not view ShotSpotter as a tool to enhance interactions between police and citizens. Several officers relayed that the interactions they had with citizens when responding to ShotSpotter alerts were not initiated by encountering a person at "the dot", rather, they were attributed to a corresponding 911 call for which officers were instructed to make contact with a resident at a certain address based on the information provided by the caller. In other words, police contact with citizens primarily occurs in order to formally close out service calls, rather than proactively engaging community members. This is not due to unwillingness, but rather because their priority is to complete tasks assigned by Dispatch and swiftly move on to subsequent assignments.

Consequently, officers do not perceive ShotSpotter as a mechanism for improving public trust. However, they also do not see it as detrimental to police-citizen relationships. Some command-level personnel acknowledge concerns raised by certain community members, council members, and oversight bodies regarding potential biases or privacy violations associated with ShotSpotter. Officers expressed surprise at these concerns, stating that the community members they interact with typically express a desire for faster police responses to enhance safety from gun violence. Notably, officers reported no negative reactions from residents during ShotSpotter-related responses, reinforcing their perception that residents do not view the technology as contributing to biased policing or over-policing. Overall, these findings suggest that CDP officers do not perceive utilizing ShotSpotter in a manner consistent with biased policing or disproportionate surveillance in affected neighborhoods.

7. Pros and Cons

When asked about ShotSpotter's overall pros and cons, officers had quite a bit of feedback.

Alert outcomes

Overall, officers reported that ShotSpotter alerts did not result in regular tangible alert outcomes such as the discovery of a person, physical evidence, or positive community-police interaction. Although we did not have a random sample of officers, none of those we spoke with reported

finding casings, making an arrest on scene, finding any/talking to any victims, or finding any persons (shooters/witnesses) on scene.

None of the officers reported to us that they had approached residences as part of their response in an attempt to complete the Community Canvas per the GPO.

> Unless I see a person, or maybe someone looking out a window, I'm not going to knock on any doors because it likely won't produce any useful information.

Command staff believe that officers follow the GPO more closely when there is a corresponding 911 call. Relatedly, officers are concerned about the drop in residents calling 911 pre/post ShotSpotter coming to the Fourth District in the pilot period but are also opined that a number of steps in the ShotSpotter GPO are likely unable to be implemented as written.

Firearm evidence obtained from random ShotSpotter alerts typically does not aid detectives tasked with rapidly solving cases, primarily due to the delay in obtaining ballistic reports. Additionally, most investigations conducted by detectives involve crimes occurring outside the areas covered by ShotSpotter, further limiting the relevance and utility of such evidence. Command staff from all districts agree that homicides have decreased in their districts from 2024 to 2025, but they do not attribute this to ShotSpotter.

Use of ShotSpotter's "bells and whistles"
Command staff said not everyone logs into ShotSpotter, but they can access it in their cars and on their phones. Officers in cars receive alerts only for the district they are working in at the time, which could be an issue in the First and Second Districts, as they have bordering coverage areas. In practice, this means that one district's officers are unable to receive ShotSpotter alerts that could be just one street away from their location, and this negates their ability to respond to these alerts independently.

Based on feedback from those we spoke with, CDP currently lacks the resources to effectively utilize ShotSpotter data ("bells and whistles" in the interface) for identifying crime trends due to time constraints and the need for manual data entry between the ShotSpotter and CAD. This is not currently being done systematically or to the same extent across districts. Additionally, the outcomes associated with ShotSpotter (evidence collected, NIBIN leads, etc.) are also not recoded consistently across districts.

Some interviewed detectives expressed amusement regarding some of the "bells and whistles" of ShotSpotter but also indicated they have not engaged with the interface in a significant or meaningful way. None of the detectives or administrative officers reported utilizing the ShotSpotter system to obtain critical information about criminal incidents, including timestamps, nor did they leverage it to establish probable cause or to compile information for prosecutors.

Generally, officers reported limited capacity to thoroughly review, process, or analyze ShotSpotter data trends due to time constraints and operational demands.

Perceived cost-effectiveness
Officers expressed uncertainty regarding the actual cost-effectiveness of ShotSpotter, noting limited awareness about ongoing expenses after initial installation. While officers we spoke with generally hesitated to reject any potentially beneficial technology, they expressed concerns about funding being redirected outside of the CDP if ShotSpotter funds were discontinued. They suggested alternative investments, including License Plate Readers (LPRs), video surveillance technologies, drones, integrative technology, and improved training methods beyond standard cultural sensitivity presentations, as well as vehicle upgrades. Although officers frequently cited the beneficial outcomes of ShotSpotter—such as increased accuracy in responding to gunfire, potentially saving lives, and aiding investigations—none could personally recall specific instances where ShotSpotter directly contributed to successful outcomes or solved cases.

Degree of perceived effectiveness
Overall, officers acknowledged that ShotSpotter likely aids police departments in other locations in solving crimes, but they find its utility limited in Cleveland due to several specific factors. These include restrictive gun laws, a high volume of calls, staffing shortages, and a lack of clear direction or incentives from command staff on effectively leveraging the technology. Command staff specifically mentioned challenges such as stringent firearm discharge regulations, overwhelming call volumes, and pressures to maintain or improve response times, which hinder their ability to utilize ShotSpotter services fully. Officers mentioned that city ordinances complicate enforcement because they require evidence that firearms were discharged improperly, such as across public spaces or near schools—something ShotSpotter cannot conclusively prove without video evidence. Theoretically, officers suggest ShotSpotter could assist in solving crimes if responders could locate bullet impacts on nearby properties following alerts, potentially providing evidence of illegal firearm use. Additionally, in areas like the Fourth District, identifying bullet impacts could provide valuable intelligence on gang activities, potentially helping to pinpoint gang members or their locations, given the retaliatory and gang-related nature of much local gun violence.

Detectives favor officer-initiated or traditional policing strategies because these methods yield immediate and visible results in crime resolution, particularly through direct interactions with witnesses and victims. Engaging directly with community members frequently results in positive feedback, reinforcing the value detectives place on these methods. Detectives prioritize such direct approaches over searching for firearm evidence, which often lacks immediate relevance or usefulness. However, they note exceptions, particularly in cases involving shootings of vehicles or residences, where they proactively search for ballistic evidence. Typically, these incidents involve direct 911 calls from residents or neighbors, and detectives indicate they rarely pursue ballistic evidence solely based on a ShotSpotter alert without corroborating calls.

Method 4: Analysis of Quantitative Data on Outcomes of ShotSpotter Alerts

Variations in the methods used by CDP for collecting quantitative data related to ShotSpotter limited our ability to analyze these data effectively for several reasons.

First, as indicated in Figure 3, not all districts have the same coverage area, and not all years include the same amount of coverage area. For example, ShotSpotter was not expanded beyond the pilot area in the Fourth District until April 2023, and coverage areas continued to be added during the course of the evaluation. Therefore, in terms of assessing trends in usage and outcomes over time, 2022, 2023, and 2024 cannot be directly compared to each other. This is particularly true for 2022, when coverage pertained to a three-square-mile area in the Fourth District and not 13 square miles, as it is currently. CDP's implementation of ShotSpotter and the timing of this evaluation meant we did not have a treatment or comparison group, as coverage areas were expanded and continued to expand during the period of observation.

Second, the interviews and officer surveys revealed that ShotSpotter errors and alert outcomes were inconsistently recorded across different districts. For example, one of the datasets included the associated individual officer ID number; however, the vast majority of the alerts did not include the ID number, and when the field did include this information, a small handful of IDs/officers comprised the majority of the entries.

Overall, the missing data issue resulted in an *undercount* of alert outcomes. Missing data and changes in coverage areas over time produced a dataset that was not suitable for statistical analysis or comparison. While there are a number of statistical techniques that can be used to account for missing data and still produce meaningful results with limited margins of error, these techniques require a minimum threshold in terms of the amount of existing data and the ability to identify predictable patterns about the missing information.

As previously mentioned, different districts have implemented ShotSpotter in various ways, which affects data collection. Some variables were available in certain Districts but not others, or during specific time periods but not all. Additionally, whether information was recorded within a district was unpredictable over time, as ShotSpotter was being rolled out.

Without being able to account for missing information, the data we had violated multiple statistical assumptions, making it unsuitable for bivariate correlations or multiple regression analyses. We were therefore limited in terms of what information we could provide in this section of the report with reasonable validity. The descriptive information below is limited to data points that represent patterns with reasonable accuracy. Again, we further note that many of the events we do report below are likely *undercounted* in some capacity. *However, given that we were able to employ multiple methodologies in this evaluation (triangulation), we were able to mitigate this limitation and were still able to assess the key goals, as detailed here.*

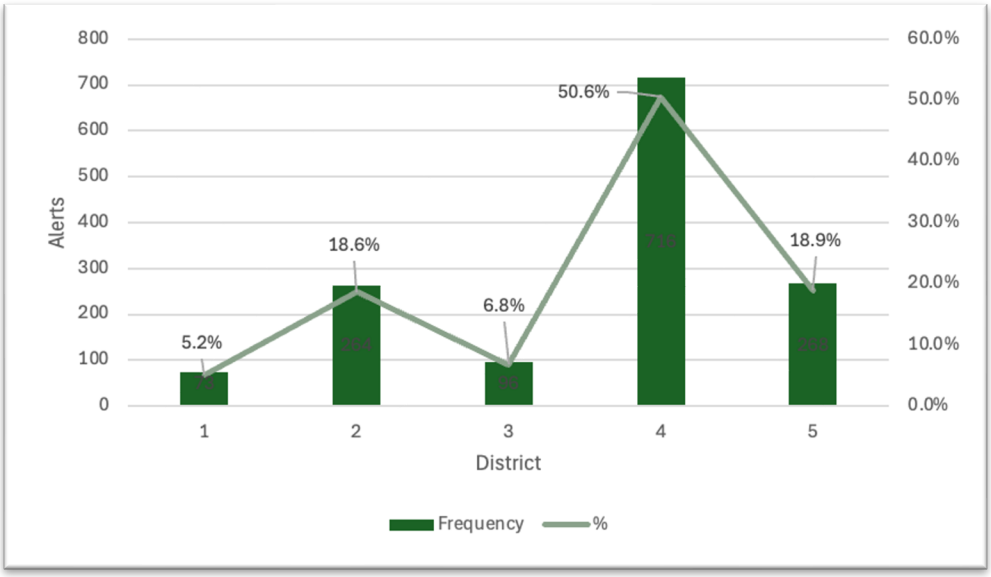
Outcomes for all ShotSpotter alerts in Quarter 1 of 2025

To compare data for all five districts, we first present data from 1/2/2025 to 3/31/2025, when all ShotSpotter coverage areas were live and ShotSpotter had been fully implemented for approximately a year or more in all districts.

The metrics below were derived from two datasets: one from ShotSpotter's Ground Truth Tracker app and another from CDP's CAD system, based on ShotSpotter alerts. We merged the two datasets based on CAD number. However, there could be more than CAD created for the same (based on alert IDs provided in Ground Truth), as evidenced by the same or almost the same latitude and longitude and date/time. After consulting with CDP, we were advised to remove CADs without corresponding alert IDs for the analyses presented below.

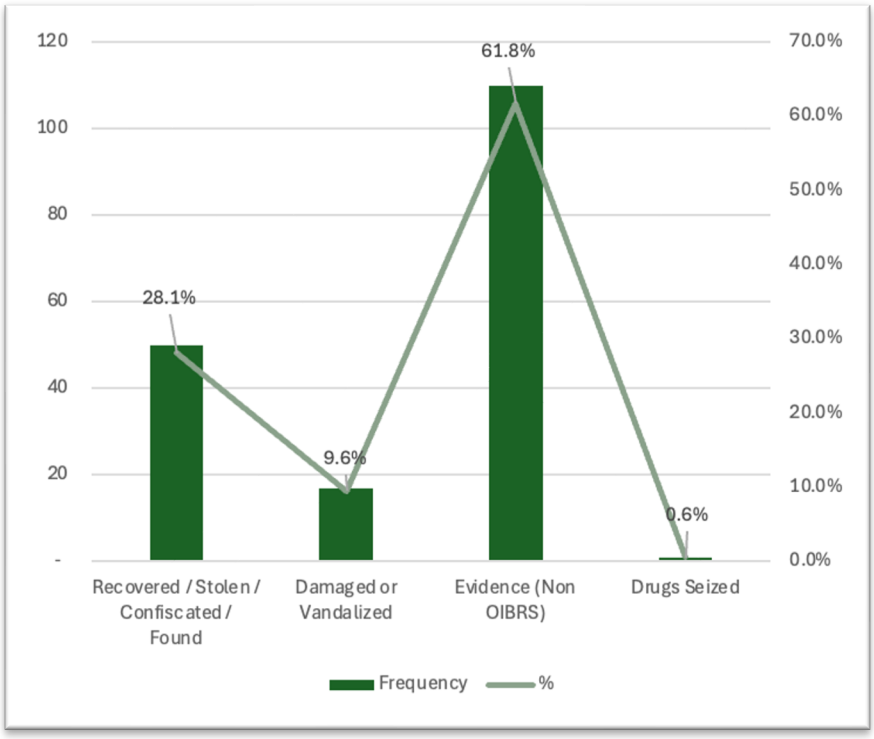
Between 1/2/2025 and 3/31/2025, there were a total of 1417 alerts published by ShotSpotter. The frequency of ShotSpotter alerts varied considerably across districts, with nearly half of the alerts occurring in the Fourth District (Figure 11). However, it should be noted that the Fourth District has much larger coverage areas compared to the other districts. And all percentages are based on non-missing data.

Figure 11. Frequency and Percentage of ShotSpotter Alerts by Cleveland Police District, 1/2/2025-3/31/2025



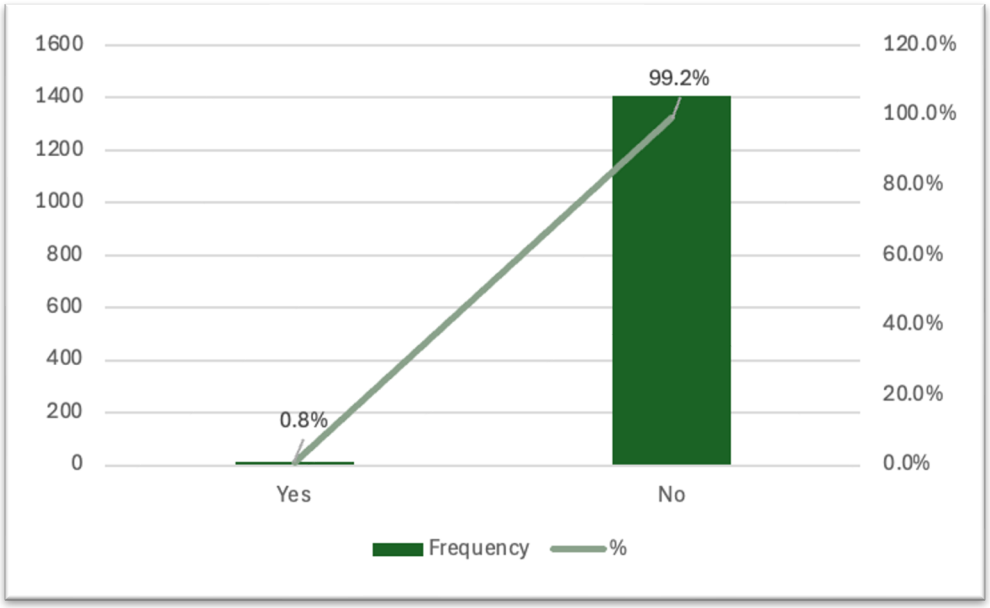
First, we focus on describing the **characteristics of the alerts**. In 210 of these 1417 published alerts, CDP recovered and logged some type of physical evidence not including a suspect or victim (Figure 12). The type of evidence gathered varied, with only half a percent resulting in officers seizing drugs. About a third of these 210 alerts resulted in the identification of property listed as “recovered/confiscated/stolen,” and about 10% of the 210 alerts resulted in the police finding property that was vandalized or damaged. In the remaining alerts (60%), property found was categorized as "non-OIBRS evidence property." Non-OIBRS evidence refers to items that are not collected as part of a criminal investigation for evidentiary purposes.

