"Using a Place-Based Technology to Address Shootings in East Palo Alto, California"

A partnership of the East Palo Alto Police Department and

University of California, Berkeley School of Law, Warren Institute on Law and Social Policy

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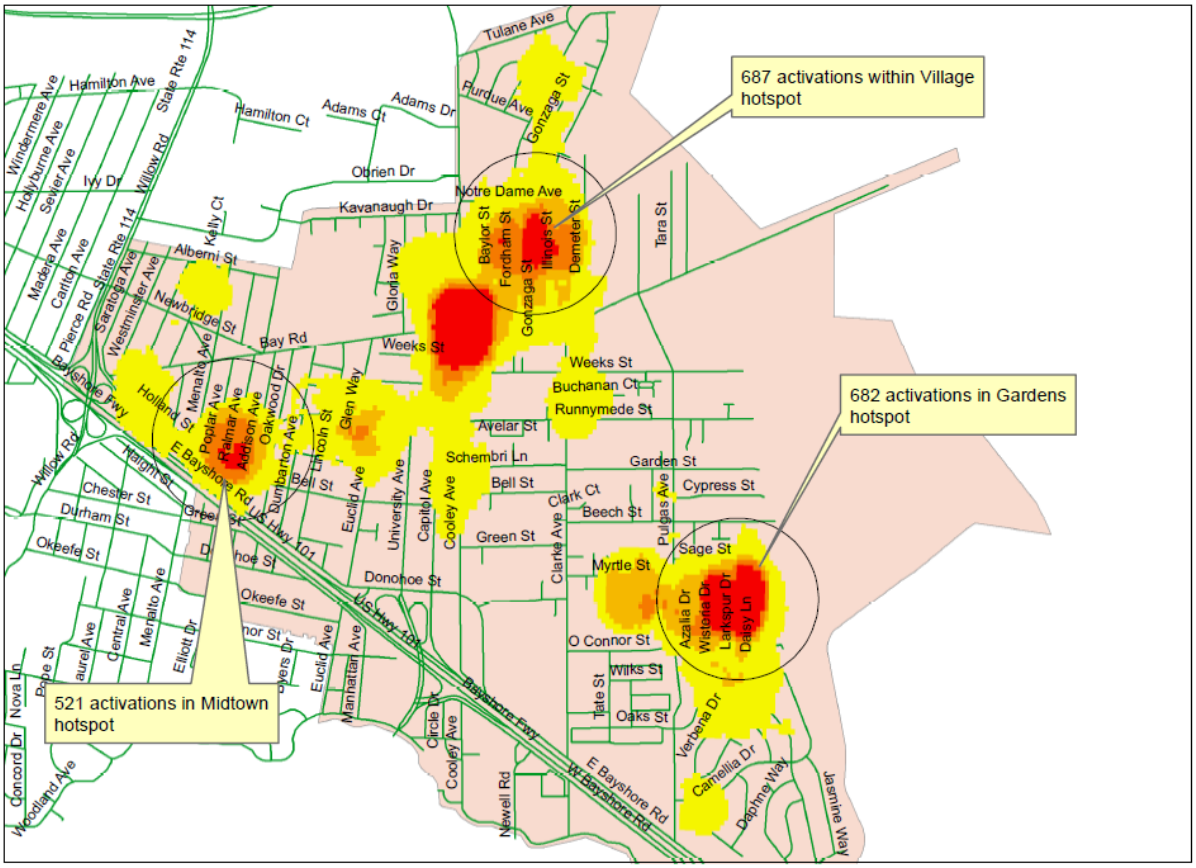
Executive Summary

Over the last decade, an increasing number of police departments have introduced gunshot location and detection systems (GLDS) to identify and convey the location of gunshots through acoustic sensors. The City of East Palo Alto, California deployed ShotSpotter citywide at the beginning of 2009. For the first several years the system was almost exclusively used as a rapid response tool. Then in 2012 East Palo Alto was awarded a grant as part of the Bureau of Justice Assistance's Smart Policing Initiative (SPI) to expand the system's use to also include strategic planning and analysis and problem-oriented policing.

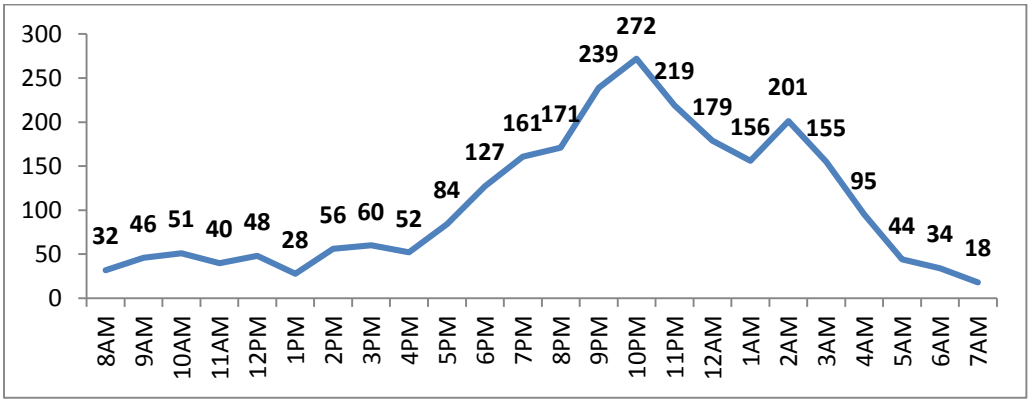
ShotSpotter data on shootings in East Palo Alto was analyzed to better understand shooting incidents and identify shooting hot spots. The most entrenched, long-standing shooting hot spots in East Palo Alto were identified through heat maps and, as shown in the figure below, three areas within the City experienced the highest volume of shooting incidents over a four-year period. Even in a city as small as East Palo Alto at 2.5 square miles, concentrated areas account for a disproportionate share of shootings.

Shooting Hot Spots, July 2009 – June 2013



In addition to a spatial assessment, a temporal assessment was conducted and ShotSpotter records were analyzed to identify the peak times when shootings occurred. The analysis revealed that shooting incidents were heavily concentrated during a few hours. The number of gunshot activations peaked at 10:00 pm and was lowest at 7:00 am.

Number of Gunshot Activations by Hour, July 2011 – June 2013



Holiday-associated celebratory gunfire accounted for a significant share of all gunfire. ShotSpotter data around New Year's Eve and the Fourth of July was examined (December 30th through January 1st and July 1st through July 6th). These nine days (or 2.5% of the days in a year) accounted for 22.5% of all shooting activations during the period July 2011 and June 2013.

The findings from the shooting analysis were the starting point for the Police Department's problem-oriented policing efforts. A Gunshot Reduction Team (GRT) was established to lead this effort and it devised a two-pronged approach to address shootings in one of the hot spots that involved 1) targeted patrols and searches and 2) community education and outreach. The efforts were jointly referred to as Operation Silent Night. Resources were deployed on certain times of the day and days of the week; individuals who were under some form of supervision, located in the area, and had a history of gun use were targeted for searches; and community outreach and education on gunplay were conducted.

Key Findings:

- ShotSpotter provides a new measure of gunfire that is probably a closer estimate of the universe of shootings relative to more traditional data sources such as calls for service for shots fired.
- Even within a city as small as East Palo Alto, at 2.5 square miles, concentrated areas accounted for a disproportionate share of shootings, as the shooting hot spots accounted for 13% of the City's area and 25% of the shootings.

- The locations of the hottest shooting hot spots were remarkably stable over time.
- Celebratory gunfire accounted for a notable share of shootings in the City.
- Overall, officers were very positive about the ShotSpotter system as a rapid response tool and an investigative tool.
- There is strong potential for using ShotSpotter activation data as an analytical tool, but departments that adopt this strategy must conduct a thorough examination of data quality.
- Substantial turnover in leadership at the East Palo Alto Police Department as well as staffing constraints resulted in less than robust implementation of Operation Silent Night than was originally planned.
- A bigger picture understanding of SPI within the Department could have strengthened implementation.

Recommendations:

- The Police Department should continue to engage in problem-oriented policing to address chronic shooting hot spots.
- The Police Department should continue to use ShotSpotter data as an analytical and strategic tool, as long as a thorough examination of data quality is performed.
- Staffing capacity should be considered for the sustainability of future initiatives.
- Strengthening buy-in and ownership on the part of involved staff should be a focus of future initiatives.