Figure 12. Frequency and Percentage by Type of Evidence Collected from ShotSpotter Alerts, Cleveland, 1/2/2025-3/31/2025



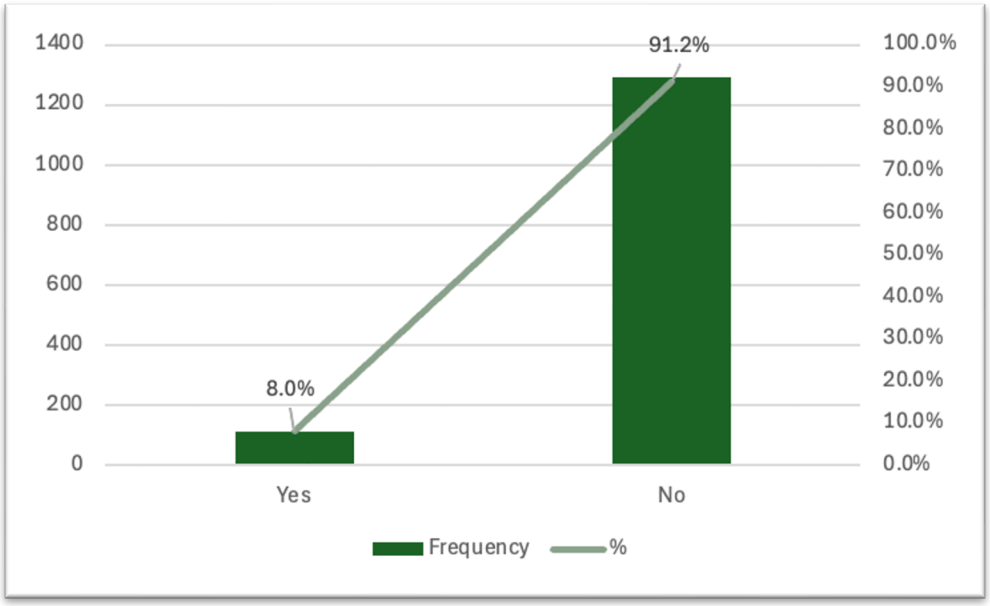
Because ShotSpotter is aimed at identifying gun-related crimes, we disaggregated alerts accordingly and found that an extremely small percentage (.08%) of all alerts led to CDP recovering one or more firearms. Police recovered a total of 17 guns based on these alerts (Figure 13).

Figure 13.Frequency and Percent of ShotSpotter Alerts with Guns Recovered, Cleveland, 1/2/2025-3/31/2025



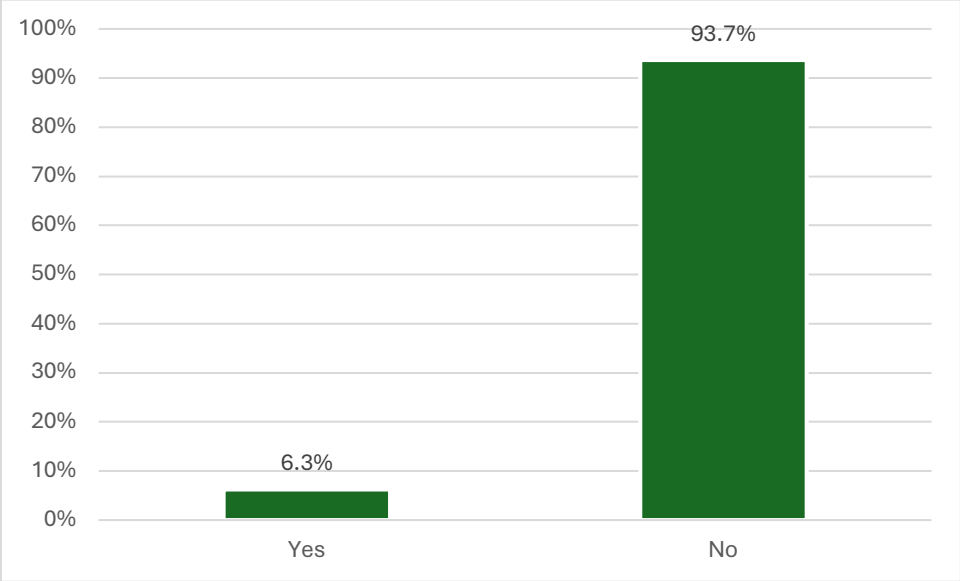
Next, because ShotSpotter is assumed to improve the chances that the police recover firearm evidence, we note that 8% of the alerts resulted in the identification of one or more gun casings (Figure 14). When casings were recovered, the average number found per alert was 7.

Figure 14. Frequency and Percent of ShotSpotter Alerts with Casing(s) Found, Cleveland, 1/2/2025-3/31/2025



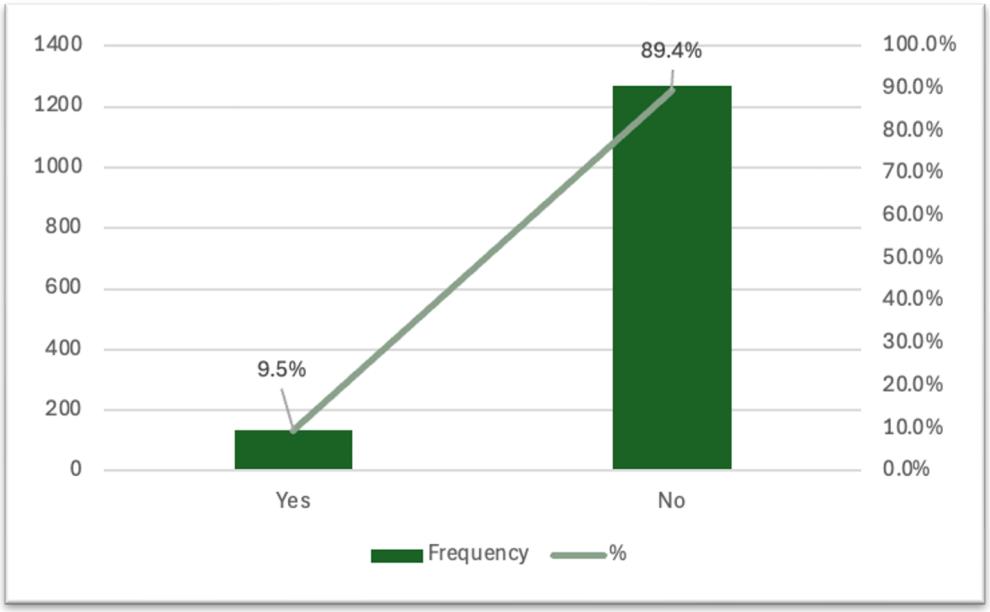
To ascertain the relative seriousness of gunfire incidents, we disaggregated alerts based on whether ShotSpotter identified it as high capacity (10+, a commonly used definition of high capacity). A little over 6% of the total alerts were defined as heavy gunfire incidents based on this definition (Figure 15).

Figure 15. Frequency and Percent of ShotSpotter Alerts with High Capacity, Cleveland 1/2/2025-3/31/2025



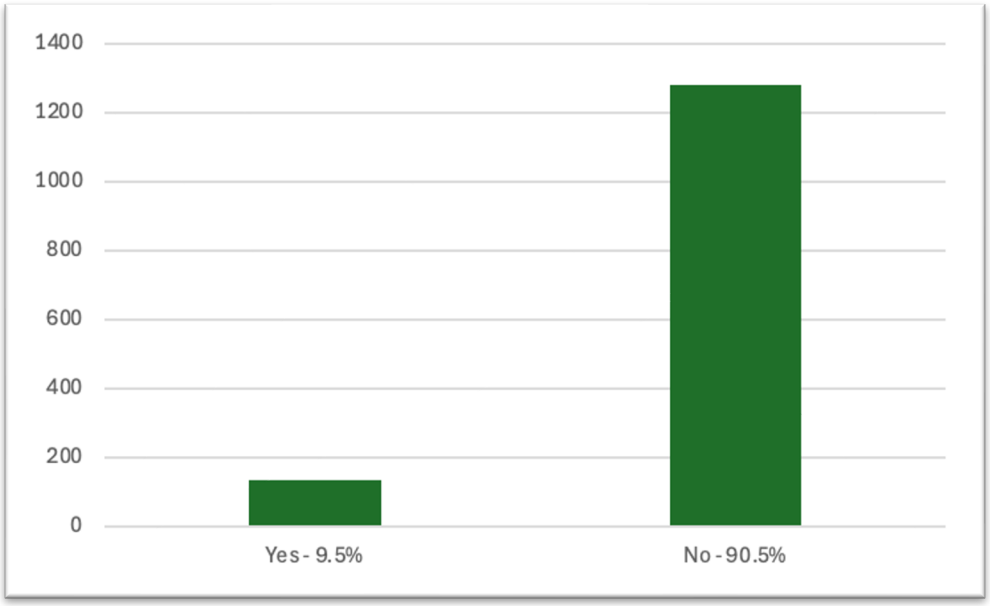
Next, we focused on the **outcomes** of the alerts. A main reason for Cleveland's adoption of ShotSpotter was the perception that many instances of gunfire are not reported to police via calls to 911. Almost 10% of all alerts from 1/2/2025 to 3/31/2025 corresponded to a 911 call (Figure 16).

Figure 16. Frequency and Percent of ShotSpotter Alerts with Correlating 911 Call, Cleveland, 1/2/2025-3/31/2025



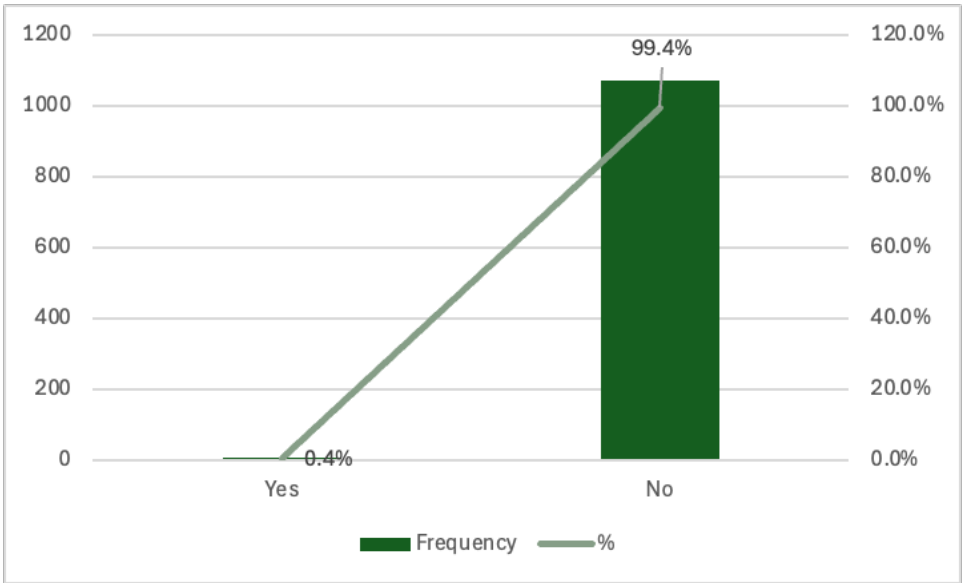
More than 90% of the ShotSpotter alerts CDP responded to from 1/2/2025 to 3/31/2025 did *not* necessitate an offense report, meaning that responding officers did not obtain any information (such as a victim, crime in progress) to suggest that a new criminal investigation should be initiated (Figure 17).

Figure 17. Percent of ShotSpotter Alerts with and Offense Report, Cleveland, 1/2/2025-3/31/2025



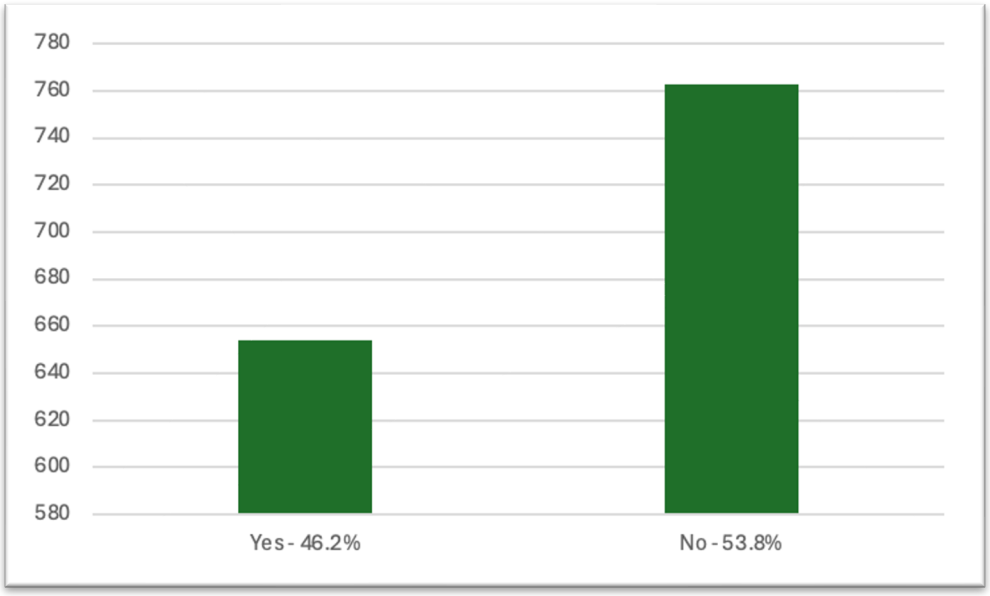
And few alerts resulted in CDP making an arrest, .4% (n = 7) (Figure 18).

Figure 18. ShotSpotter Alerts that Resulted in an Arrest, Cleveland, 1/2/2025-3/31/2025



CDP, in their report based on the 6-month pilot use of ShotSpotter across 3 square miles (Cleveland Division of Police, 2021, page 4), argues ShotSpotter alerts provide a potential opportunity for police officers to engage in positive interactions with community members via a "community canvas." We therefore examined the frequency with which officers reported canvassing as part of their response to a ShotSpotter alert during this time period. CDP completed a community canvas about half of the time when responding to ShotSpotter alerts (Figure 19).

Figure 19. ShotSpotter Alerts that Included a Canvass (Citizen Contact & No Citizen Contact), Cleveland, 1/2/2025-3/31/2025



Finally, a potential benefit of ShotSpotter is that officers can more quickly identify victims of gun violence. There were 20 victims with which police responded to a ShotSpotter alert and identified a victim of felonious assault (representing 1.4% of all ShotSpotter alerts). Officers identified one homicide victim during this time period (0.1%).

From 1/2/2025 to 3/31/2025, officers rendered first aid/life-saving measures while responding to ShotSpotter alerts two times.

Overall, the above results show that in the first half of 2025, most of the gunfire incidents identified by ShotSpotter in Cleveland did not involve heavy gunfire. Less than one-half of a percent resulted in the police making an arrest or identifying a homicide victim.

Further details on lives saved/aid rendered
Results from nearly all other methods used in this study agree that one of the main perceived benefits of ShotSpotter is its potential to save lives by rendering first aid to victims that would not otherwise be possible. In their review of ShotSpotter alerts, CPD identified alerts in which a victim was found. To verify that the alert resulted in lifesaving first aid and obtain additional contextual details, a member of CPD reviews body camera footage from involved officers. Multiple people we spoke with corroborated this process. Based on their data, a total of 53 lives were saved in the course of officers responding to a ShotSpotter alert. **All but one of these incidents had a corresponding 911 call.** For these 52 alerts, there was, on average, a 4-minute difference from the time ShotSpotter published the alert and dispatch received the corresponding 911 call, according to descriptive statistics (already analyzed) data provided.

Property recovered in the Fourth District, 2021-2024
To investigate changes over time in outcomes from ShotSpotter alerts, we reviewed the information we received from the CDP for all ShotSpotter-initiated calls for service in the Fourth District from 2021 to 2024. We limited this analysis accordingly because this is the only district that was using ShotSpotter consistently over these years (ShotSpotter was not added to other districts until 2023 or 2024), so it provides a longer time period for assessing changes over time.