Overview of Smart Policing Initiative and Project Goals

Police departments across the country are being asked to do more with fewer resources and are spending millions of dollars, much of it federal funding, to purchase various technologies. New technology that holds the promise of enhancing job quality and improving efficiency is both attractive and alluring to departments that are chronically stretched thin. Historically, law enforcement practices have been significantly influenced by the introduction of technology dating as far back to the adoption of two-way radios in the 1930s, to computer-assisted dispatching in the 1960s, to fingerprint readers in the 1970s, and DNA testing today. Law enforcement's relationship with technology is as important as ever. Each time a new and innovative technology is adopted it is driven by the desire to improve law enforcement's performance through such things as decreased response times, improved accuracy of suspect identification, or better officer safety, among other measures. It is often the case that a new technology becomes rapidly adopted by police departments before a sufficient level of rigorous and independent research and evaluation has been conducted.

Over the last decade, an increasing number of police departments have introduced gunshot location and detection systems (GLDS) to identify and convey the location of gunshots through acoustic sensors.[1] In short, GLDS provide police departments with a more comprehensive understanding of the volume and nature of shootings as they provide real-time, round-the-clock information about shootings including the number of rounds fired, the precise location of the incident, and the time and duration of the incident. The leading provider, SST Incorporated with its ShotSpotter System, is operating in over 90 U.S. cities.[2,3] This expansion of use is occurring despite limited research and evaluation of the technology. Many claims have been made about the effectiveness of the technology but they are largely based on anecdotal experiences rather than rigorous examination.

The City of East Palo Alto, California deployed ShotSpotter citywide at the beginning of 2009. For the first several years the system was almost exclusively used as a rapid response tool. Then in 2012 East Palo Alto was awarded a grant as part of the Bureau of Justice Assistance's Smart Policing Initiative (SPI) to expand the system's use to also include strategic planning and analysis and problem-oriented policing (POP).[4] The East Palo Alto Police Department (EPA PD) in partnership with the Warren Institute on Law and Social Policy at the Berkeley Law School implemented a project, "Using a Place-Based Technology to

[1] "Shots Fired, Pinpointed and Argued" Erica Goode, *New York Times*, May 28, 2012.
[2] Other brands include Safety Dynamics' Sensor Enabled Neural Threat Recognition and Identification (SENTRI), Battelle Siteguard Active Shooter Response (ASR), and Raytheon BBN Technologies' Boomerang system.
[3] http://www.shotspotter.com/press-releases/article/shotspotter-adds-six-new-cities-in-second-half-2014-now-in-more-than-90-cit.
[4] For an overview of the BJA Smart Policing Initiative see www.smartpolicinginitiative.com.

Address Shootings in East Palo Alto," to address the high levels of shooting incidents within the City. The project falls under Smart Policing Initiative Purpose Area #2: "Develop innovative, data-driven approaches to contemporary crime problems and criminogenic circumstances within their jurisdiction."[5] Projects under this purpose area generally include a data driven approach, innovative use of technology, place-based policing, and problem-oriented policing.

The goals of this project as outlined in the initial proposal were to:

1. Document how ShotSpotter had been used by the Police Department since its launch in 2009;
2. Understand how Police Department staff and dispatchers feel about the ShotSpotter system;
3. Gain an in-depth understanding of shootings over time;
4. Identify chronic shooting hot spots;
5. Use shooting data to help design and implement problem-oriented policing tactics and strategies;
6. Assess the effectiveness of those data-driven POP tactics and strategies; and
7. Reduce shootings in chronic hot spots.

While the set of goals did not change in any notable ways over the course of the two-year project, the relative weight of the goals, in terms of time and resources dedicated to them, evolved as more was learned about data availability and existing documentation. The project generally achieved the above goals with the exception of a few, which is detailed below. Goals #1 through #5 were accomplished during the course of the project; goal #6 was not accomplished; and while there was a decline in shootings it is uncertain whether it was attributable to East Palo Alto's Smart Policing Initiative (goal #7).

Overview of ShotSpotter

Gunshot location and detection systems identify and convey the location of a gunshot or other loud sounds through acoustic sensors. These systems are used for local law enforcement efforts, homeland security efforts, corporate security efforts, and military security and protection applications. In recent years, the deployment of GLDS has been increasing for indoor environments such as schools, rather than outdoor environments. The ShotSpotter system is comprised of a network of sensors that use the physics of sound propagation and triangulation to determine the precise location of where a sound originated. Sensors are installed at approximately 15 to 20 per square mile. When a gunshot, explosion, or another loud sound occurs within a coverage area, the system detects, locates, identifies, and classifies the sound in just a few seconds. The system needs at least three sensors to triangulate sound and a fourth to validate it, creating a "sound signature." Information collected by the GLDS includes an audio recording and downloadable data for each activation. Data elements include:

[5] Bureau of Justice Assistance Smart Policing Initiative, Competitive Grant Announcement, FY 2011.

- Type of event, which includes a range of sound types such as single gunshot, multiple gunshots, possible gunshots, firecracker, construction, or helicopter, among others;
- Number of rounds fired, which reflects the actual number of shots fired for a single system activation;
- Location of the incident, which includes the police beat, the nearest street address, as well as the longitude and latitude coordinates;
- Duration of the incident, which reflects the length of time sounds were recorded for a single system activation; and
- Time of day.

ShotSpotter was first implemented in Redwood City, California in 1996 and is now implemented in some capacity in over 90 cities including Boston, Miami, Oakland, and Kansas City.[6] There is no shortage of testimonials from law enforcement officials and local politicians on the positive impacts that these systems have had in their communities.[7] The media has printed numerous articles claiming a causal impact on violence and shootings as a result of the GLDS. For example, a local Los Angeles television station reported that ShotSpotter played a role in a 40% reduction in homicides over the previous four years in an area where the system had been deployed.[8] In New Haven, Connecticut the police department attributes, in part, a four-year decline in homicides to the deployment of the ShotSpotter system.[9]

Information about the full cost of installing, running, and maintaining the system is not publicly available. However, several articles reference cities paying an annual subscription fee of $40,000 to $60,000 per square mile plus a one-time $10,000 activation fee.[10] This does not include installation costs. The company works proactively with communities to identify potential funding sources, such as federal competitive grants and formula funds, asset forfeiture funds, community public safety partners, public housing agencies, and community funds. ShotSpotter's website notes that "Many of our customers have used federal and alternative funding for initial deployments as well as subsequent expansions. From 2008 through the present, our funding team guided customers toward securing more than $10 million in federal funds."[11]

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[6] http://www.shotspotter.com/company#history and http://www.shotspotter.com/press-releases/article/shotspotter-adds-six-new-cities-in-second-half-2014-now-in-more-than-90-cit.

[7] See http://www.shotspotter.com/news for a compilation of articles touting the public safety gains as a result of the ShotSpotter system.

[8] KABC-TV, Los Angeles, California. January 28, 2009. "L.A. County Sheriff's Deputies Detect Crime as It Happens."

[9] http://www.lawofficer.com/articles/print/volume-11/issue-2/staging-area/shotspotter-reduces-crime-hono.html.

[10] For example, *New York Times*, May 28, 2012, "Shot Fired, Pinpointed, and Argued Over;" WEYI-TV, NBC25 News, November 17, 2011, "Flint to get ShotSpotter Technology at Cost of $40k - $60k per Area per Year."

[11] http://www.shotspotter.com/funding#FAQ.

Recently, SST Inc. has been taking a more global look and assessing trends across jurisdictions through the development of its National Gunfire Index. Launched in 2013 the company has been using data from a sample of ShotSpotter cities to track aggregate levels of shooting, as well as information about the number of rounds, the density of shootings (i.e., shooting incidents per square mile), and time of day, among other metrics.[12]

At the end of 2007, the City of East Palo Alto piloted the system over an area that covered 0.5 square miles within the City boundaries. East Palo Alto entered into an agreement with ShotSpotter, Inc. to install their system at no-cost to the City in exchange for it serving as a software validation site. The partial system was activated on December 31, 2007 and operated for one full year. Through a grant from the U.S. Department of Justice, East Palo Alto was able to install equipment citywide with a total of 32 sensors and on December 31, 2008 ShotSpotter was deployed citywide making East Palo Alto the first jurisdiction to have full coverage by a GLDS.

Dispatch for the East Palo Alto Police Department is handled by San Mateo County Public Safety Communications. During the first few years that the system was running, San Mateo County dispatch would receive notification of system activation, review the audio recording, confirm that the activation was a single gunshot, a multiple gunshot, or a possible gunshot, and notify police upon confirmation. The notification and review process changed in the summer of 2012 when the FLEX system was launched.[13] Now ShotSpotter staff, who are located at the company's Incident Review Center, review the audio and confirm shot(s) fired before notifying San Mateo County dispatch and police officers of the activation for gunshots or possible gunshots through the FLEX Alerts Console. In most cases, the notification of a system activation for shots fired is received well before any 911 calls for service for shots fired are received.

Expected Benefits of Gunshot Location and Detection Systems

The applications of a gunshot location and detection system can be grouped into three areas: 1) for rapid response, 2) for investigation and prosecution, and 3) for crime prevention. The use of the system in East Palo Alto has primarily been as a rapid response tool, but increasingly over the years also for investigation and prosecution. The intent of East Palo Alto's Smart Policing Initiative was to use this place-based technology as a tool for problem-oriented policing and crime prevention efforts.

[12] For more information on the National Gunfire Index see http://www.shotspotter.com/2015NGI.
[13] For more information on ShotSpotter FLEX see http://shotspotter.com/system/content-uploads/ShotSpotter-Flex-Datasheet.pdf.

The anticipated benefits of an acoustic surveillance system are both strategic and tactical. Producers of the technology claim the key benefits of the system are "1) enhanced situational awareness and officer safety, 2) faster evidence collection and witness identification, 3) court-admissible, detailed forensic reports, 4) increased gun crime arrests, 5) improved community relations and collaboration, 6) proactive gun crime pattern analysis and strategic deterrence, 7) no need to buy/manage a complex technology infrastructure, 8) expedited response to shooting victims, 9) increased suspect leads, suspect arrests, and 10) increased ability to identify homicides and injured victims."[14] While many of these are hard to measure in any quantifiable way, feedback from Police Department staff, which is presented below, sheds light on the extent to which they feel that EPA has been reaping some of these benefits.

Building on the well-established research on crime hot spots, GLDS can in some ways be viewed as a logical direction in which a technological application would be developed that would further advance law enforcement's utilization of place-based anti-crime strategies.[15] Prior to the development of GLDS, police departments primarily relied on calls for service from community members as the source of information for shooting incidents. This mechanism for making police aware of shooting incidents is limited in several ways, namely that calls for service can lack precision (e.g., overly broad or unclear location information), provide conflicting information (e.g., multiple callers providing different locations for the same event), not be made in a timely manner, and be altogether erroneous. Rarely does the person calling to report gunshots actually see a person shooting a gun. GLDS reduces the number of shootings that go undetected, reduces the chance of human error, and increases the accuracy and timeliness of information about shootings. ShotSpotter, Inc. reports that the number of shooting incidents detected by the acoustic sensors is significantly higher than the number of calls for service for gunshots.[16,17]

The remainder of this report presents the problem analysis, implementation, and lessons learned associated with East Palo Alto's Smart Policing Initiative. The first section includes an in-depth examination of shooting incidents in the City based on ShotSpotter data followed by an overview of East Palo Alto's Operation Silent Night, which was largely based on the results of the shooting analysis. A synthesis of feedback about Operation Silent Night and the GLDS from Police Department staff and dispatchers is

[14] http://www.shotspotter.com/system/content-uploads/ShotSpotter-Flex-Datasheet.pdf.
[15] For an overview of research on hot spot policing see, Braga, Anthony, Andrew Papachristos, and David Hureau (2014) "The Effects of Hot Spots Policing on Crime: An Updated Systematic Review and Meta-Analysis," *Justice Quarterly*, 31:4, 633-663.
[16] The company claims that more than 80% of shooting incidents go undetected and do not get reported to 911. http://www.shotspotter.com/law-enforcement.
[17] ShotSpotter's integration into the 9-1-1 system in San Mateo County changed the way in which calls for service for shots fired were recorded and, thus, the ability to analyze calls for service data is limited. See text box on page 16 for more detail.

included next. And lastly, reflections on lessons learned over the course of the project, key findings, and recommendations are discussed.

Targeted Problem: Shooting Incidents

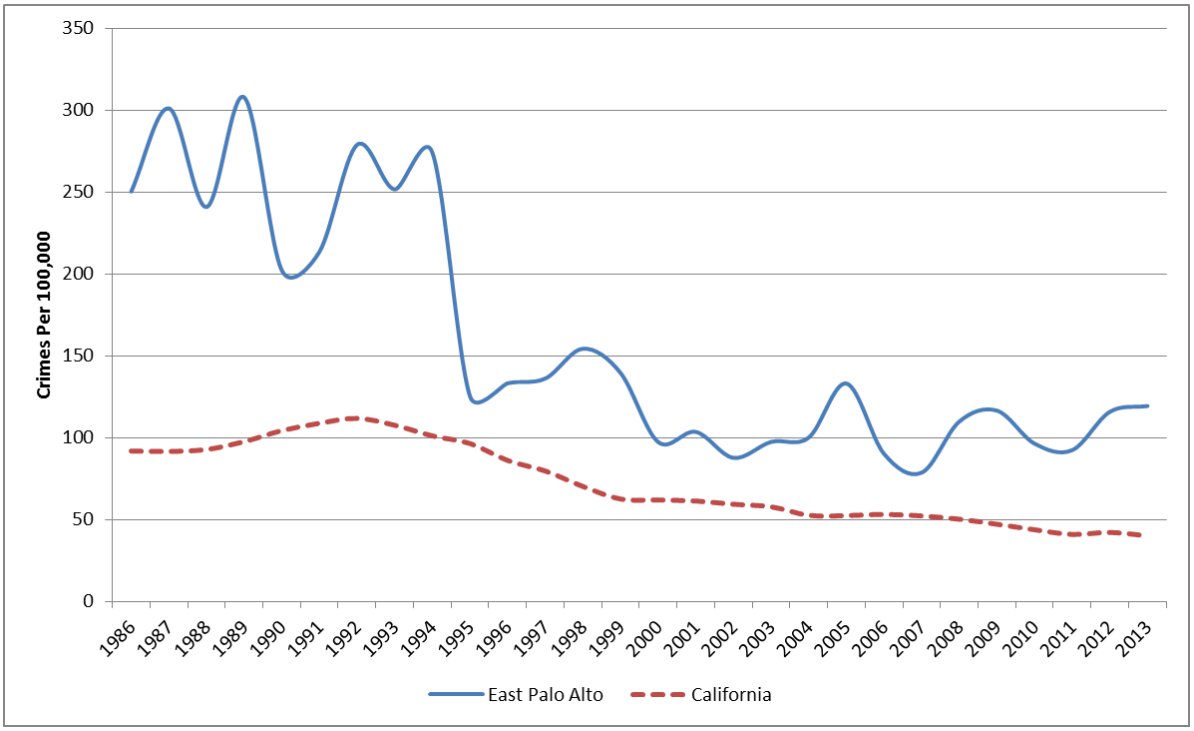
East Palo Alto is a small, diverse community with a serious violence problem. The City is located in San Mateo County in the San Francisco Bay Area, is approximately 2.5 square miles, and has a population of approximately 29,000 people. Nearly two-thirds of residents are Latino and just over 40% are foreign born.[18] The Police Department is staffed with approximately 35 to 40 sworn officers.

> ***East Palo Alto Police Department: A Department in Flux***
>
> *For much of the SPI project EPA PD was a department in flux. Ronald Davis, who was chief when the project was conceptualized and at the beginning of the SPI grant period, left the position during the first year. Over the next 12 months the Department was led by four interim chiefs before the new permanent chief, Chief Albert Pardini, started in November 2014. At the same time, there were many changes at the Captain rank, which is second in command at EPA PD, and there was turnover at the City Manager position, who is responsible for appointing a police chief.[19] While several committed, professional staff – both sworn and non-sworn – gave their best efforts to make this grant program a success, this substantial level of turnover in leadership did have ripple effects for program implementation, which are detailed below.*

In 2013 EPA's violent crime rate was 1,193 per 100,000, which is nearly triple the California state average of 402 per 100,000 for that year. Of the 459 cities in California that submit crime data to the FBI, East Palo Alto ranked 11th in terms of highest violent crime rate and of similarly-sized cities, defined as less than 50,000, EPA ranked 8th. As shown in Figure 1, the City has experienced significant declines in violent crime over the last few decades. Despite these gains, however, violent crime in EPA still remains stubbornly high relative to California overall. For example, over the last five years EPA's violent crime rate has increased by a modest 2%, yet the state overall experienced a 15% decline.[20]

[18] 64.5% Latino, 16.7% African-American, 7.5% Pacific Islander, 28.8% White, 41.4% foreign born. Source: US Census, East Palo Alto, CA QuickFacts. http://quickfacts.census.gov/qfd/states/06/0620956.html.
[19] http://www.mercurynews.com/peninsula/ci_26556276/east-palo-alto-hires-fourth-interim-police-chief and http://peninsulapress.com/2014/12/19/east-palo-alto-new-police-chief-albert-pardini/.
[20] Uniform Crime Report Program, FBI.