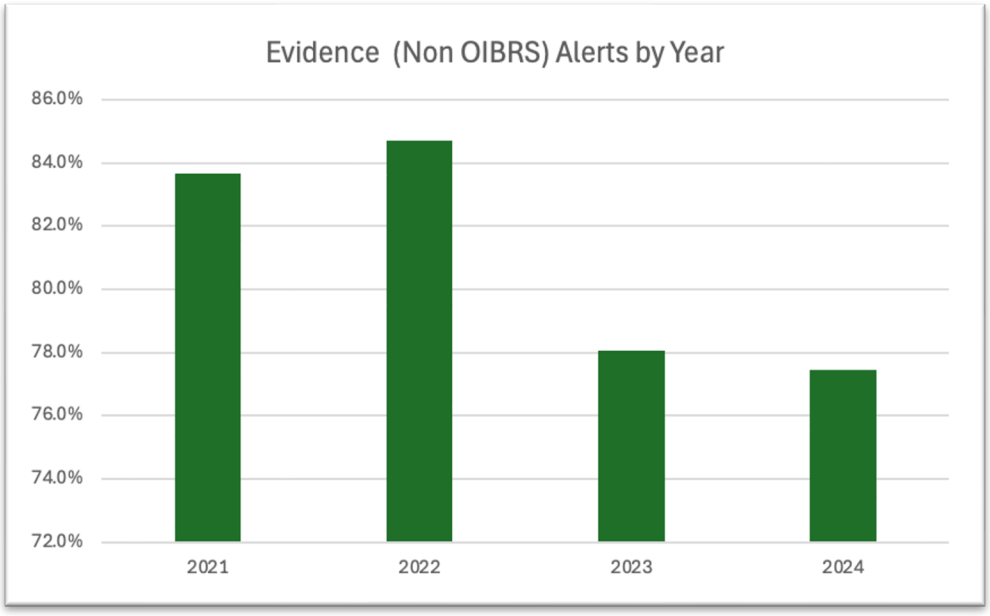
Based on this data, we isolated a total of 2611 ShotSpotter alerts in which police recovered property of some sort during their response. Similar to our findings from our city-wide review of ShotSpotter alerts in the first quarter of 2025, in the Fourth District, regardless of year (both before and after the expansion in ShotSpotter coverage areas), most of the time when an officer identifies property as a result of a ShotSpotter alert, this property is categorized as “Non-OIBRS” evidence (Non-OIBRS evidence refers to items that are not collected as part of a criminal investigation for evidentiary purposes). The second most common type of property officers discover in the course of responding to a ShotSpotter alert is items that are categorized as being recovered (found) or stolen/confiscated. Yearly distribution of these alerts by property type is as follows (Table 4):

Table 4. Type of Evidence Collected in Connection with ShotSpotter Alerts by Year, Cleveland, 2021-2024

Property Type	Number of Alerts
Damaged or Vandalized	**183**
2021	30
2022	22
2023	64
2024	67
Evidence (Non OIBRS)	**2079**
2021	379
2022	266
2023	712
2024	722
Recovered / Stolen / Confiscated / Found	**341**
2021	42
2022	25
2023	133
2024	141
Seized	**8**
2021	2
2022	1
2023	3
2024	2
Total	**2611**

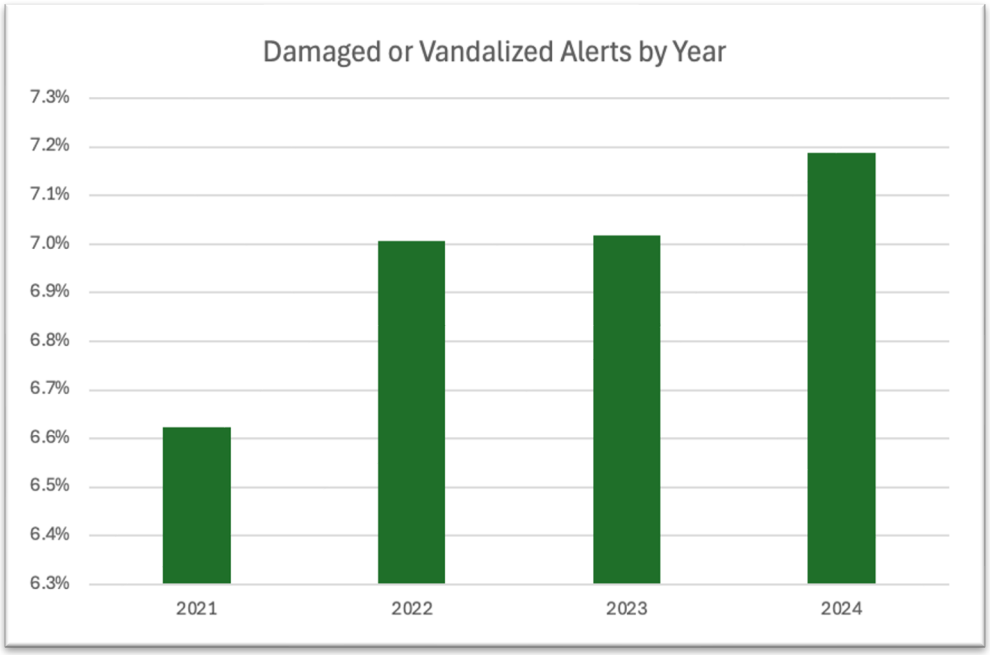
To investigate potential changes over time in each type of property officers identified while responding to ShotSpotter alerts, we disaggregated the total 2611 alerts according to the type of property. To account for the increase in coverage area over time, we present percentages (e.g., the number of alerts with Non-OIBRS evidence in 2021 divided by the total number of alerts with property in 2021) rather than raw numbers. First, even though the ShotSpotter coverage area increased significantly halfway through 2023, CDP's post-expansion was less likely to discover Non-OIBRS property when responding to ShotSpotter alerts (Figure 20).

Figure 20. Percentage of ShotSpotter Alerts with Property Identified in Which Officers Specifically Recovered *Non-OIBRS Items,* Cleveland's 4th police district, 1/2/2021-12/31/2024



However, officers were more likely to identify property that was *damaged or vandalized* from 2021 to 2024 (Figure 21).

Figure 21. Percentage of ShotSpotter alerts with Property Identified in Which Officers Specifically Recovered *Damaged or Vandalized Items,* Cleveland's Fourth District, 1/2/2021-12/31/2024



Similarly, a higher proportion of the property found as a result of ShotSpotter alerts was categorized as *recovered/stolen/confiscated* in 2023 and 2024 compared to 2021 and 2022 (Figure 22).

Figure 22. Percentage of ShotSpotter Alerts with Property Identified in Which Officers identified items as *recovered/stolen/confiscated,* Cleveland's Fourth District, 1/2/2021-12/31/2024

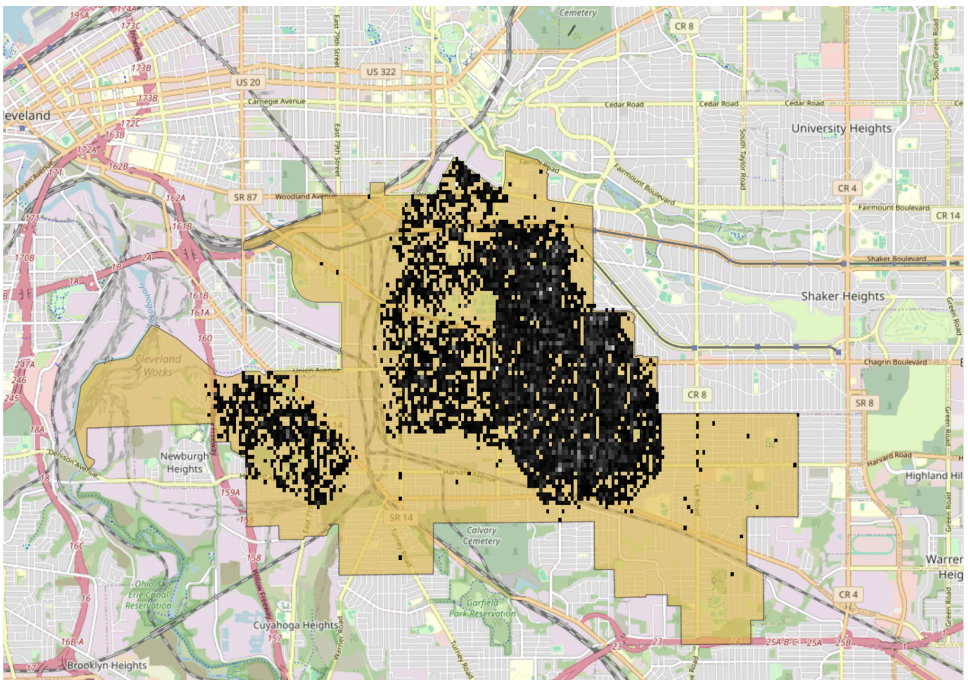
ShotSpotter alerts in the Fourth District

Since ShotSpotter's implementation began in the Fourth District and has continued to expand, encompassing the largest coverage area, we analyzed data provided by CDP on ShotSpotter alerts, essentially since implementation began in 2021.

Figure 23 presents a Kernel Density Estimation map of alerts in the Fourth District. When comparing this map to that provided in Figure 3 (the Fourth District is indicated by C and D, and the area outlined in red represents the coverage area from the pilot program), you can see that the areas with the largest number of alerts somewhat align. Although area C in Figure 24 was added as of 2024 and therefore had the coverage for the shortest period of time.

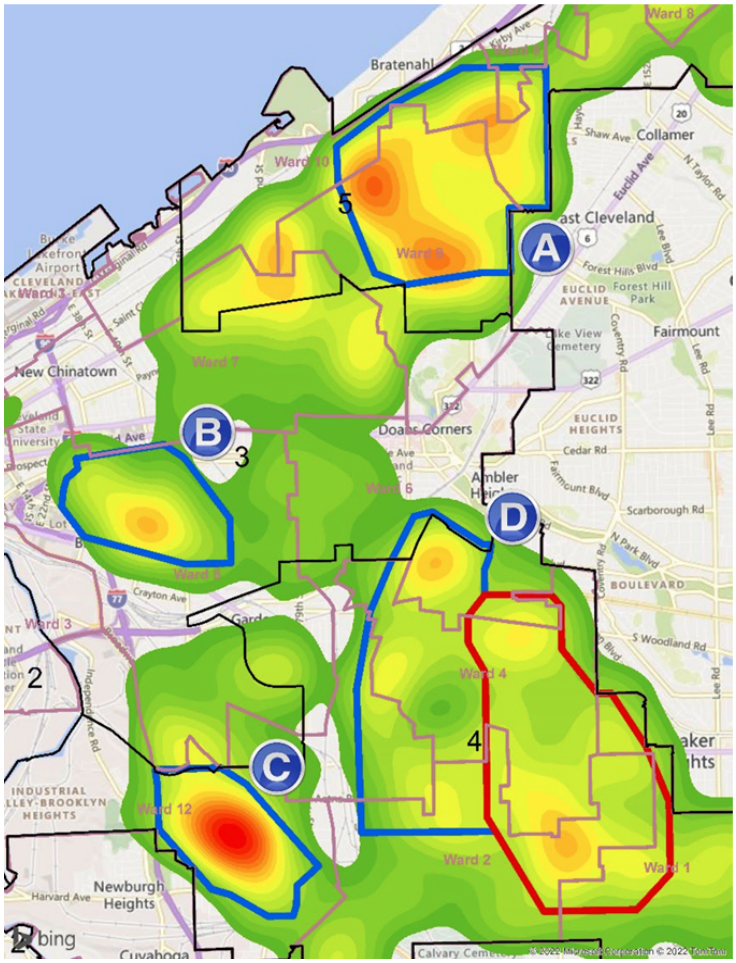
Figure 23 should not be interpreted to indicate the location of gunfire in the Fourth District, but instead as the location of gunfire in the Fourth District within the ShotSpotter coverage area. Also, of note, all alert locations outside of the Fourth District boundaries have been removed from this analysis, such that a ShotSpotter call could have been detected in locations outside the boundaries of the Fourth District but from Fourth District ShotSpotter sensors.

Figure 23. Kernel Density Estimation Map of ShotSpotter Alerts, CDP's Fourth District, 01/02/21 to 04/16/2025



Source. ShotSpotter alerts provided by CDP. *Note.* Yellow boundaries present the CDP's Fourth District.

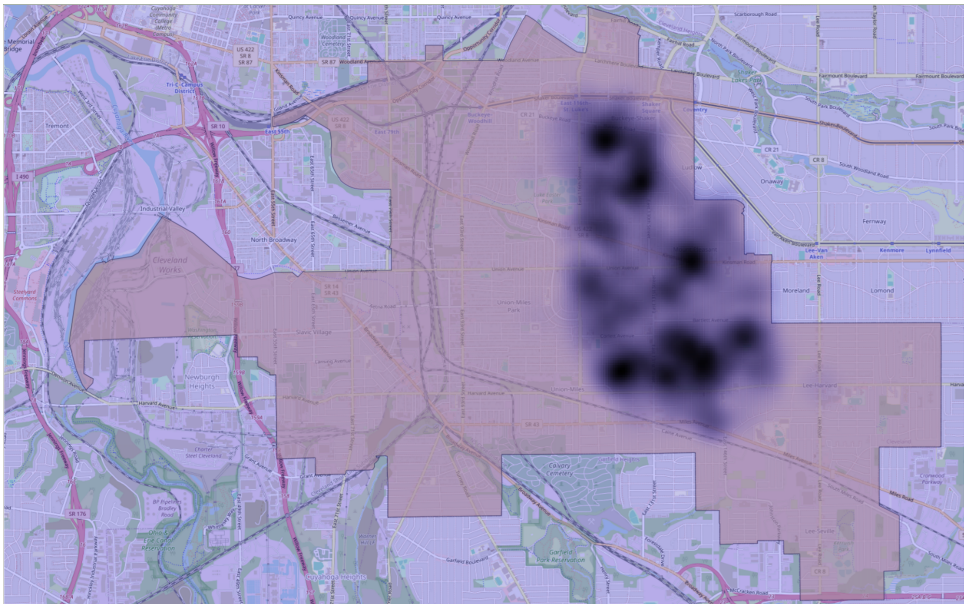
Figure 24. Proposed Expansion Coverage Areas, Cleveland Division of Police, May 2022 (also presented as Figure 3 in this report)



Source. SoundThinking

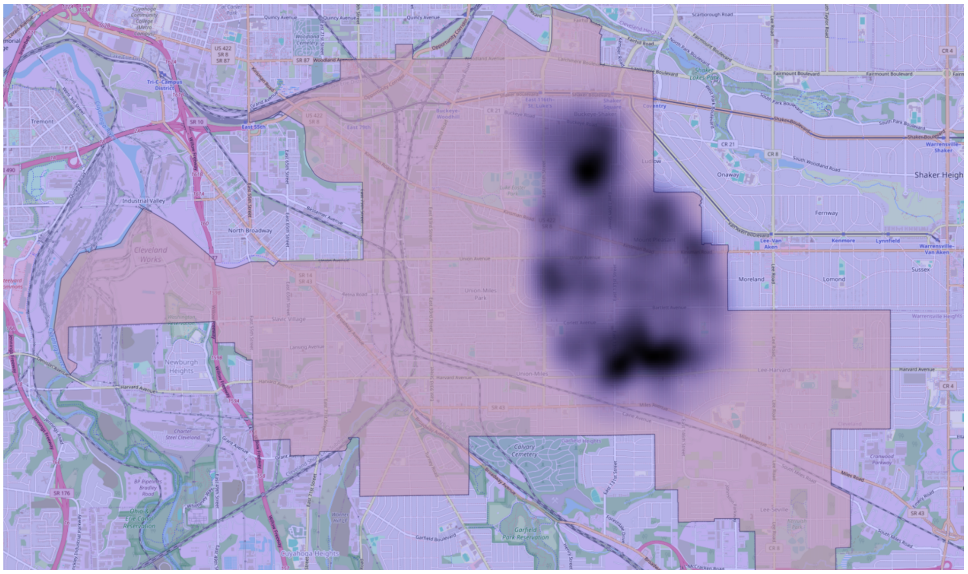
To illustrate change over time, the following figures depict the concentration of ShotSpotter alerts over time for the Fourth District (Figures 25 – 30). The figures represent the Fourth District's continued expansion.

Figure 25. Kernel Density Estimation Map of ShotSpotter Alerts, CDP's Fourth District, 2020



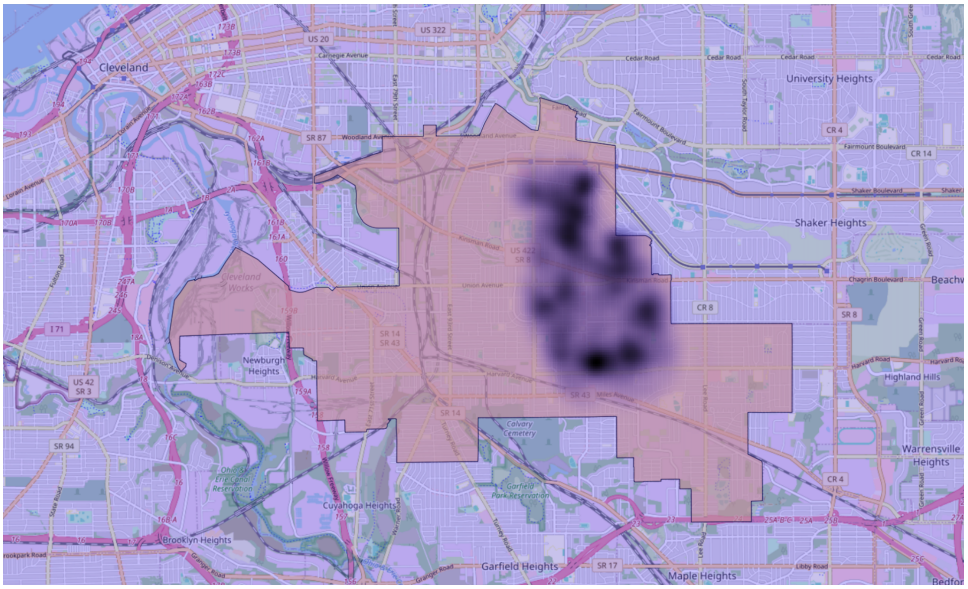
Source. ShotSpotter alerts provided by CDP. *Note.* Yellow boundaries present the CDP's Fourth District.

Figure 26. Kernel Density Estimation Map of ShotSpotter Alerts, CDP's Fourth District, 2021



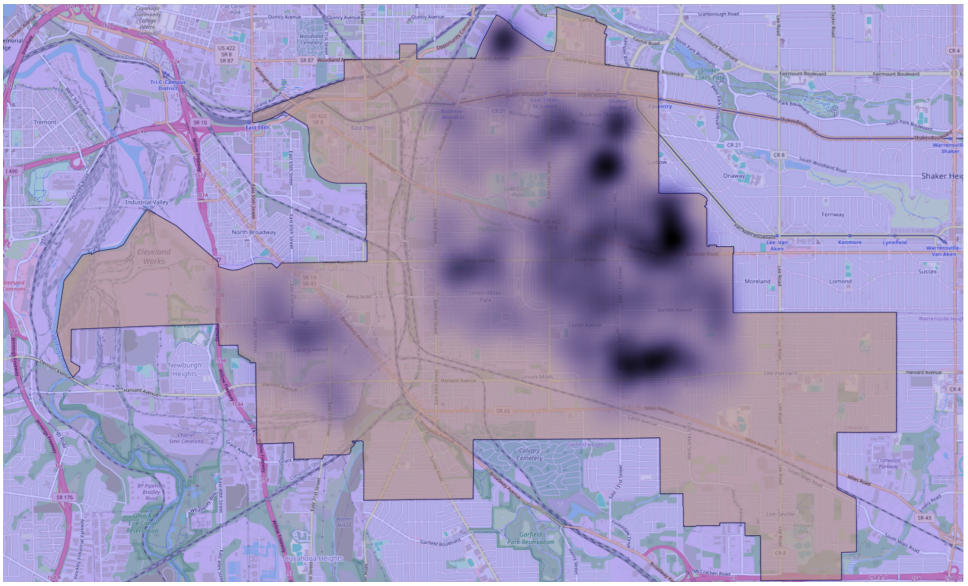
Source. ShotSpotter alerts provided by CDP. *Note.* Yellow boundaries present the CDP's Fourth District.