Figure 1. Violent Crime Rate in California and East Palo Alto, 1986 - 2013



Data on shootings since the GLDS was launched in January 2009 was analyzed to better understand shooting incidents and identify shooting hot spots within the City. As described earlier, one of the goals of East Palo Alto's Smart Policing Initiative was to use information from the ShotSpotter system for strategic and analytic purposes. As such, the strengths and weaknesses of this essentially untested data source were not well known at the outset. What follows are the results of the analysis of four years of shooting data after the data was compiled and cleaned. As the PD and researchers delved deeper into the analysis, the strengths and weaknesses of this data source began to emerge. The findings related to the overall quality of ShotSpotter data will be covered in the section "Challenges of an Untested Data Source."

A note on language…

The primary unit of analysis is a "shooting incident," which is the activation of the ShotSpotter system because of shots fired. Shooting incidents do not necessarily mean that a person or property was hit. A single incident – or single activation – may involve multiple gunshots or rounds.[21] *As mentioned above, the ShotSpotter system records many types of sound activations. The activation types included in the analysis below are Single Gunshot, Multiple Gunshots, and Possible Gunshots.*

[21] Between January 2009 and December 2014, the average number of rounds fired per shooting incident was 3.46. Each year, the City experienced a few shooting incidents that were in excess of 40 rounds.

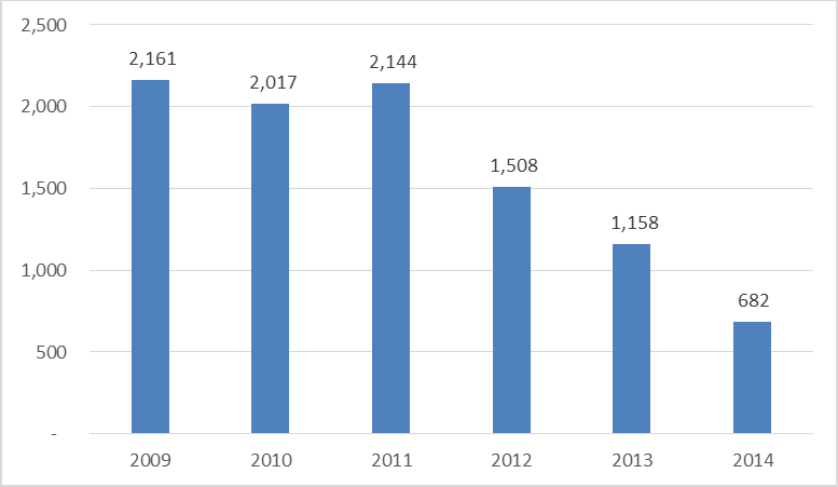
Key Research Questions

- *How has the volume of shooting incidents changed since the system was launched?*
- *What are the patterns in shooting incidents in terms of time of day, day of week, and seasonal fluctuations?*
- *Where are the shooting hot spots and to what extent do they change in size and location?*

Trends in Shooting Incidents Citywide

The previous chart shows that violent crime has been a serious problem in the City for quite some time. For this Smart Policing Initiative, the focus was specifically on gunfire. On average the City received about 500 dispatched calls for service involving a firearm annually. However, ShotSpotter data supports the notion that calls for service for shots fired account for only a fraction of total gunplay. As shown in Figure 2, over the five-year period 2009 to 2014, there was an average of just over 1,600 activations for shots each year, which equates to 4.4 shooting incidents every day. Notably, shootings have been down significantly over the last three years, averaging 3.1 per day since 2012.[22] The year with the lowest number of activations for shootings (2014) still supports the notion that calls for service dramatically undercount the number of shootings taking place.

Figure 2. Number of ShotSpotter Shooting Activations, 2009 - 2014



[22] As will be discussed later in this report, this dramatic decline may, in part, be the result of a change ShotSpotter's review and verification process rather than a real decline in the number of shooting incidents.

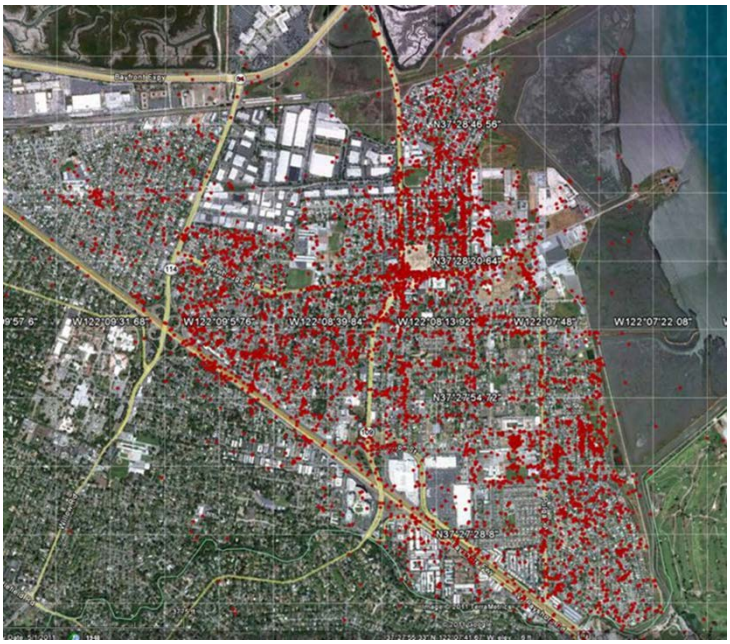
Calls for Service for Shots Fired

When ShotSpotter was launched it was integrated into San Mateo County's dispatch system at the Public Safety Communications Division. Generally, a ShotSpotter activation is received prior to a 911 call for shots fired. When a call for shots fired is received after a system activation that call is essentially appended to the activation record. One practical implication of this integration is that analyzing the number of calls received for shots fired, independent of system activations, is no longer possible. A tally of calls for shots fired would only include records for which there was no system activation, a severe undercount.

Chronic Shooting Hot Spots

Gunplay happens in almost every corner of the City. Figure 3 presents ShotSpotter activations for shootings, covering a 34-month period January 2009 through October 2011. And while gunplay is pervasive, the map reveals that some areas of the City are certainly "hotter" than others.

Figure 3. ShotSpotter Activations, January 2009 – October 2011



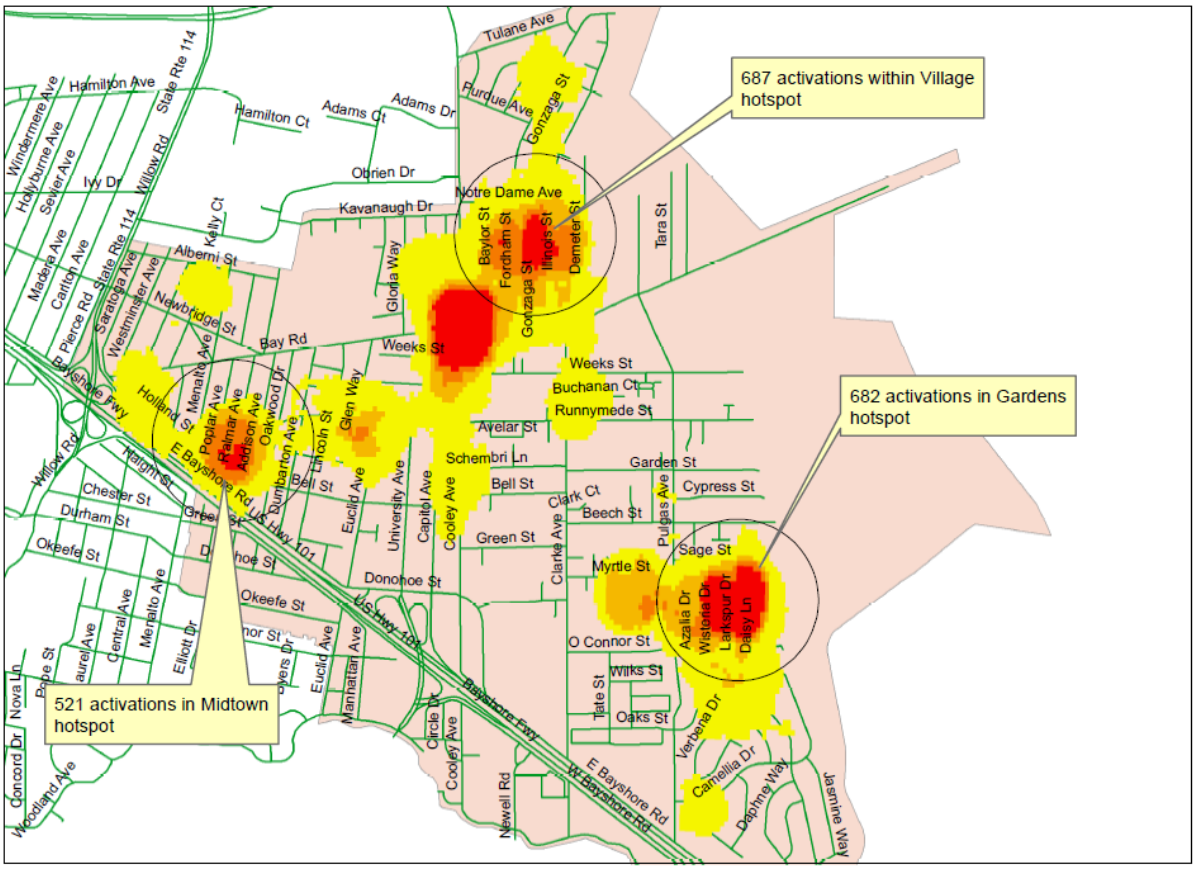
In order to get a sense of the where the most entrenched, long-standing hot spots in East Palo Alto were located, maps were developed based on 48-months of data.[23] Figure 4 shows areas within the City that experienced the highest volume of shooting incidents over the four-year period July 2009 through June 2013. This illustrates that, even in a city as small as East Palo Alto at 2.5 square miles, there are still concentrated areas within the city limits that account for a disproportionate share of shootings. The