Figure 27. Kernel Density Estimation Map of ShotSpotter Alerts, CDP's Fourth District, 2022



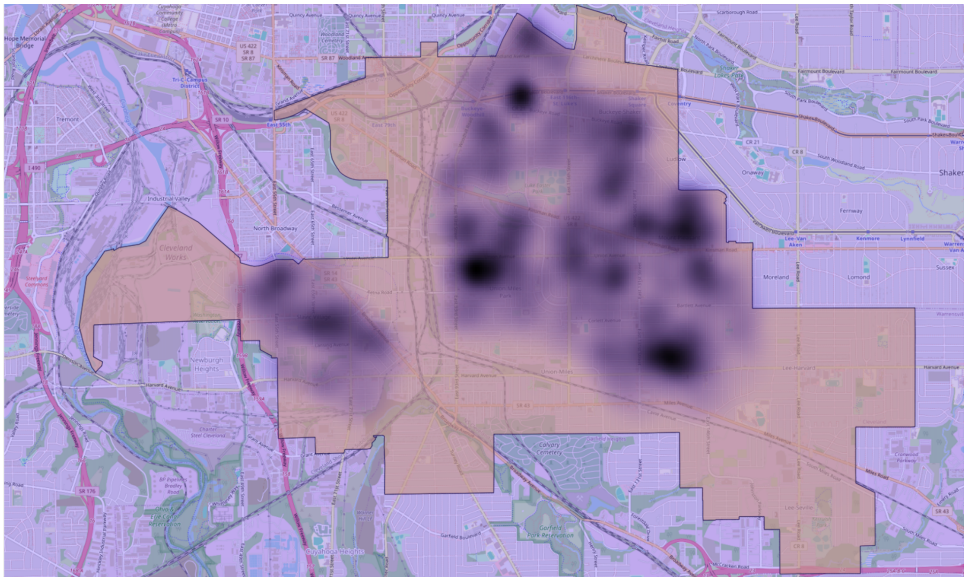
Source. ShotSpotter alert provided by CDP. *Note.* Yellow boundaries present the CDP's Fourth District.

Figure 28. Kernel Density Estimation Map of ShotSpotter Alerts, CDP's Fourth District, 2023



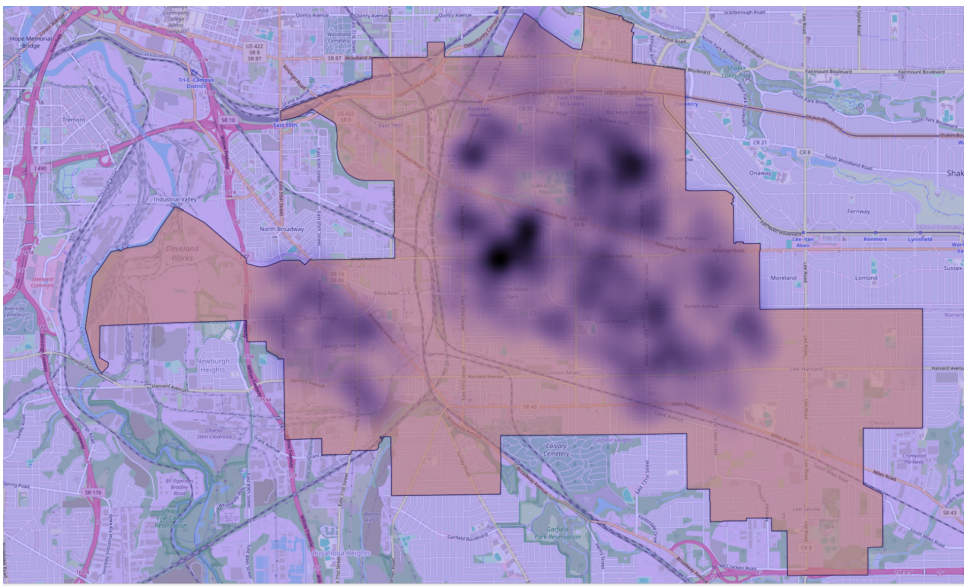
Source. ShotSpotter alerts provided by CDP. *Note.* Yellow boundaries present the CDP's Fourth District.

Figure 29. Kernel Density Estimation Map of ShotSpotter Alerts, CDP's Fourth District, 2024



Source. ShotSpotter alerts provided by CDP. *Note.* Yellow boundaries present the CDP's Fourth District.

Figure 30. Kernel Density Estimation Map of ShotSpotter Alerts, CDP's Fourth District, April 2025



Source. ShotSpotter alerts provided by CDP. *Note.* Yellow boundaries present the CDP's Fourth District.

ShotSpotter Post-Expansion

To best represent the outcomes from ShotSpotter alerts after the city expanded the coverage areas beginning in 2023 (see Figure 3 and Table 2 for exact dates), we reviewed descriptive statistics provided by CPD for the years 2023 and 2024 from the Ground Truth Tracker app. For these two years, the total number of alerts published by ShotSpotter was 7011 and 8013, respectively, and the daily average number of ShotSpotter alerts CDP responded to increased by 10% from 20 to 22. However, ShotSpotter did not expand until April 2023, while 2024 saw continued expansions. With expanded coverage areas and a calendar year of alerts, a 10% increase is lower than expanded, but might be attributable to violent crime in Cleveland declining in 2024 compared to 2023.

Given that the size of the ShotSpotter coverage areas increased over these two years, for accurate comparison, we present the outcomes below as percentages rather than raw numbers. Figure 31 and Table 5 illustrate the following outcomes by year. Below are our key findings from this analysis.

Residents were less likely to call 911 to report hearing gunshots.

The percentage of ShotSpotter alerts that also had a 911 call decreased from 13% to 10% from 2023 to 2024. CDP reported a similar decrease in 911 calls after the first 6 months the technology had been used solely in the Fourth district (Cleveland Division of Police, 2021).

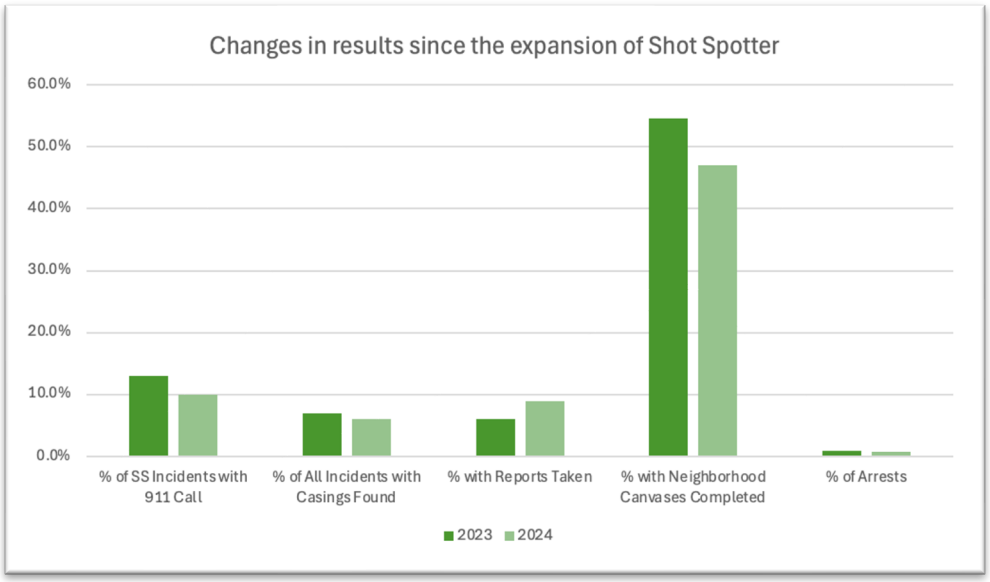
The proportion of ShotSpotter calls in which responding officers discovered gunfire evidence has decreased slightly.
The percentage of ShotSpotter alerts that resulted in casings found decreased from 7% to 6% from 2023 to 2024.

Police are filing more police reports when responding to ShotSpotter alerts.
In 2023, 6% of ShotSpotter alerts were associated with the creation of a police report. In 2024, 9% of alerts resulted in this outcome.

CPD officers have been less likely to conduct a community canvas as part of their response to ShotSpotter alerts. While police reported conducting a community canvas in a little more than half (55%) of ShotSpotter alerts in 2023, this percentage dropped to 47% in 2024, which might be attributable to the increased workload and procedural adherence associated with the expansion. Of note, this practice was changed in the newly revised GPO.

Despite the addition of additional coverage areas over time, the likelihood of officers arresting while responding to a ShotSpotter remained low. The proportion of ShotSpotter alerts that resulted in arrests in both 2023 and 2024 was stable at .8%.

Figure 31. Changes from ShotSpotter Expansion, 2022 to 2023



Source. ShotSpotter alerts provided by CDP.

In addition to the above outcomes, we reviewed data on ShotSpotter alerts in which the responding officer(s) identified victims of homicide or felonious assault and found that **officers are not more likely to identify victims of serious crimes while responding to alerts after ShotSpotter completed its expansion.** The likelihood of officers finding victims of homicide and felonious assault while responding to a ShotSpotter alert has decreased since the expansion of ShotSpotter coverage areas in the city, though the overall probability of this outcome is very low:

Table 5. Percent of ShotSpotter Alerts Associated with Victims, Cleveland, 2023 and 2024

Year	2023	2024
% of Alerts: Homicide Victims	0.2%	0.1%
% of Alerts: Felonious Assault Victims	4.3%	3.0%

Goal #2: To evaluate the impact on community trust in the police in ShotSpotter by assessing residents' views about the Cleveland Division of Police's use of ShotSpotter

Method 1: Content Analysis of Public Commentary about the Cleveland Division of Police

We analyzed community perspectives on law enforcement, specifically CDP, by examining public comments made during meetings in which community members were invited to participate through discussion, public comment, or question-and-answer sessions. The unit of observation was the meeting itself, while the unit of analysis was each community member's comment about law enforcement or CDP. As noted in Figure 32 and Table 6 below, each comment was coded as *positive*, *negative*, or *neutral* in tone.

The primary data sources were public comment segments from Cleveland City Council meetings, including relevant subcommittee meetings, as Council was the initial catalyst for this evaluation. Additionally, we analyzed public comments made at meetings of the Cleveland Community Police Commission (CPC) and the Cleveland Citizen Police Review Board (CPRB). These venues were selected because they serve as widely recognized and accessible forums for public opinion in Cleveland, where speakers are more likely to prepare and present organized statements, and where public officials are directly exposed to residents' views. Additional relevant meetings included town-hall style meetings that allowed for dialogue between

community members and officials via question-and-answer sessions, such as those hosted by the Consent Decree Monitoring Team. We observed approximately 480 meetings from May 1, 2020 until June 30, 2025.

The content analysis captured the overall number of meetings and individual speakers during the specified time frame, as well as the subset of comments that addressed ShotSpotter technology in particular. This approach was designed to assess the range and distribution of public sentiment about CDP and ShotSpotter as expressed in formal civic settings. *These findings provide insight into the community and community leadership's perspectives of CDP as well as ShotSpotter.*

Figure 32 and Table 6 provide details on public comments about CPD, including but not limited to ShotSpotter. Public comments about CPD were more negative than positive, with variation by year. For all years, between 60% and 74% of the comments were negative, with the most negative commentary occurring in 2025 (as of June 30, 2025). The percent of positive commentary on CPD ranged over the years from 10% in 2023 to 23% in 2024.

However, substantive concerns varied over the observation period based on current events. For example, nearly all comments in 2025 focused on the use of drones by the CDP. *The drop in overall public satisfaction with the police in 2025 is almost entirely due to negative views related to the use of drones by CDP.*

From 2020-2025 overall, almost all community concerns about the CDP centered on topics or behaviors other than ShotSpotter. **Only 7 public comments of the 173 directed at the Cleveland Division of Police (4%) referred specifically to ShotSpotter;** *thus, based on these data, the implementation or use of ShotSpotter by itself did not have any meaningful impact on the observed shifts in public sentiment.*

Figure 32. Content Analysis of Public Commentary on the Cleveland Division of Police, from 2020 to 2025, Negative and Positive as a Proportion of Total Comments

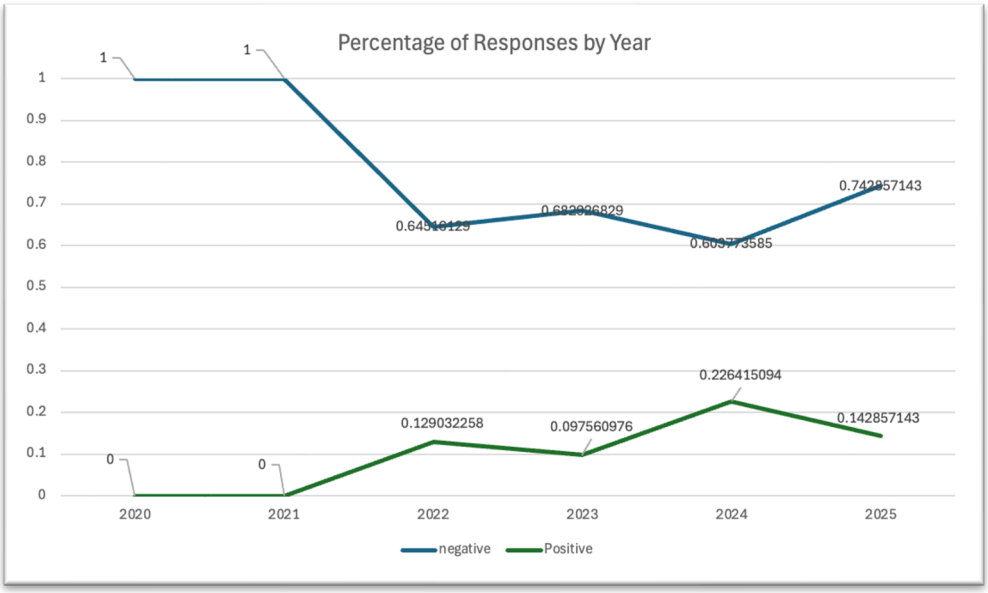


Table 6. Descriptives for the Content Analysis of Public Commentary on ShotSpotter from 2020 to 2025, Percent of Total Comments

Year	**2020**		**2021**		**2022**		**2023**		**2024**		**2025**	
	n	% of total	*n*	% of total	*n*	% of total	*n*	% of total	*n*	% of total	*n*	% of total
Total # comments	*10*		*3*		*31*		*41*	*0.32*	*53*	*0.29*	*35*	
Negative tone	10	100	3	100	20	65	28	68	32	60	26	74
Positive tone	--		--		4	13	4	10	12	23	5	14
Neutral tone	--		--		7	23	9	22	9	17	4	11

Below are some specific examples of the types of ShotSpotter comments from residents. These comments were uniformly negative in tone, expressing concerns related to the cost of ShotSpotter, its effectiveness, and/or how CDP use/might use ShotSpotter to surveil residents unjustly:

One resident said, “De-funding surveillance is necessary because it causes distrust…ShotSpotter calls are prioritized over real people, causing overpolicing of black and brown people.” Furthermore, they claimed that ShotSpotter is related to (overzealous) ICE enforcement. They urged Council to cancel ShotSpotter because it is ineffective and too expensive.

Another resident cited prior studies that suggested that ShotSpotter has failed to be useful in other cities. They did not support the expansion of ShotSpotter but suggested using an independent evaluator to assess its effectiveness if Cleveland decides to expand its use.

Yet another resident stated, “We should invest in preventative measures first rather than ShotSpotter.” They suggested that Cleveland Documenters has collected/published public opinion data to show that city residents do not want Council to support ShotSpotter.

Another resident similarly expressed preference for alternative policing techniques “We need community policing not just ShotSpotter.” They further cited a need for more police training in evidence collection.

One resident also called for training. They believed that if the City were to implement ShotSpotter, CDP should undergo training on it and other new technologies to ensure their use of the technology does not infringe upon people’s civil rights. “The public needs to know about this [ShotSpotter].” The City should not invest in ShotSpotter if the community is unaware of what it is and how it works.

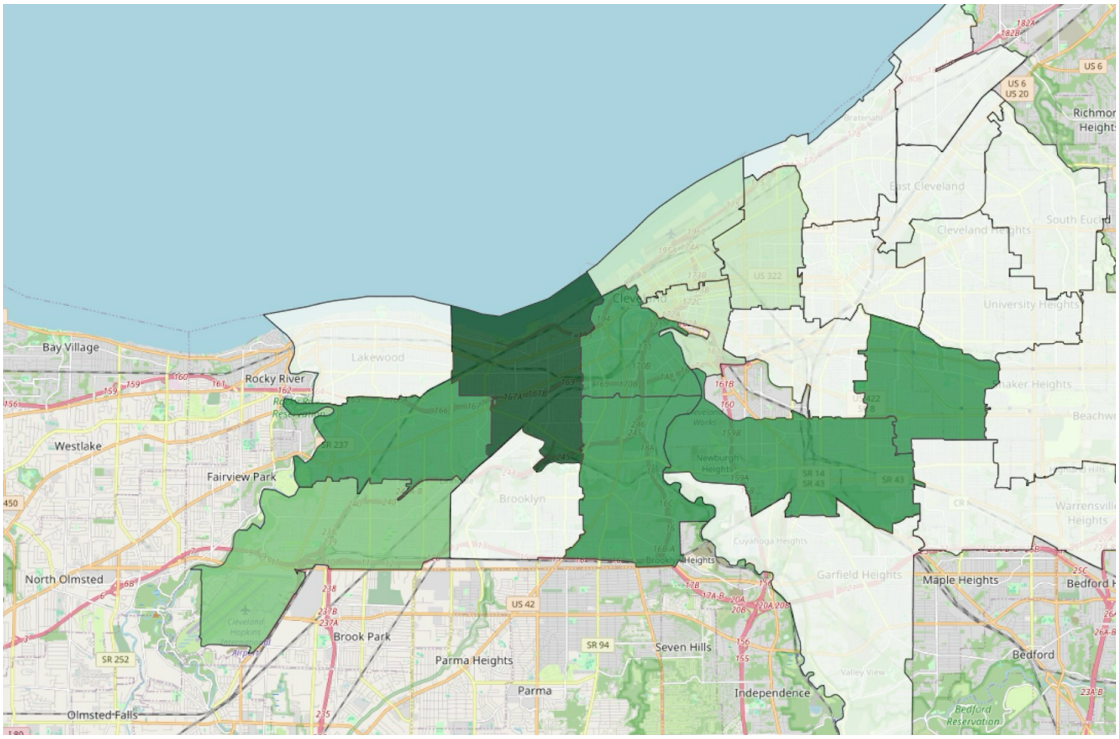
A different resident expressed frustration that despite evidence that CDP has used ShotSpotter as a pretext for investigatory stops, Council expanded it anyway. “We need to pay attention to how CDP is using it (ShotSpotter).”

One resident stated, “ShotSpotter is making a profit off of Cleveland.” They want the city to consider alternative technologies that do not compromise residents’ civil rights and privacy.

Method 2: Online Community Survey

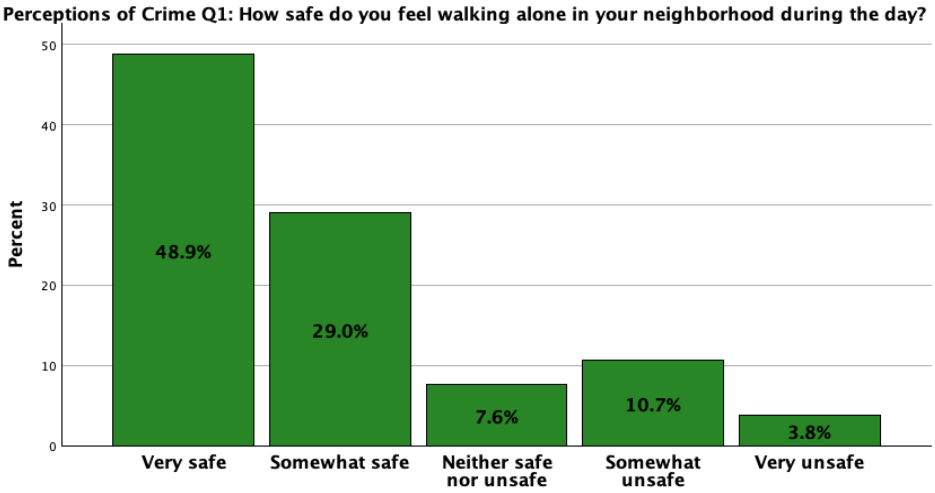
From September 2024 to February 2025, we administered an online anonymous survey for the community. The survey allowed for more focused data collection about residents’ opinions of CPD, ShotSpotter, and perceptions of gunfire. Residents surveyed were asked to provide their zip code. The distribution of responses is presented in the following image, in which darker colors represent more residents surveyed (Figure 33).

Figure 33. Map of Community Survey Participants' Zip Codes, Cleveland



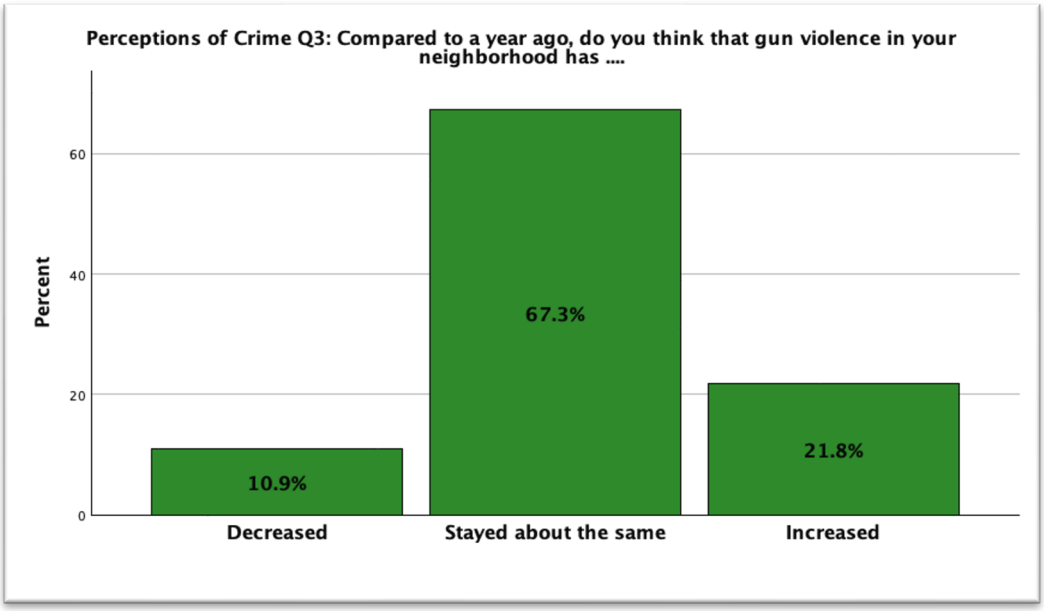
The responses to this survey are as follows:

The majority of respondents (78%) expressed feeling very safe or somewhat safe during daylight hours. Only a small number reported feeling unsafe or very unsafe, indicating a general sense of confidence regarding neighborhood safety during the day.

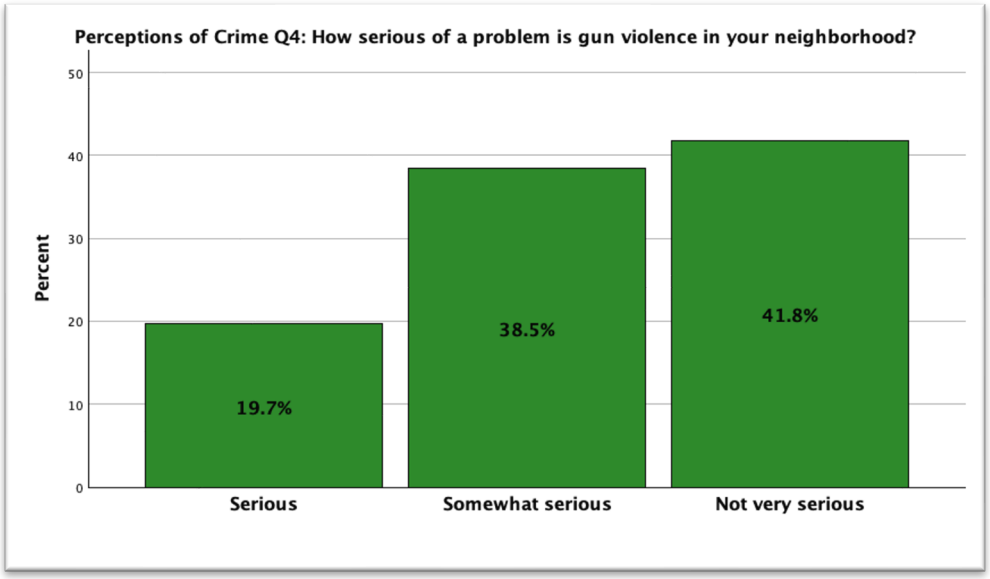

Perceptions of Crime Q1: How safe do you feel walking alone in your neighborhood during the day?
Percent
50
40
30
20
10
0
48.9%
29.0%
7.6%
10.7%
3.8%
Very safe
Somewhat safe
Neither safe nor unsafe
Somewhat unsafe
Very unsafe

However, when asked about feelings of safety after dark, there was a significant drop in perceived safety compared to during daylight. While the majority (54%) still reported feeling very or somewhat safe, there's a notable increase in responses for somewhat unsafe and very unsafe, indicating heightened concern about crime or visibility at night.

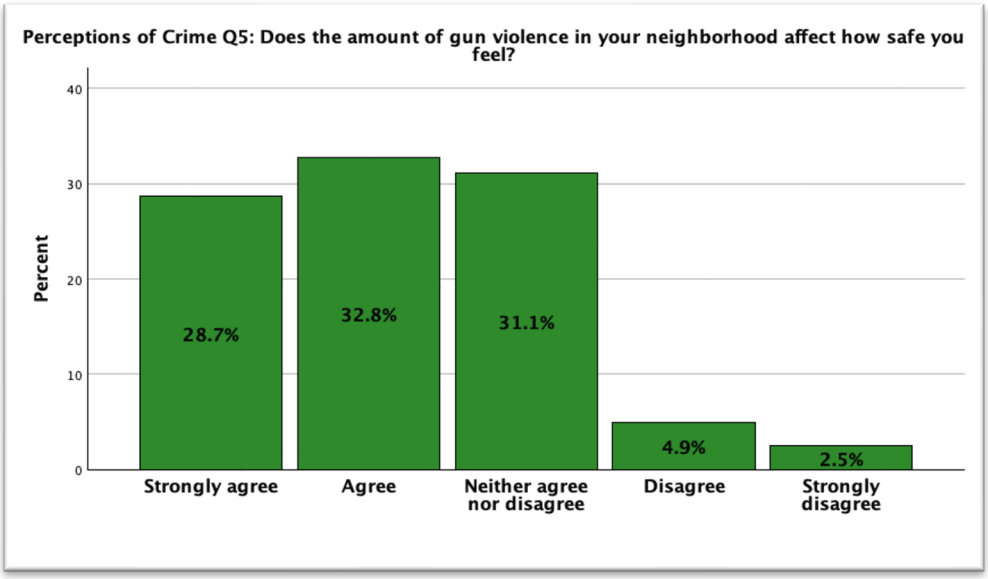
Responses were divided, with over two-thirds of residents (67%) indicating that gun violence has increased compared to a year ago. A lesser percent (22%) stated it stayed about the same, while even fewer observed a decrease 11%).



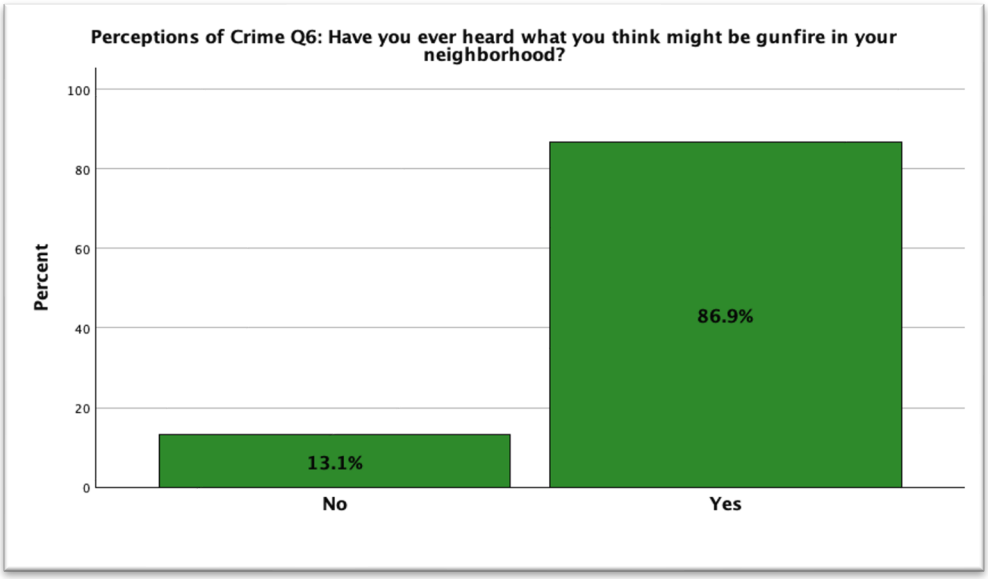
The majority of respondents (58%) viewed gun violence as serious or somewhat serious, with 20% feeling it was not very serious, indicating widespread concern about its effects and prevalence.


Perceptions of Crime Q4: How serious of a problem is gun violence in your neighborhood?
Percent
50
40
30
20
10
0
19.7%
38.5%
41.8%
Serious
Somewhat serious
Not very serious

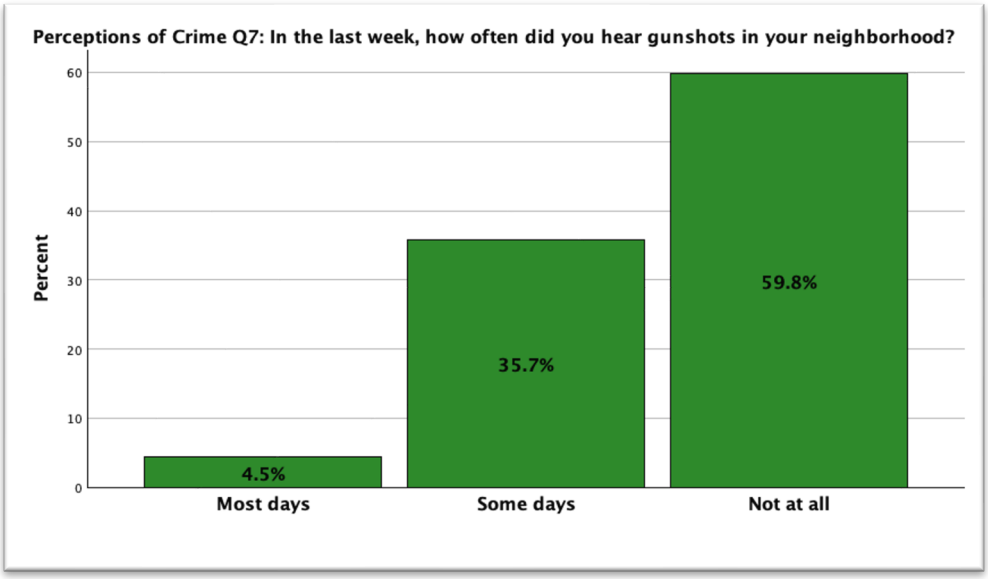
Most respondents (62%) agreed or strongly agreed that gun violence affects their sense of safety. This highlights a significant psychological effect among those who completed the survey.