[23] The maps were developed with ArcGIS, in which the user defines the size of the hot spots. Hot spots were defined by a 1000-foot radius.

three hot spots accounted for 13% of the City's area and 25% of the shooting incidents. After rounds of review and revision with police department staff, the three "hottest spots" were identified (Figure 4): [24]

- Midtown: The 1000-foot radius around the intersection of Garden St. and Ralmar Ave.
- University Village: The 1000-foot radius around the western edge of Jack Farrell Park
- Gardens: The 1000-foot radius around the western edge of MLK Park, along Larkspur Dr.

Figure 4. Shooting Hot Spots Based on Four Years of Data, July 2009 – June 2013

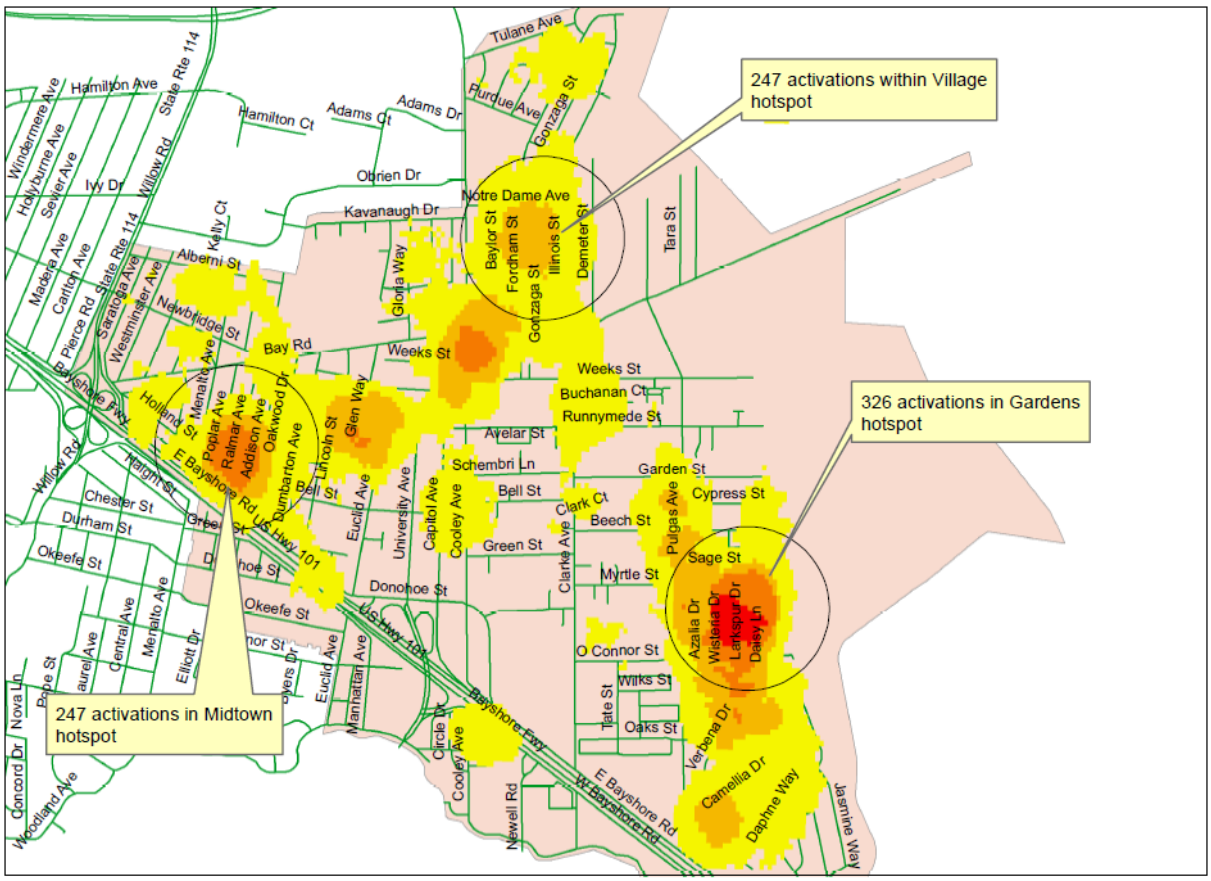


The leadership at the Police Department at the time East Palo Alto's Smart Policing Initiative was conceptualized was interested in using four years of data to identify chronic and entrenched hot spots. However, police officers and the Interim Chief at the time the ShotSpotter analysis was being conducted were of the opinion that four years was too long a time period and expressed concern that recent "flare ups" might be lost in the longer view. Said another way, while the original vision was to focus on long-

[24] Note that officers were not comfortable including the hot spot around the University/Bay intersection as one of the "hottest spots." That is one of the largest intersections of the City and there was speculation that that sounds other than gunshots were causing activations at this major intersection. As one example, there is a McDonald's located at that intersection and one officer noted that the dumpster being emptied almost daily was known to trigger an activation. It is worth noting that much of this timeframe was before the introduction of the FLEX system.

standing problem areas, further on in the project officers and command staff became more interested in what was currently happening in the City. To assess the extent to which the problem areas were different depending upon the time frame, maps were developed for one-year periods, and the most recent two years, in addition to the full four-year period, to see the extent to which shooting hot spots changed in size and location. The analysis showed that for the most part shooting hot spots were remarkably stable over the four-year period regardless of the months included. As one example, Figure 5 shows two years rather than four years of data and the three areas that are the "hottest spots" in the City were essentially the same.[25]

Figure 5. Shooting Hot Spots Based on Two Years of Data, July 2011 – June 2013



[25] The maps in Figures 4 and 5 depict the total volume of shootings based on a fixed scale. Because Figure 5 only includes half as much data as Figure 4 the intensity of the hot spot is less (i.e., hot spots appear orange rather than red). However, the locations are generally the same.

Shootings by Time of Day

In addition to a spatial assessment of shootings, a temporal assessment was conducted. Time and date data from ShotSpotter records were analyzed to identify the peak times when shootings occurred. As expected, the analysis revealed that shooting incidents were not evenly distributed throughout the day and were heavily concentrated during a few hours. As shown in Figure 6, 32% of all shooting incidents occurred between the four-hour period of 10:00 pm to 2:00 am. By comparison, only 22% of shooting incidents occurred during the 12–hour period 6:00 am to 6:00 pm. When taking an hour-by-hour look, the number of gunshot activations peaked at 10:00 pm and was lowest at 7:00 am (see Figure 7).[26]