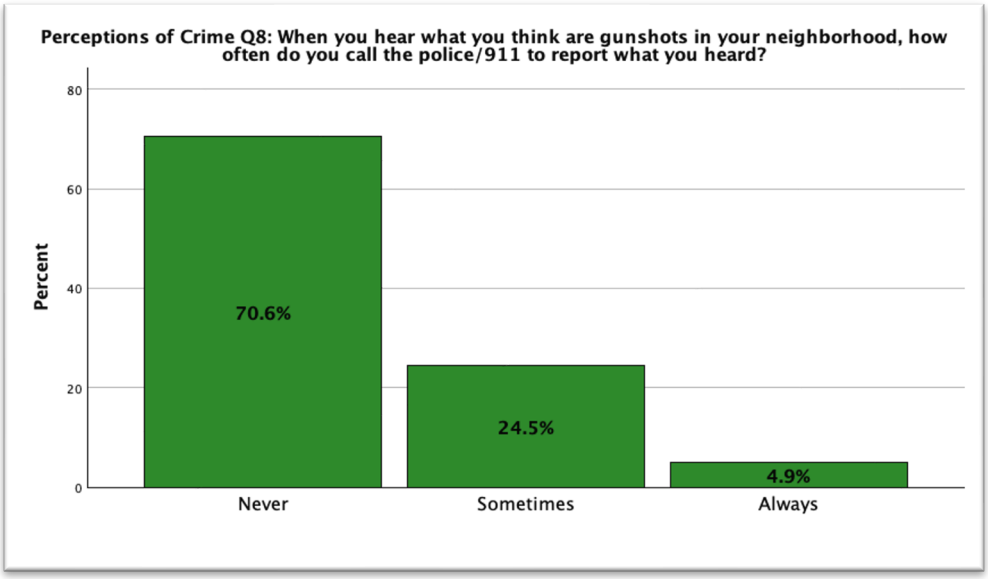
The following chart indicates that hearing gunfire was a common experience for those who completed the survey—87% responded affirmatively to this question. *This response suggests that those who completed the study were most likely to be living, visiting, or working in neighborhoods most impacted by gun violence.*



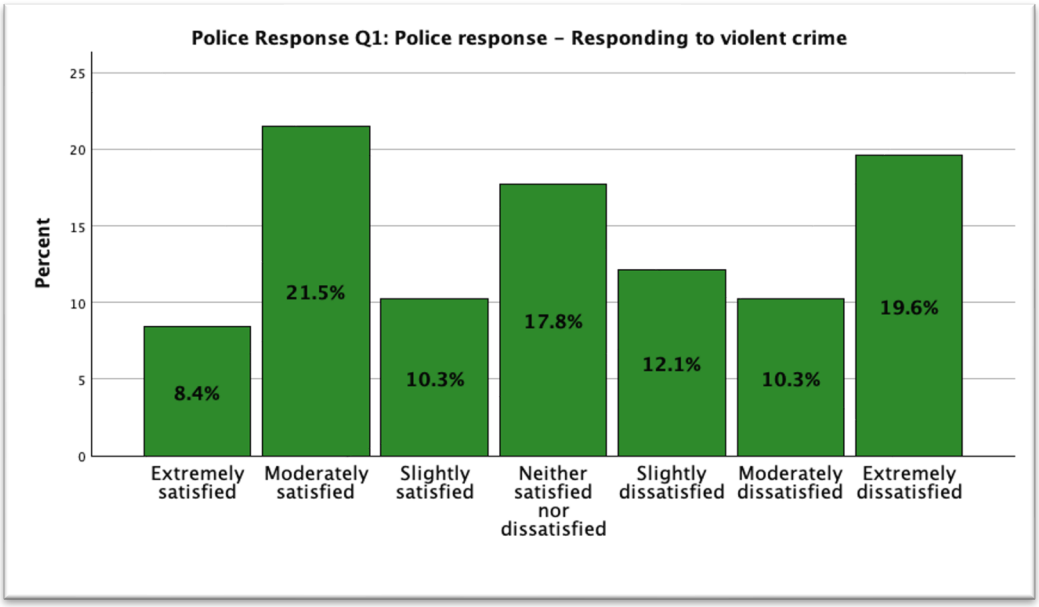
Responses ranged widely to the question about how frequently they heard gunshots in their neighborhood last week. The majority (60%) said not at all. Over a third (36%) said on some days, on most days, and 5% said on most days. This suggests a concentrated exposure in some areas or among certain respondents, indicating geographic variability in violence.



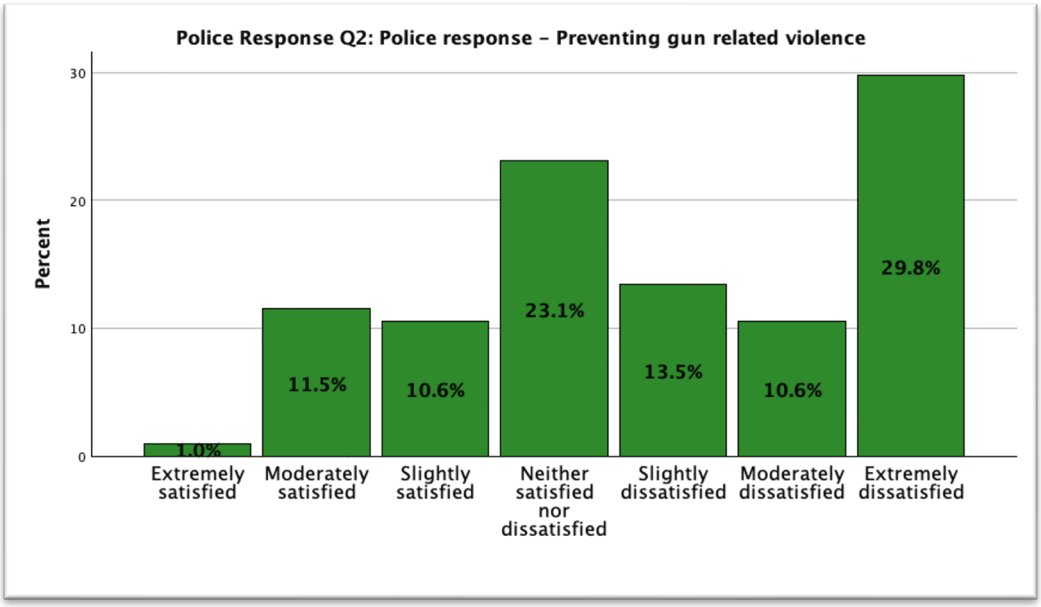
Most respondents (71%) reported never calling the police if they heard gunshots in their neighborhood, 25 % said they called the police sometimes, and only 5% said they often did, suggesting that many incidents go unreported.



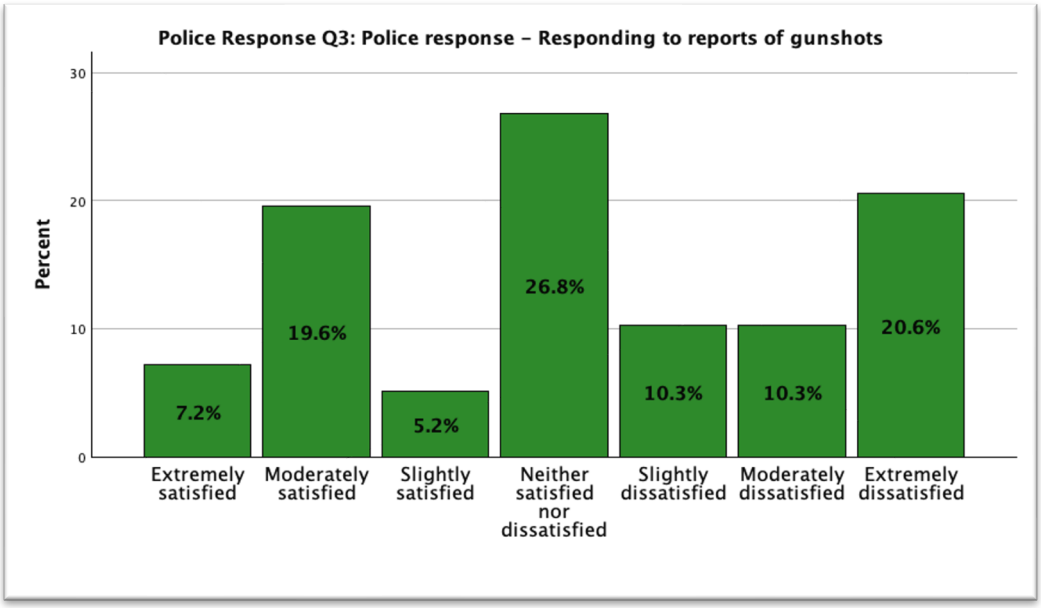
Responses about CDP's response to violence varied. About 40% said they were satisfied, with 22% saying they were moderately satisfied. About 43% % said they were unsatisfied, with 20% saying they were extremely dissatisfied. Nearly a fifth (18%) were neither satisfied nor dissatisfied, pointing to a divided perception of police performance.



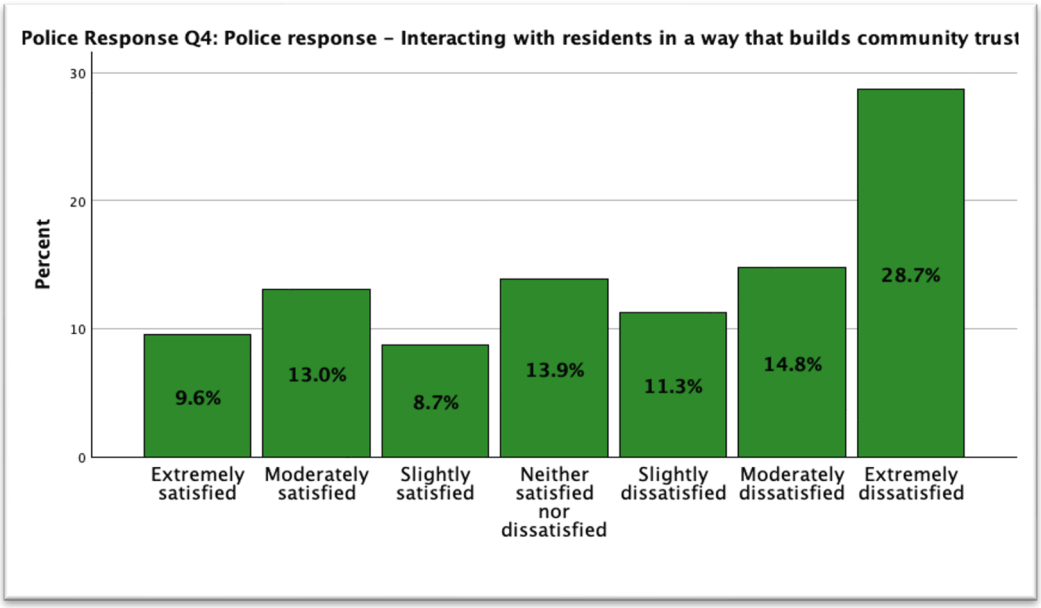
However, respondents reported being more dissatisfied with CDP's response to preventing gun-related violence. Almost 54% were dissatisfied (with 30% of these reporting being extremely dissatisfied), 22% were satisfied, and nearly a quarter were neither satisfied nor dissatisfied. 30%, suggesting substantial concern about the effectiveness of prevention efforts.



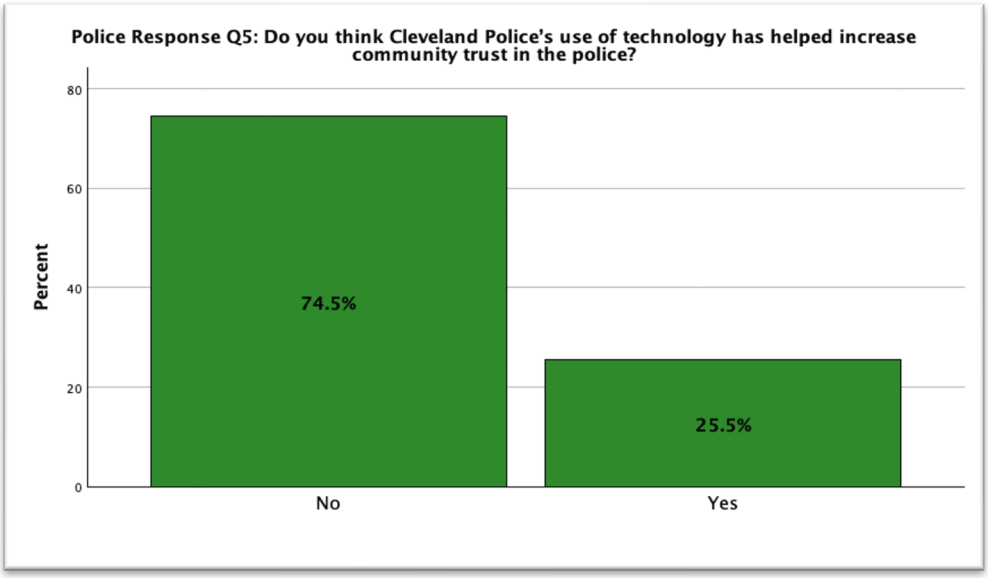
As with previous questions, satisfaction with CDP's response to reports of gunshots was mixed. Over a quarter said they were neither satisfied nor dissatisfied, 41% said they were dissatisfied, and 32% said they were satisfied, which may reflect perceived delays or a lack of follow-up.



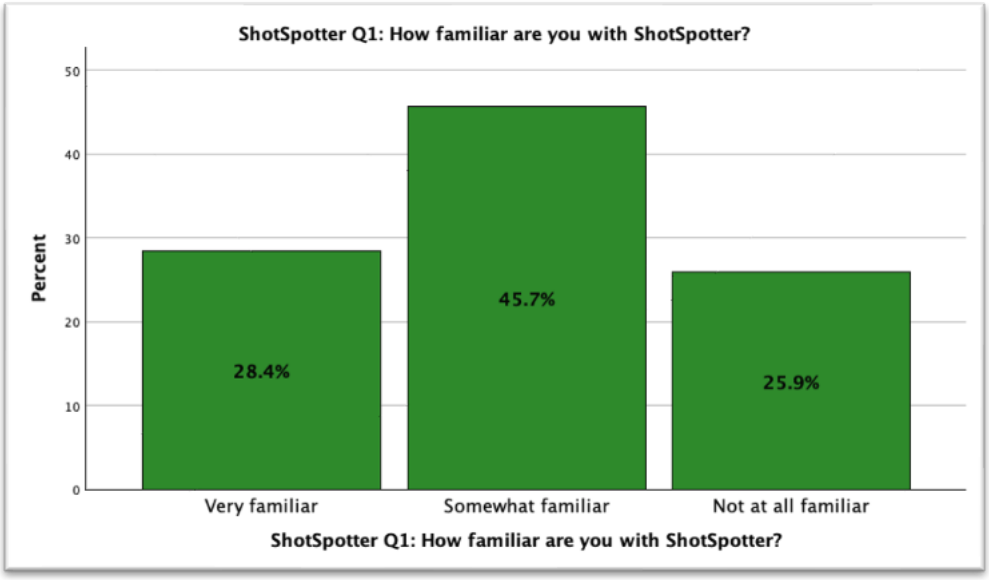
The chart shows a notable distribution across all satisfaction levels of CDP's response to interacting with residents in a way that builds community trust. While 31% of respondents felt satisfied about police-community relations, 14% were neither satisfied nor dissatisfied, and 55% reported dissatisfaction, indicating a trust gap that could be addressed through engagement strategies.

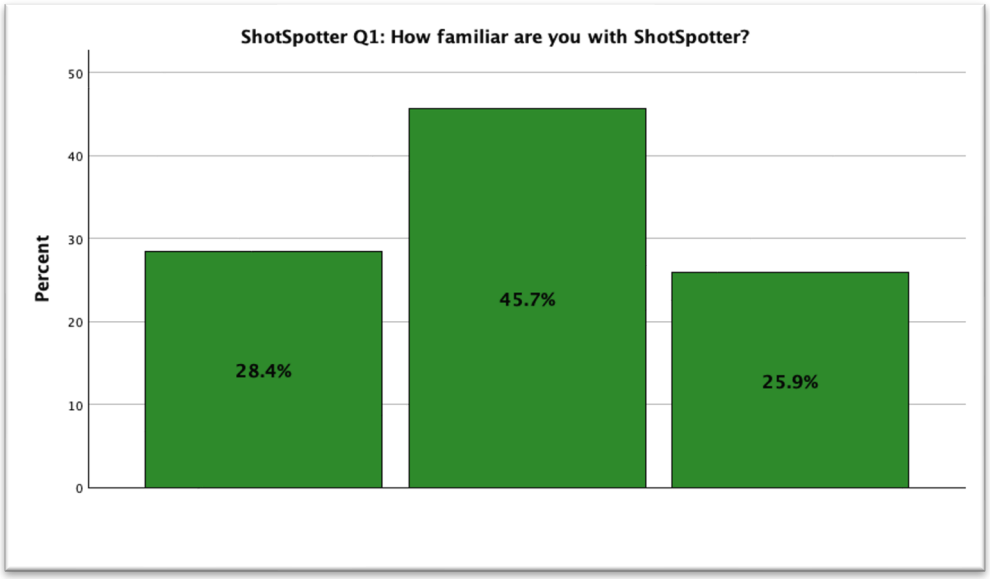


Three-fourths of respondents said that CPD's use of technology has not helped increase community trust in police.

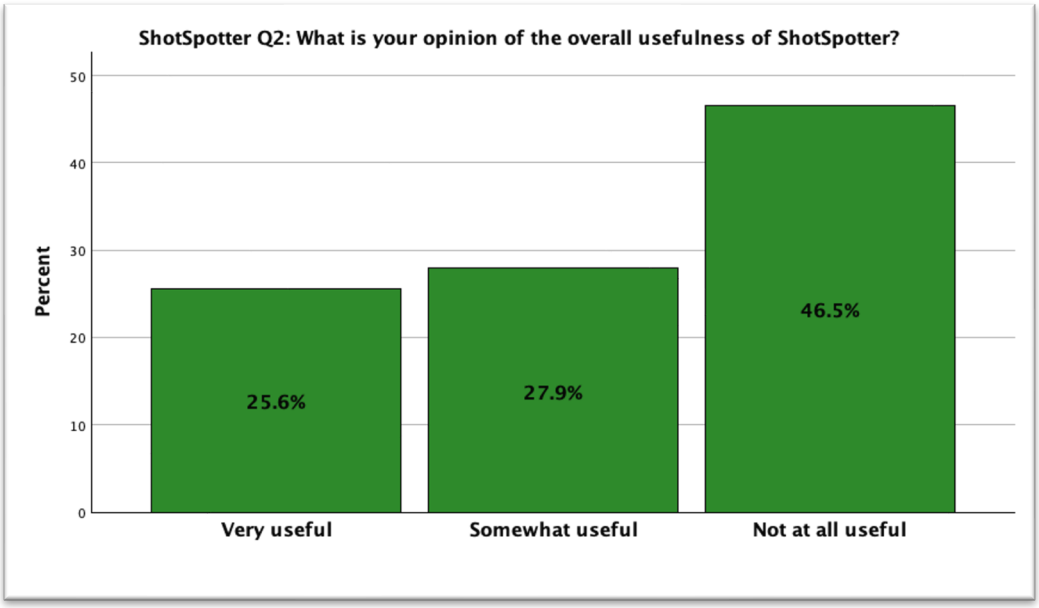


Responses showed varying levels of awareness of ShotSpotter. Almost half reported being somewhat familiar with ShotSpotter, nearly a third said very familiar, and over a fourth said not at all familiar.





Among those familiar with ShotSpotter, perceptions of usefulness varied. Almost half found it not useful at all, over a quarter found it somewhat useful, and almost a quarter found it very useful, with broader skepticism about its effectiveness or accuracy.



Below, we summarize **the two open-ended responses to the community survey online regarding ShotSpotter.** One response from a respondent could encompass several themes.

Below are the six themes that emerge from their feedback to the prompt, *"In a few words, please tell us why you either called or did not call the police/911 to report what you thought were gunshots?"*

The first five pertain to the majority of comments about why they did not call. The last theme pertains to why they did call.

1. Distrust of police
Many individuals express a lack of faith in the police, believing that they may escalate situations rather than resolve them, or that their response will be slow and ineffective. One respondent said, they were "Uncomfortable around police." Another said, "I believe the police usually cause more harm than good and would only call them if there was a clear danger to someone's life that could not be otherwise resolved."

2. Uncertainty and confusion
Numerous individuals are unsure whether the sounds they hear are actual gunshots or could be something else, such as fireworks or backfiring cars, or where the shots were fired. This uncertainty leads to hesitation in making 911 calls. One specifically said, "ShotSpotter alerts police, so I don't need to." Another stated, "Dispatch wants an exact location, which I can't tell a house address. Cleveland police response is slow/non-existent."

3. Perception of ineffectiveness
Some believe that calling the police does not lead to meaningful action, especially if the location of the gunshots is unclear or if the police are perceived as having more pressing matters to deal with. Below are several participants' responses:

> Typically, when you hear gunshots, it's impossible to know where they are coming from, other than the general direction. It would be a waste of time to report shots if I can't say where they happened.
>
> Never sure if it is actually gunfire, or have any details on where it came from.
>
> By the time they respond the people doing the shooting are long gone.
>
> The police wouldn't respond anyway, they have too much work to investigate potential shots fired.

4. Community awareness
Many feel a communal responsibility, stating that they assume that someone closer to the noise will report it, thereby reducing their own urge to intervene. One summarizes this as:

> "I will call if they sound very close and if it's multiple shots, like within a few houses of where I live. If it sounds farther away, I don't call because I don't know where they are coming from, and I assume someone who is closer and can give information will call."

5. Not wanting to get involved
There are underlying fears that involvement with the police could result in violence, either against community members or themselves, leading to a reluctance to engage. There is also a concern about potential backlash from the community or individuals involved in incidents if police are called. Many people prefer to avoid any association with law enforcement for personal safety. One responded, "I feel like if I call the police I'll somehow be involved. I want to remain completely separate from any gun activity." Another stated, "I mind my business." Yet another summarized by stating that they "do not want to be identified as someone who calls the police."

6. Personal responsibility
For those who reported, they did so out of a sense of personal responsibility. One said they "called as I heard gunshots, wanted to make sure everyone was safe." Another: "It is the right thing to do." And finally: "I called because the gunshots were nearby my home."

Below are the four themes that emerge from their feedback to the prompt, *"In a few words, what benefits, if any, do you see in the Cleveland Police's use of ShotSpotter?*

Overall, opinions are mixed, highlighting a range of perceptions regarding its impact on safety and policing efficacy. Fewer respondents answered this question, and often the respondents were shorter. Overall, opinions are mixed, highlighting a range of perceptions regarding its impact on safety and policing efficacy.

The first three pertained to benefits, and the last theme to drawbacks.

1. Quicker response, better accuracy
As expressed in various responses, CDP's use of ShotSpotter benefits include quicker response times to gunfire incidents, better accuracy in identifying the location of shootings, and potentially saving lives by enabling police and paramedics to arrive sooner. The majority of the responses pertained to reducing response times. One respondent stated, "It could potentially increase responsiveness. And another said, "One benefit would be they would the exact location or area the shots were fired which in return would make it more easy catching the person who fired the gun."

2. Reduced reliance on residents
A few said they believed it helps reduce reliance on residents to report gunfire.

3. Enhanced police awareness
A few mentioned they thought it was a valuable tool that could enhance police awareness.

4. Waste of money, not effective
In a question about benefits, several respondents expressed significant concerns about its effectiveness and cost, with some people viewing it as a waste of taxpayer money and others feeling it may increase surveillance without improving community trust in the police.

Summary of open-ended responses
For both questions, the sentiments expressed in this question reflect a distrust and discomfort in involving police or themselves in situations that entailed gunfire or engaged the police. The responses underscore an often-complex relationship that communities may have with law enforcement, particularly in areas where gun violence is a concern. They highlight the need for alternative strategies to enhance safety and communication, strategies that do not rely solely on residents to report shots fired.

Method 3: Qualitative Data Gathered via Researcher-Administered Surveys and Interviews of Community Members

In addition to conducting the online survey interviews, we conducted participant observation of meetings, trainings, and informal gatherings related to CDP and/or ShotSpotter. We collected additional feedback through anonymous discussions with individuals who attended meetings, trainings, and informal gatherings (primarily at district community meetings). This feedback aimed to test the validity of our interview and survey data and to contextualize the insights gained from other methodologies.

In total, we spoke with an *additional 76 individuals,* often using the community survey as a guide for the informal feedback/conversations. Since both the survey and the participant observations were anonymous, we cannot guarantee that the same persons participated more than once; however, based on our experience, this is unlikely, as people would have informed us that they had already completed the survey.

Using iterative coding, we identified the following key themes.

1. Cost of ShotSpotter
Residents expressed concern about the cost of ShotSpotter and preferred that the funds be allocated to enhance public safety in alternative ways. More specifically, nearly a third of

residents who spoke with said that ShotSpotter was too expensive. Most of these residents would prefer that the money currently spent on ShotSpotter be allocated towards other policing efforts.

Of those who cited this concern, the most mentioned preference was for the money to be spent on technology that includes a video component. For example, a number of residents in the Third district said that they wanted more video cameras on main roads and intersections in their neighborhood. Citizens felt that video technology is more useful for identifying lawbreakers than ShotSpotter. They also believed that potential lawbreakers are deterred by these video cameras because they have blinking blue lights that are easily spotted and known to be recording devices. This contrasts with ShotSpotter sensors because (as relayed by those interviewed) people in the city generally do not know what areas of the city are covered by ShotSpotter and where sensors are located.

Residents in all areas of the city also expressed a preference to allocate resources towards additional officers on the streets. A common sentiment was that more officers would help reduce long response times for citizen calls. Many people cited personal experiences when they called the police, but either waited for hours to see the problem resolved or never found the complaint to be resolved at all. Indeed, these were usually calls regarding public order concerns such as parking violations, excessive noise complaints, and other public disturbances; however, multiple people also expressed frustration that their reports of perceived gunfire did not result in visible officer presence/response. (However, it is important to note that hiring more officers is not simply a matter of additional funding, nor was CDP provided the option to either use allocated funding to hire more officers or expand ShotSpotter coverage.)

Some residents felt that the resources allocated to ShotSpotter would be better spent on efforts to prevent crime and remedy current crime problems in the city. Respondents recognized several social factors they believe contribute to crime, such as mental health issues, dearth of housing, lack of educational and lawful gainful employment, and ineffective family situations. They suggested that the city dedicate more resources towards these pursuits.

Finally, a number of respondents would like to see the city allocate more funds to efforts aimed at preventing and addressing police misconduct and biased policing, rather than investing in ShotSpotter. Residents believe that these funds should be focused on addressing the issues noted in the Consent Decree between the City of Cleveland and the United States Department of Justice.

2. ShotSpotter is not as effective as other policing strategies

Residents perceive ShotSpotter as less effective than alternative policing strategies.

First, and as noted above, residents see video camera technology as a more valuable tool in helping the CPD solve crimes. Indeed, several people relayed personal experiences in which

video footage from their or their neighbors' personal video surveillance cameras or doorbell cameras was used by CDP to identify lawbreakers. Also noted in the above, residents cited multiple perceived benefits of spending funds currently spent on ShotSpotter towards human resources. Residents would like a more visible presence of officers in their community. These included general calls for more officers on the street to respond to calls for service, as well as a preference for policing strategies such as community-based and problem-solving policing that require extensive officer involvement rather than the audio surveillance provided by ShotSpotter. Investment in more officers was suggested as necessary for addressing immediate and neighborhood-specific crime problems other than those involving gunfire and is therefore viewed as irrelevant to ShotSpotter. Visible officer presence was also perceived to be more effective in deterring potential lawbreaking behavior than ShotSpotter technology.

In terms of the perceived value of ShotSpotter in preventing gun-related crimes, residents believe that increasing the penalties for those who unlawfully use firearms would more effectively deter future gun crimes.

Finally, community members view ShotSpotter as primarily a technology designed to surveil the public for potential lawbreakers rather than a tool for improving police-citizen relationships. Some individuals expressed concern that the audio recording capabilities of ShotSpotter were a violation of their privacy. These residents expressed a strong preference for police efforts towards improving procedural justice, an activity they believe is contrary to the use of ShotSpotter and other technologies that have surveillance capabilities.

3. Need to continue to address gun violence.
Residents overwhelmingly feel that addressing gun-related crime in Cleveland is necessary, as also indicated in the online community survey.

Residents' opinions about the magnitude of this problem were mixed. Several people reported recent reductions in the frequency of hearing what they perceive to be gunfire. Some believe that gun-related crimes have gone down in their neighborhoods or at least not gotten worse recently. Others, however, expressed concerns that the amount of gun-related violence where they live is at a record high. Several residents were not sure whether actual gun violence has declined or if they have noticed less gunfire because they are so used to hearing it and are therefore less likely to notice hearing gunshots. However, residents in all areas of the city largely agree that gunfire and violent crime are significant problems where they live.

Residents from communities across the city similarly felt that reducing gunfire and gun-related crime was important to them. *Some residents were therefore pleased to learn about the use of ShotSpotter towards this end. Accordingly, several people advocated for an expansion of this technology.* Several advocated for the expansion of ShotSpotter city-wide to ensure that all communities were equally benefiting from the technology.

4. Perceived benefits of ShotSpotter

Residents see a number of potential benefits of using ShotSpotter in Cleveland.

Beyond ShotSpotter's potential for reducing gun-related crime, *a number of residents were impressed by other aspects of this technology.* Some were pleased with ShotSpotter's potential ability to help officers more effectively respond to gunfire by providing them with situational knowledge when responding to alerts. This was noted as a benefit aimed at improving officer safety as well, because officers know ahead of arriving at the scene whether there is active gunfire or multiple shooters.

A number of people agreed that people in their community, oftentimes including themselves, do not always call 911 to report hearing gunfire. *While some do not call because they are reluctant to intervene, most say that they do not report perceived gunfire out of a concern that they are either unsure whether the noise they heard was in fact gunfire or are not sure about the location of the sound.* These were also key findings in our online community survey. These respondents therefore appreciated ShotSpotter's potential ability to more accurately and consistently identify gunfire than relying on residents alone.

Relatedly, residents recognized that people who report gunfire to 911 may not do so immediately. They therefore appreciated that ShotSpotter provides officers with immediate information about gunfire, potentially resulting in a quicker response.

5. Additional perceived limitations/drawbacks

Residents also see a number of perceived limitations in Cleveland's use of ShotSpotter:

Data concerns

First, while residents note that ShotSpotter should, in theory, reduce response time, they are *frustrated by a lack of data to substantiate whether the technology has, in fact, accomplished this goal in Cleveland.* Similarly, while community members recognize that many residents do not call 911 when they hear what they think is gunfire, they would like to see data related to gunfire incidents that were discovered via ShotSpotter alerts alone, that is, those incidents in which a resident did not also call 911. Some of these residents opposed any renewal or expansion of ShotSpotter without first knowing this information.

Transparency

A number of residents felt that information about the use and implementation of the ShotSpotter technology itself was not transparent and were therefore reluctant to support its use.

Use of recordings

A number of people *worried that SoundThinking might use the recordings in ways other than their stated purpose of alerting police to instances of gunfire.* Some mentioned the possibility that recordings containing personal information might be shared, sold, or used by SoundThinking in ways other than intended. Others worried that the CDP or Prosecutors might use information from these recordings to either identify potential criminal activity not related to the gunfire or as evidence in pending criminal cases unrelated to gunfire. All these activities were perceived to be serious violations of privacy.

Biased policing
These concerns were amplified by the fact that ShotSpotter is not used in all areas of the city. *Residents in the neighborhoods with ShotSpotter coverage would therefore be unduly affected by these activities.* Some respondents voiced the additional concern that the areas where ShotSpotter is implemented may be areas in which the residents are primarily black or brown people, resulting in excessive targeted police investigation (overpolicing) of people in these demographic groups.

Location of sensors
A number of people felt that the public should know where sensors are located to alleviate these concerns. Others believed the public should be aware of the sensors' location to deter potential lawbreakers by knowing the technology is in place. More than one person specifically recommended signage similar to what is used in some areas of the city to alert drivers of the presence of traffic cameras.

Accuracy
This lack of awareness of the presence of the sensors amplified some respondents' general concerns that the technology may not be accurate in its ability to distinguish gunfire from other similar sounds.

Staffing shortages
The majority of community members we interacted with *recognize that the usefulness of ShotSpotter necessarily depends on the ability of the CPD to respond to alerts.* Nearly all residents who noted this claim voiced concerns over the CDP being understaffed, which likely limits the effectiveness of ShotSpotter as it is used in Cleveland.

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Appendices

Appendix A: ShotSpotter Officer Survey

Start of Block: Title

Thank you for your participation in the Criminology Research Center at Cleveland State University's
ShotSpotter Survey of CDP Officers

End of Block: Title

Start of Block: explanation of study

Page Break

Q2
ShotSpotter Informed Consent Cleveland State University's Evaluation of ShotSpotter
Researchers at the Criminology Research Center at Cleveland State University (CSU) are reviewing the use of ShotSpotter by the Cleveland Division of Police. We are seeking feedback from current CDP officers and personnel.

This evaluation is important to:
-help inform the City of Cleveland's future decisions about the retention/expansion of ShotSpotter.
-Improve the current implementation of ShotSpotter.
-allow the CSU team to conduct future research on the use of acoustic gunshot detection technology.
Before agreeing to complete this survey, you must understand the following: 1. You will be asked to read and digitally sign this form before beginning the survey. This survey will take place through an online software known as Qualtrics. Qualtrics is a web-based software that allows researchers to create and send surveys safely and confidentially. Qualtrics uses Transport Layer SecurityTLSLS) encoding (also known aHTTPSPS) for all data. Our Qualtrics surveys are password-protected. Qualtrics services are hosted by trusted data centers independently audited using the industry standard SSAEAE-18 method. 2. The survey will ask about your experiences and opinions of ShotSpotter. **This will take 10-15 minutes.** 3. **This survey and the data collected from it are anonymous.** The survey does not ask you to share any identifying information. In any report we publish, we will not include any information that will make it possible to identify you as a participant. After completing the survey, your answers will be downloaded from the Qualtrics platform and stored on a password-protected CSU server. 4. **The questions are not meant to cause you distress.** This research may involve some level of risk to you, whether expected or not. The possible risks related to this study include discomfort in answering honestly about your experience with and use of ShotSpotter and your suggestions for areas for improvement. If

you work for the Cleveland Division of Police, you may feel anxious about answering questions honestly about your employer. 5. **This survey is voluntary.** There will be no costs to you for this survey. You will not be paid for your participation in this research study. There is no penalty or loss of benefits for not completing this survey. If you choose not to complete this survey, it will not affect your current or future relations with the Cleveland Division of Police or the City of Cleveland. ***You may decide you do not want to answer a question or any questions. You can skip any questions you do not want to answer or that make you uncomfortable. You may also exit the survey at any time.*** **Contacts and Questions** The research team conducting this study are **Stephanie Kent, PhD and Rachel Lovell, PhD.** You may send them any questions now. If you have any additional questions, concerns, or complaints about the study, the CSU research team can be reached at **CrimCenter@csuohio.edu or (216) 687-4526**. *The CSU Institutional Review Board is responsible for protecting human participants and governing agencies. If the CSU research team cannot be reached, or if you would like to talk to someone other than the researcher(s) with questions about your rights as a research subject, you can contact the CSU Institutional Review Board at (216) 687-3624.* **Statement of Consent** **By checking the box below, you consent to the following:** You are at least 18 years of age. You have read the information provided above. You understand who to contact if you have any questions. You have freely decided to participate in this research. You understand that you are not giving up any of your legal rights.

- ○ I Consent To Take This Survey (1)

End of Block: explanation of study

Start of Block: relevant to all

interact frequent How often do you currently *interact* with the **ShotSpotter** technology when at work?