Figure 6. Percent of Gunshot Activations by 4-Hour Blocks, July 2011 – June 2013

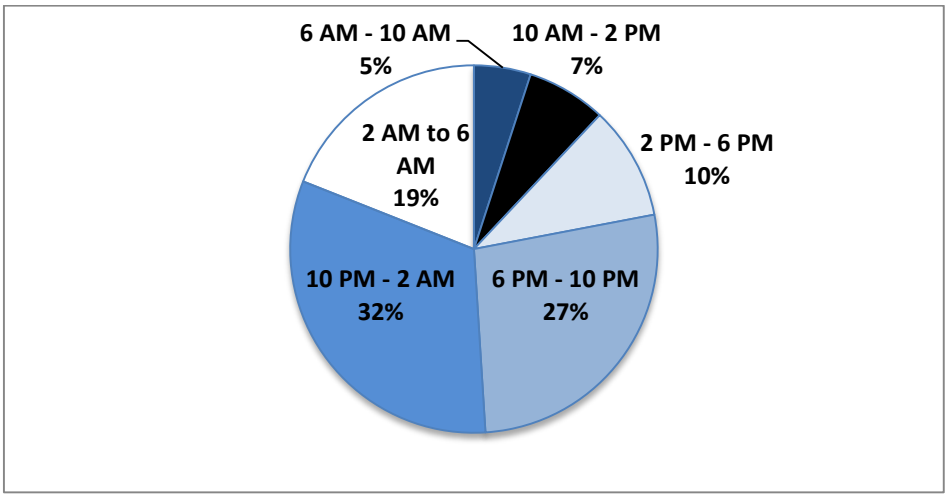
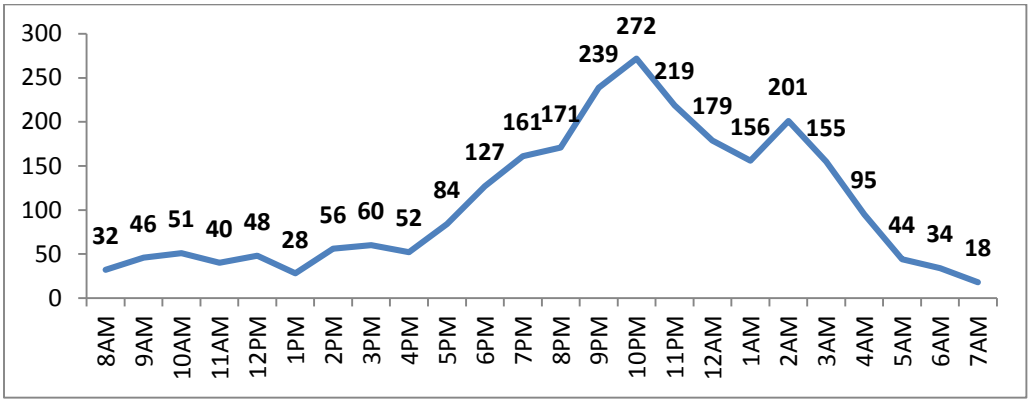


Figure 7. Number of Gunshot Activations by Hour, July 2011 – June 2013



[26] Similar to the assessment of hot spot locations, the time of day analysis was done for various date ranges. Patterns in the time of day that shootings occurred were also fairly stable when looking at one year, two years, or four years of data.

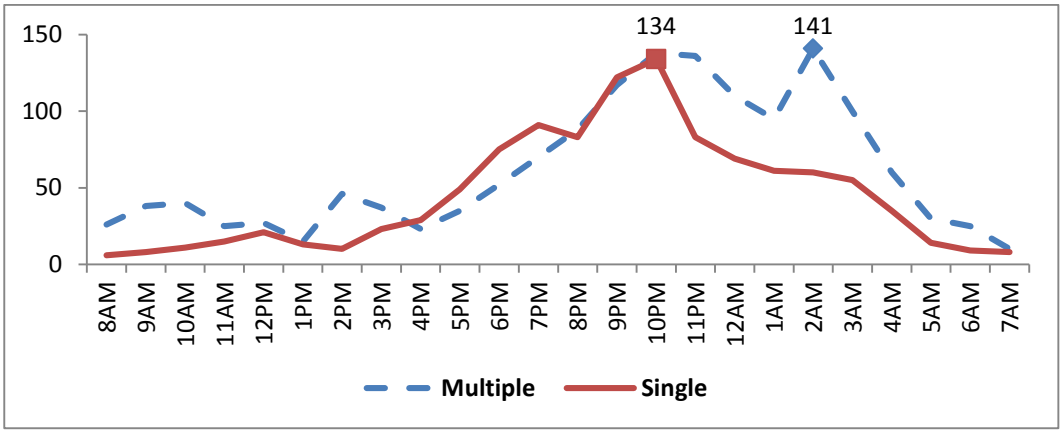
The Police Department decided to focus its efforts on a single hot spot, the Gardens, rather than launch a new operation in all three hot spots. Therefore, researchers conducted time of day and day of week analyses for the Gardens hot spot to determine whether shooting patterns in that hot spot differed compared to the rest of the city. Figure 8 shows that generally the distribution of shooting incidents in the Gardens matched the City overall. However, shootings in the Gardens were somewhat more concentrated during the peak time relative to the City as a whole. Specifically, while the highest share of shootings also occurred between 10:00 pm and 2:00 am, shootings were more concentrated in the Gardens, at 40% compared to 32% citywide.

Figure 8. Percent of Shooting Incidents by Time of Day, July 2011 – June 2013

	Gardens	Citywide
6AM - 10AM	3%	5%
10AM - 2PM	3%	7%
2PM - 6PM	9%	10%
6PM - 10PM	25%	27%
10PM - 2AM	40%	32%
2AM - 6AM	21%	19%
Total	100%	100%

Single versus Multiple Gunshots by Time of Day. After reviewing initial analysis of the ShotSpotter data, police officers expressed an interest in whether time of day shooting patterns were different for single gunshot activations compared to multiple gunshot activations. The thinking was that gang-related violence would involve more serious weapons that could discharge multiple rounds quickly or involve multiple shooters. While single gunshots and multiple gunshots generally show similar patterns by time of day, as shown in Figure 9, single gunshots occurred slightly earlier in the evening than multiple gunshots, as 34% of single gunshots occurred during the 6:00 pm to 10:00 pm block, but only 22% of multiple gunshots happened during that time. Conversely, multiple gunshots were more likely during the early morning hours of 2:00 am to 6:00 am compared to single gunshots (22% and 15%, respectively). Single gunshots peaked at 10:00 pm and multiple gunshots peaked at 2:00 am.

Figure 9. Activations by Hour for Single versus Multiple Gunshots, July 2011 – June 2013



Shootings by Day of Week

ShotSpotter data was also analyzed by the day of the week on which shootings occurred. Across the City the highest levels occurred on Saturdays and Sundays and the lowest levels occurred on Mondays and Tuesdays (see Figure 10).[27] Forty-five percent of shootings occurred on Saturdays and Sundays.

Figure 10. Number of Activations by Day of Week, July 2011 – June 2013

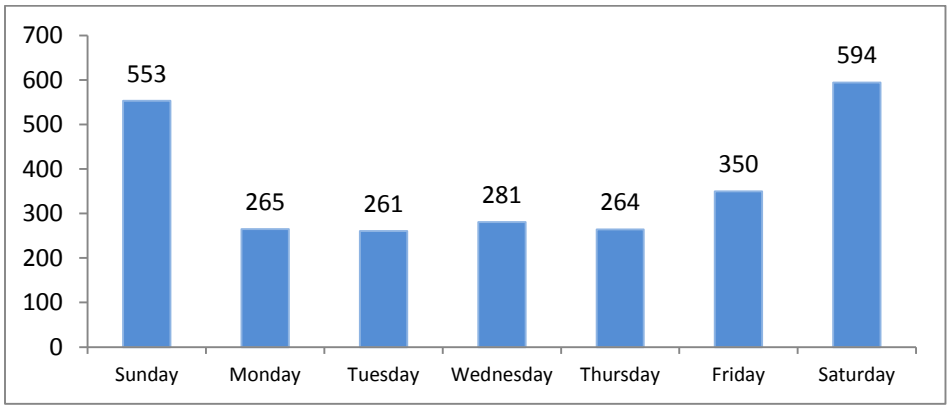


Figure 11. Percent of Activations by Day of Week, July 2011 – June 2013

Sunday	22%
Monday	10%
Tuesday	10%
Wednesday	11%
Thursday	10%
Friday	14%
Saturday	23%

[27] Similar to the assessment of hot spot locations and time of day, day of week shooting distributions were examined based on various date ranges. Patterns in the day of weeks on which shootings occurred were also fairly stable when looking at one year, two years, or four years of data.

Shootings by Season

Shooting incidents were aggregated by month and season. Perhaps somewhat surprisingly, the levels of shootings were evenly distributed across three of the four seasons and the lowest level of shootings was during the spring months (18% in March, April, and May). The level of shootings incidents was similar during the summer months (27%), fall months (28%), and winter months (28%).

Figure 12. Number of Activations by Month, July 2011 – June 2013

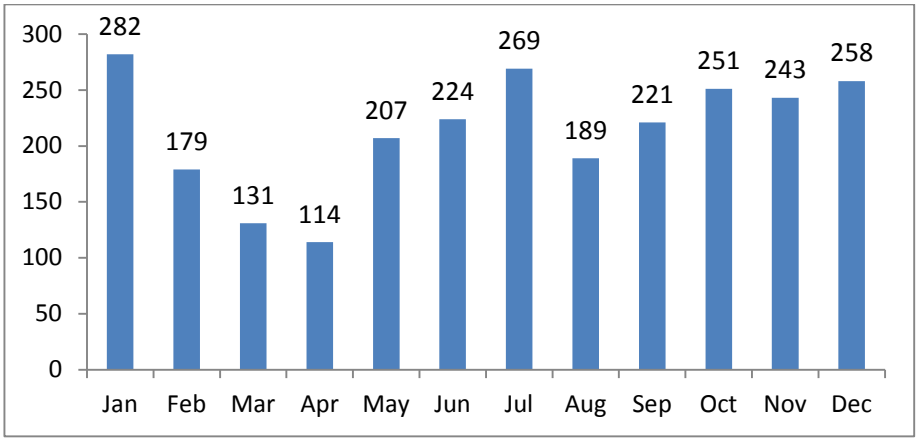
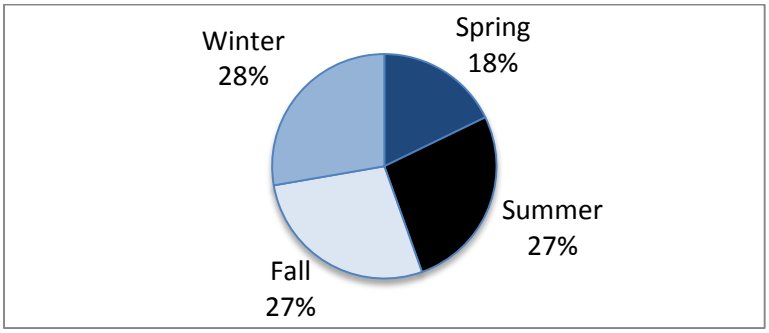


Figure 13. Percent of Activations by Season, July 2011 – June 2013



Celebratory Gunfire

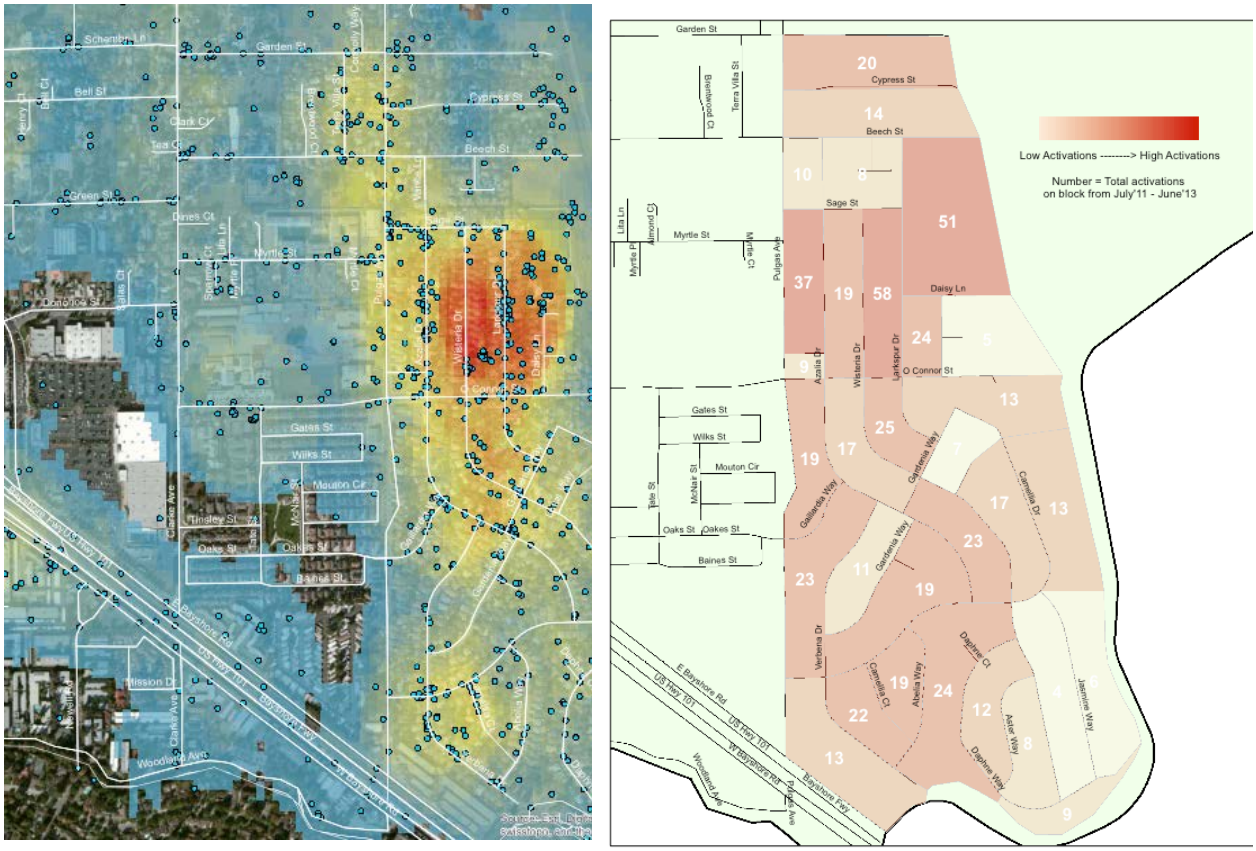
An examination of shootings by month led to the issue of celebratory gunfire. This was also raised by police officers during one-on-one interviews, as several noted the high levels of gunplay in the City around New Year's Eve and July 4th. To assess the levels and locations of holiday-associated celebratory gunfire, ShotSpotter data for nine days around these two holidays was examined for the period December 30th through January 1st and July 1st through July 6th.[28] These nine days (or 2.5% of the days in a year) accounted for 22.5% of all shooting activations in a year. A mapping of shooting incidents around these two holidays showed that the hot spot locations for celebratory gunfire were for the most part the same as the rest of the year.

[28] The data revealed that celebratory gunplay was spread over fewer days for New Year's Eve (three days) compared to the Fourth of July (six days). Cinco de Mayo was initially included but did not account for a notable share of incidents and was removed.

A Focus on Beat Three and the Gardens Hot Spot

East Palo Alto Police Department decided on the Gardens hot spot, located in Beat 3, as the focus of the Smart Policing Initiative. The research team then did a deeper dive into the ShotSpotter data and a supplemental analysis of UCR incidents that involved firearms. The team reviewed case files and UCR data for incidents in Beat 3 in which a person or property was hit. This analysis was intended to supplement the citywide look at shootings and provide additional information to officers as they began to design POP strategies. To get a sense of the hottest blocks within the Gardens area Figure 14 shows ShotSpotter activations over the two-year period July 2011 to June 2013. It shows the density of shootings across the area and presents the total number of activations for shots fired for each block during this period. The highest areas were around MLK Park and on Larkspur Drive and Azalia Drive between O'Connor and Sage.

Figure 14. ShotSpotter Activations in the Gardens, July 2011 – June 2013



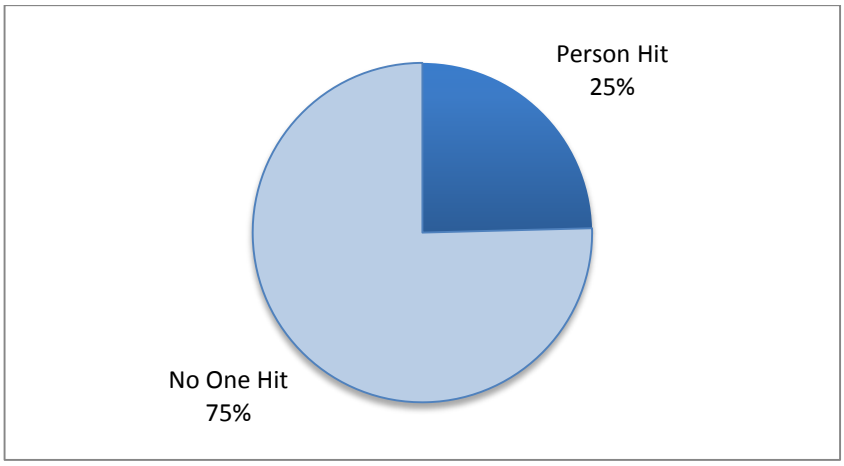
The Police Department provided the Warren Institute UCR data on offenses involving a firearm covering the period January 1, 2013 through January 31, 2014. The data included the following offense types: assault with a deadly weapon, shooting at an inhabited dwelling or occupied car, shooting at an unoccupied vehicle or building, attempted murder and murder, which represented 161 cases across the city over this 13-

month period. Beat 3 accounted for 38% of incidents involving a firearm and person was hit in 25% of incidents involving a firearm in Beat 3.