- ○ Very frequently (1)
- ○ Frequently (2)
- ○ Occasionally (3)
- ○ Rarely (4)
- ○ Very rarely (7)
- ○ Never (5)
- ○ Unsure / Not applicable (6)

GPO training Have you received training or information on the **Cleveland Division of Police's (CDP) General Police Order,** or GPO, related to using ShotSpotter?

- Yes (1)
- No (2)
- Unsure / Not applicable (3)

S-thinking training Have you received training on using ShotSpotter from a representative of **SoundThinking** (the company that makes ShotSpotter)?

- Yes (1)
- No (2)
- Unsure / Not Applicable (3)

End of Block: relevant to all

Start of Block: patrol officer block

Q42 From June 2023 until the present, have you ever been in a role involving **routine patrol**?

- Yes (1)
- No (2)
- Unsure / Not applicable (3)

Skip To: End of Block If patrol = No

ptrl off responses **The following are questions related to CDP's General Police Order (GPO) for ShotSpotter. We ask these questions to assess how often certain tasks are able to be completed.**
When responding to a call related to ShotSpotter, how often do/did you perform the following tasks?

	Always (1)	Very frequently (2)	Occasionally (6)	Rarely (3)	Very rarely (7)	Never (4)	Unsure / Not Applicable (5)
Open/view the **"Respond" dashboard** in your car or on your phone (1)	○	○	○	○	○	○	○
Listen to **audio recording** of the gunshot(s) provided by ShotSpotter (2)	○	○	○	○	○	○	○
Listen to **audio recordings** for situational context *prior to interviewing victims, witnesses, or suspects* (19)	○	○	○	○	○	○	○
Use information provided by ShotSpotter to make **tactical decisions** about your response (e.g., need for additional units; consideration of how units will approach the scene; consideration for perimeter control, etc.) (3)	○	○	○	○	○	○	○

Search for potential **injured parties** within at least a *35-meter radius of "the dot"* (4)	○	○	○	○	○	○	○
Search for crime scene **evidence** (e.g., shell casings) (11)	○	○	○	○	○	○	○
Search for crime scene **evidence** within at least a *25-meter radius of "the dot"* (8)	○	○	○	○	○	○	○
Charge **Improperly Discharging a Firearm on or near Prohibited Premises** (CCO 627.09) in your incident report when discovering crime scene evidence? (10)	○	○	○	○	○	○	○
Attempt to contact **residents** of at least *six addresses* nearest the ShotSpotter alert (13)	○	○	○	○	○	○	○
If contact is made, *provide* resident with a ***gunfire incident door hanger*** (14)	○	○	○	○	○	○	○

Leave a **gunfire incident door hanger** at a residence and fill out the date and time fields on the hanger when residents are not home or do not come to the door (16)	○	○	○	○	○	○	○
Respond to a ShotSpotter alert ***before*** being given the assignment through MCAD (21)	○	○	○	○	○	○	○

Page Break

encounter errors **The following couple of questions are about how effective ShotSpotter is in your experiences in patrol-related activities.** How often do/did you encounter a discharged firearm incident that ShotSpotter should have picked up and alerted CDP but didn't (in other words, a firearm discharged outdoors in the ShotSpotter coverage area)?

- ○ Very frequently (1)
- ○ Frequently (7)
- ○ Occasionally (2)
- ○ Rarely (3)
- ○ Very rarely (8)
- ○ Never (4)
- ○ Unsure / Not Applicable (5)

Skip To: End of Block If The following couple of questions are about how effective ShotSpotter is in your experiences in p... = Never

Display this question:

If The following couple of questions are about how effective ShotSpotter is in your experiences in p... != Never

report errors When you encountered ShotSpotter's failure to identify shots fired, how often did you contact ShotSpotter support (via the ShotSpotter Respond application/support tab) to report this error?

- Always (1)
- Very frequently (2)
- Occasionally (3)
- Rarely (4)
- Very rarely (7)
- Never (5)
- Unsure / Not Applicable (6)

End of Block: patrol officer block

Start of Block: detective block

investigatory role From June 2023 until the present, have you ever been in a role involving **investigation**?

- Yes (1)
- No (2)
- Unsure (3)

Skip To: End of Block If From June 2023 until the present, have you ever been in a role involving investigation? = No

detective use of SS Thinking about your time in this role, how often do/did you use ShotSpotter's "Respond" application to obtain **additional information about the incident** such as the time of the shooting, location, etc. in your investigation of the incident?

- ○ Always (1)
- ○ Very frequently (2)
- ○ Occasionally (7)
- ○ Rarely (3)
- ○ Very rarely (8)
- ○ Never (4)
- ○ Unsure / Not applicable (5)

Page Break

data use detectives In this role, how often do/did you complete the following tasks?

	Always (1)	Very frequently (2)	Occasionally (8)	Rarely (3)	Very rarely (9)	Never (4)	Unsure / Not applicable (7)
Request a "**Detailed Forensic Report"** from ShotSpotter (1)	○	○	○	○	○	○	○
Use historical data via ShotSpotter **"Insight"** to determine if there were other gunfire incidents in the area to provide a connection between crimes for a *search warrant* (2)	○	○	○	○	○	○	○
Present incident reports, audio files, and/or detailed forensic reports from ShotSpotter to the **Prosecutor's Office** as part of an investigative packet (6)	○	○	○	○	○	○	○

Notify **responding officers** when shell casings they recovered from ShotSpotter-initiated calls were connected (via *NIBIN*) to other crimes (8)	○	○	○	○	○	○	○

lead summary In a few words, indicate how or in what ways you use/used ShotSpotter's **"Investigative Lead Summary"** report in making decisions.

_____

other uses Overall, how essential are data provided by ShotSpotter when completing the above tasks and/or other decisions you make/made while in this role?

- ○ Very essential (5)
- ○ Somewhat essential (6)
- ○ Neutral (12)
- ○ Not very essential (7)
- ○ Not at all essential (8)
- ○ Unsure / Not applicable (11)

End of Block: detective block

Start of Block: analyst block

analyst filter From June 2023 until the present, have you ever been in a role involving **crime analysis**?

- Yes (1)
- No (2)
- Unsure / Not applicable (3)

Skip To: End of Block If From June 2023 until the present, have you ever been in a role involving crime analysis? = No

daily analysis Thinking about your time in this role, how often do/did you perform **analyses** of gunshot and other relevant crime data provided by ShotSpotter to **"provide commanders situational awareness."**

- Always (1)
- Very frequently (2)
- Occasionally (7)
- Rarely (3)
- Very rarely (8)
- Never (4)
- Unsure / Not Applicable (5)

temporal analysis How often do/did you regularly provide reports on gunfire activity that include **temporal activity** (days of the week and hour of the day), along with repeat gunfire activity locations?

- ○ Always (1)
- ○ Very frequently (2)
- ○ Occasionally (3)
- ○ Rarely (4)
- ○ Very rarely (8)
- ○ Never (7)
- ○ Unsure / Not Applicable (5)

report routing In a few words, tell us about the process for ensuring the reports created from the evidence collected from a ShotSpotter alert are routed to the District Detective Unit for review.

_____

End of Block: analyst block

Start of Block: supervisor block

Page Break

supervisor filter From June 2023 until the present, have you ever been in a role involving **supervision of patrol**?

- Yes (1)
- No (2)
- Unsure / Not applicable (3)

Skip To: End of Block If From June 2023 until the present, have you ever been in a role involving supervision of patrol? = No

follow up Thinking about your time in this role, how often do/did you *instruct* officers to follow up on a ShotSpotter-initiated incident **at a later time for evidence recovery and/or community outreach?**

- Always (1)
- Very frequently (2)
- Occasionally (6)
- Rarely (3)
- Very rarely (7)
- Never (4)
- Unsure / Not Applicable (5)

CAD How often do/did you document the results of said follow-up tasks under the original CAD/incident report number?

- Always (1)
- Very frequently (2)
- Occasionally (3)
- Rarely (9)
- Very rarely (10)
- Never (4)
- Unsure / Not applicable (5)

door hangers In a few words, in your role as a supervisor, tell us about the process for ensuring officers have a sufficient supply of door hangers for community contacts related to ShotSpotter.

_____

SS call priority In a few words, in your role as a supervisor, tell us about the process for assisting the Communications Control Section (CCS) and patrol in prioritizing calls for service, including ShotSpotter alerts, when call volumes are high.

_____

errors to SS In a few words, in your role as a supervisor, tell us about the process for documenting dispositions via MCAD and inconsistencies to ShotSpotter.

_____

End of Block: supervisor block

Start of Block: SS opinion ALL

Q37

The purpose of the following questions is to find out how useful ShotSpotter is to you and CDP.

Q38 Thinking about how CDP uses ShotSpotter, **based on your observations,** to what extent do you agree with the following statements?

	Strongly Agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly Disagree (5)	Unsure / Not applicable (6)
CDP prioritizes ShotSpotter initiated calls ***more than*** calls for **in-progress violent felonies** that are not discovered through ShotSpotter. (1)	○	○	○	○	○	○
CDP prioritizes ShotSpotter-initiated calls ***more*** when there has **also been a 911 call** in which the caller has heard gunshots. (2)	○	○	○	○	○	○
Responding to ShotSpotter-initiated calls results in **positive police-community interactions.** (3)	○	○	○	○	○	○
Residents have a positive opinion of ShotSpotter. (4)	○	○	○	○	○	○

ShotSpotter is **worth its' cost** compared to other technologies you have used / have heard of. (5)	○	○	○	○	○	○
Following the procedures outlined in the General Police Order (GPO) related to using ShotSpotter is a **worthwhile use of CDP officers' time.** (6)	○	○	○	○	○	○
If the city were to discontinue the use of ShotSpotter, **CDP's ability to address gunfire/violent crime** in Cleveland would be **seriously hindered.** (7)	○	○	○	○	○	○

If the city were to discontinue the use of ShotSpotter, there would be a **significant increase in gun-related crime** in Cleveland. (8)	○	○	○	○	○	○

Page Break

Q39 Do you have any other feedback for us? Other things you think we should consider in our evaluation?

_____

End of Block: SS opinion ALL

Start of Block: demographics

Q32
While your answers in this survey are completely confidential, for us to summarize the responses, the following questions ask for general information about you.

Q33 When did you begin your employment with CDP?

- Prior to 2017 (1)
- 2017 - 2020 (2)
- 2021 - present (3)

Q34 Which shift have you worked most often since June 2023?

- 1st (1)
- 2nd (2)
- Neither of the above (4)

Q35 Please indicate the District in which you have worked most often since June 2023.

- ○ 1st (7)
- ○ 2nd (8)
- ○ 3rd (9)
- ○ 4th (10)
- ○ 5th (11)
- ○ Other (12)
- ○ Not applicable (13)

Page Break

Appendix B. ShotSpotter Community Survey

Start of Block: title

title

ShotSpotter Community Survey

End of Block: title

Start of Block: explanation of study

Page Break

informed consent
Informed Consent **Researchers at the Criminology Research Center at Cleveland State University (CSU) are reviewing the use of ShotSpotter gunshot detection technology by the Cleveland Division of Police. As part of this review we seeking feedback from current residents of the City of Cleveland.** **Your responses are important because:** 1. They can help the City of Cleveland make decisions about whether to expand or continue the use of gunshot detection technology 2. They can help improve public safety services in the City of Cleveland The survey should take **about 10-15 minutes to complete.** **This survey and the data collected from it are confidential.** The survey does not ask you to share any identifying information. **This survey is voluntary.** ***You are free to exit the survey at any time. You can skip any questions you do not want to answer or that make you uncomfortable.*** **Contacts and Questions** The research team conducting this study are **Stephanie Kent, PhD and Rachel Lovell, PhD.** They can be reached at **CrimCenter@csuohio.edu or call (216) 687-4526**. The CSU Institutional Review Board governs the use of human subjects in research studies. You can contact the Cleveland State University Institutional Review Board at (216) 687-3624. **Checking the box below certifies the following:** You are at least 18 years of age. You have read (or been read) the information provided above. You have been told who to contact if you have any more questions. You have freely decided to participate in this research.

○ I Consent To Take This Survey (1)

End of Block: explanation of study

Start of Block: Module 1: Perception of gun violence/gunfire

module 1 heading **First, we would like to ask you some questions about your perception of crime in your neighborhood.**

Q1.1 How safe do you feel walking alone in your neighborhood **during the day?**

- ○ Very safe (1)
- ○ Somewhat safe (2)
- ○ Neither safe nor unsafe (6)
- ○ Somewhat unsafe (4)
- ○ Very unsafe (5)
- ○ Unsure / Not applicable (7)

Q2 How safe do you feel walking alone in your neighborhood **after dark?**

- ○ Very safe (1)
- ○ Somewhat safe (2)
- ○ Neither safe nor unsafe (6)
- ○ Somewhat unsafe (4)
- ○ Very unsafe (5)
- ○ Unsure / Not applicable (7)

Q1.4 Compared to a year ago, do you think that gun violence in your neighborhood has ... ?

- ○ Decreased (1)
- ○ Stayed about the same (2)
- ○ Increased (3)
- ○ Unsure / Not applicable (4)

Q1.3 How serious of a problem is gun violence in your neighborhood?

- Serious (1)
- Somewhat serious (2)
- Not very serious (3)
- Unsure / Not Applicable (6)

Q1.10 Does the amount of gun violence in your neighborhood affect how safe you feel?

- Strongly agree (5)
- Agree (6)
- Neither agree nor disagree (9)
- Disagree (10)
- Strongly disagree (11)
- Unsure / Not Applicable (8)

Page Break

Q1.5 Have you ever heard what you think might be gunfire in your neighborhood?

- Yes (1)
- No (2)
- Unsure / Not Applicable (4)

Skip To: End of Block If heard gunfire = No

Q1.6 **In the last week,** how often did you hear gunshots in your neighborhood?

- ○ Most days (1)
- ○ Some days (2)
- ○ Not at all in the last week (3)
- ○ Unsure / Not applicable (5)

Page Break

Q1.8 When you hear what you think are gunshots in your neighborhood, how often do you call the police/911 to report what you heard?

- ○ Never (1)
- ○ Sometimes (2)
- ○ Always (3)
- ○ Unsure / Not Applicable (6)

Q1.9 In a few words please tell us **WHY** you either called or did not call the police/911 to report what you thought were gunshots?

_____

End of Block: Module 1: Perception of gun violence/gunfire

Start of Block: Module 2: Perception of effectiveness of police response to gunfire

Medule 2 heading **Now, we would like to ask you some questions about your perception of the Cleveland Division of Police:**

Q2.1 Please rate your satisfaction with how Cleveland Police are currently dealing with the following issues in your neighborhood:

	Extremely satisfied (6)	Moderately satisfied (7)	Slightly satisfied (8)	Neither satisfied nor dissatisfied (9)	Slightly dissatisfied (10)	Moderately dissatisfied (11)	Extremely dissatisfied (12)	Unsure / Not applicable (13)
Responding to violent crime (7)	○	○	○	○	○	○	○	○
Preventing gun related violence (6)	○	○	○	○	○	○	○	○
Responding to reports of gunshots (1)	○	○	○	○	○	○	○	○
Interacting with residents in a way that builds community trust (8)	○	○	○	○	○	○	○	○

Page Break

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Q2.2 Do you think Cleveland Police's use of technology has helped increase community trust in the police?

- ○ Yes (1)
- ○ No (2)
- ○ Unsure / Not applicable (3)

Page Break

End of Block: Module 2: Perception of effectiveness of police response to gunfire

Start of Block: Module 3: ShotSpotter

Module 3 heading Next we would like to ask you about **ShotSpotter,** a type of technology currently being used by the Cleveland Division of Police. ***ShotSpotter uses audio sensors to record possible gunfire and alert police to the location of this gunfire. The police can then respond to these alerts.***

Q1 How familiar are you with ShotSpotter?

- ○ Very familiar (1)
- ○ Somewhat familiar (2)
- ○ Not at all familiar (3)
- ○ Unsure / Not applicable (5)

Q2 What is your opinion of the overall usefulness of ShotSpotter?

- ○ Very useful (1)
- ○ Somewhat useful (2)
- ○ Not at all useful (4)
- ○ Unsure / Not applicable (3)

Q3 In a few words, what benefits, if any, do you see in Cleveland Police's use of ShotSpotter?

_____

Q4 What downsides, if any, do you see in Cleveland Police's use of ShotSpotter?

_____

Q26 Is there anything else you would like to share with us about your opinion of Cleveland Police's use of ShotSpotter?

_____

_____

_____

_____

_____

Page Break

End of Block: Module 3: ShotSpotter

Start of Block: Module 4: Demographics

Q30 **Finally, for us to report the responses of all community members across the city, please provide the following information:**

Q50 Do you currently live in the city of Cleveland?

- ○ Yes (1)
- ○ No (2)

Skip To: End of Block If Do you currently live in the city of Cleveland? = No

Q51 How long have you lived in Cleveland?

- ○ Less than one year (1)
- ○ 1-5 years (3)
- ○ More than 5 years (4)

*

Q25 What is your ZIP code?

_____

End of Block: Module 4: Demographics

Start of Block: Module 5: Open-Ended Feedback

Q55 Is there anything else you think we should know to help us better understand your responses to the questions in this survey?

_____

End of Block: Module 5: Open-Ended Feedback