Figure 15. UCR Incidents Involving a Firearm, January 2013 – January 2014

	Number	Percent
Beat 1	67	42%
Beat 2	22	14%
Beat 3	61	38%
Beat 4	11	7%
	161	100%

Figure 16. Percent of Beat 3 Cases with a Firearm Where a Person was Hit (N=61)



Multiple incidents involving a firearm occurred on a few blocks in and around the Gardens hot spot between January 2013 and January 2014. The blocks with the highest number of incidents were provided to officers as they created an implementation plan.

- The 300 block of Azalia Drive, where five incidents occurred on January 1, 2013, March 6th, April 10th, August 29th, and December 20th. A person was hit on the April 10th incident.
- The 200 and 300 blocks of Wisteria Drive, where four incidents involving a firearm occurred on January 30, 2013, June 6th, September 17th, and October 24th. No persons were hit in any of these incidents.
- The 300 and 400 blocks of Larkspur Drive, where five incidents occurred on April 14th, April 15th, July 4th, July 20th, and December 5th. This includes a homicide on July 20th and a person was hit in the December 5th incident.
- 1060 Myrtle Street was the location of four incidents involving a firearm on October 29th, November 26th, November 27th, and December 1st. Persons were hit in the October 29th incident and the November 26th incident.

One of early tasks of East Palo Alto's SPI was to obtain an in-depth understanding of the nature and context of shootings in the City. For the first time since the ShotSpotter system was launched at the beginning of 2009, activation data was analyzed to examine where the most entrenched shooting hot spots were located, get a sense of the extent to which shooting hot spots moved over time, and understand with some level of precision when shooting incidents were occurring. This was supplemented with UCR data on shootings and a case review of incidents that happened in the targeted hot spot, the Gardens and Beat 3. The results of this analysis helped inform command staff and police officers as they designed POP strategies to reduce shootings in the targeted area.

Strategies Employed: Operation Silent Night

The findings from the shooting analysis were the starting point for the Police Department's problem-oriented policing efforts. A Gunshot Reduction Team (GRT) was established to lead this effort. Over the course of several meetings the GRT devised a two-pronged approach to address shootings in the targeted hot spot that involved 1) targeted patrols and searches and 2) community education and outreach. The efforts were jointly referred to as Operation Silent Night.

Targeted Patrols and Searches

Based on the ShotSpotter analysis and review of UCR incidents involving firearms the GRT decided to launch enhanced patrols in the targeted area during the times of the week when shootings were the highest, specifically, Thursday, Friday, and Saturday nights from 6:00 pm to 4:00 am. The intent was to have two officers in a car every night of the detail. Officers who worked the Operation were instructed to increase field interviews in the hot spot during these patrols.

In addition to increased patrols and intelligence gathering in the area, targeted probation and parole field searches were also conducted. The intent was to identify individuals who were under some form of community supervision, lived and/or hung out in the hot spot, and were known to have gun-related offenses. During the Operation an intelligence analyst at the PD selected and vetted the search targets and prepared folders for the officers on nights Operation Silent Night was being conducted. Several law enforcement data sources were queried, keeping in mind applicable search and seizure requirements, including California Department of Corrections and Rehabilitation Parole's Law Enforcement Automated Data System (LEADS), U.S. Courts' Law Enforcement Notification System (LENS), and San Mateo County Adult Probation and Juvenile Probation files.

Patrols and searches for Operation Silent Night started on April 24, 2014 and ended on January 31, 2015 but there were significant gaps in the Operation during these 41 calendar weeks.[29] Of the 93 Thursday, Friday, and Saturday nights during weeks when Operation Silent Night was run, 60 nights (65% of nights) had at least one officer working the detail and 37 nights (40% of nights) had two officers working the detail. As will be further detailed below, one implementation challenge was the availability of officers to work overtime shifts in a small department that was already stretched thin. The number of officers per night is worth noting, as searches were not included in the duties if only one officer was working due to officer safety concerns.

Community Outreach and Education

The second component of Operation Silent Night involved community outreach and education related to gunplay, and specifically celebratory gunplay. This was in part derived from the ShotSpotter analysis that showed a disproportionate share of shootings occurred around a few holidays and was likely celebratory gunfire (see text box above), as well as feedback from officers who spoke about concerns about celebratory gunfire. On six occasions between May and November 2014 police department staff conducted door-to-door outreach in the targeted areas. Information about ShotSpotter activations and the Police Department's efforts to reduce gunfire was also distributed at 12 beat meetings. In addition, the Police Department shared information about Operation Silent Night at five community events. As part of these community education efforts police officers began leaving fliers at houses that were in close proximity to a ShotSpotter activation. While canvasing the area and knocking on doors officers left fliers that said, "Dear residents, A gunfire incident was reported in your neighborhood on [date] at [time]. If you have any information regarding this incident, please contact the East Palo Alto Police Department." Several ways in which the police could be contacted were included. Appendices A and B include samples of the information that was distributed to residents.

Activities for Operation Silent Night were designed by the Gunshot Reduction Team to address the chronic, high levels of shootings in one of the hottest spots in the City. Activities were based on analysis and mapping of ShotSpotter data, case reviews of UCR incidents involving a firearm in the targeted area, and officers' knowledge about the neighborhood. Resources were deployed on certain times of the day and days of the week; individuals who were under some form of supervision, located in the area, and had a history of gun use were targeted for searches; and community outreach and education on gunplay were conducted. Shootings were down significantly in 2014 compared to the prior year – with a 41% reduction

[29] No details were staffed between the middle of June through the end of August. In addition, there were many nights during this period when no officers worked the detail.

in shootings across the city and a 52% reduction in Beat 3 where Operation Silent Night was conducted. That said, the significant gaps in operations and the inconsistency with the number of officers working a detail or the activities conducted during a detail means that a high-quality, outcome evaluation to assess the effectiveness of Operation Silent Night on shootings in the hot spot was not possible.

The remainder of this report presents analysis of East Palo Alto's Smart Policing Initiative that is more focused on process than outcomes. Specifically, opinions about Operation Silent Night and the ShotSpotter system, an assessment of the strengths and limitations of ShotSpotter data for analytical purposes, and lessons learned related to implementation are included.

Staff Opinions about Operation Silent Night and ShotSpotter

Over the course of the project, one-on-one interviews were conducted with sworn officers (representing day and night shifts, line staff and supervisors, and detectives and patrol), civilian staff at the police department, and dispatchers from San Mateo County to better understand how ShotSpotter users felt about the system. Members of the Gunshot Reduction Team and officers who worked Operation Silent Night details were interviewed after operations ceased to get their reflections on the SPI. Questions included:

- What were the successes of Operation Silent Night?
- What were the biggest challenges of Operation Silent Night?
- If you could re-launch this initiative, what would you do differently?
- What are the biggest lessons learned from Operation Silent Night?
- How was the ShotSpotter system introduced to you?
- Have there been formal changes in Police Department policies or protocols as a result of the technology?
- How do you use the information from the system in your day-to-day work, if at all?
- Has the use of this technology evolved since the system was launched citywide at the beginning of 2009?
- What are the benefits of the system to you as an officer and to the Police Department overall?
- What are some of the problems or challenges with the system?
- If you could make improvements to the system or how it is used what would they be?

Below are highlights from these interviews organized around themes that emerged from the conversations.

Operation Silent Night: Leadership and Staffing

The officers and staff who were interviewed about Operation Silent Night expressed both positive and negative opinions about East Palo Alto's Smart Policing Initiative. There was general agreement that the project was needed and that the Department could benefit from using data and information to help shape tactics and strategies. Interviewees were largely supportive of the planning and design phases of Operation

Silent Night. However, several people expressed a sense of frustration that Operation Silent Night was not more robust, specifically related to sustained staffing of the details and identification of appropriate individuals for searches. Most officers attributed this frustration to the dramatic changes in command staff at the PD and the larger context within which this grant-funded program was being implemented. (See text box on page 13 about changes in leadership.) Most expressed satisfaction with the goals of the project and the plans for operations but believed that things weren't implemented as designed because of the larger challenges confronting the Department. "The plan was ok but we are such a small and stretched Department that we struggled with staffing."

Several of the Police Department staff who were interviewed commented on the challenges of responding to the changing priorities of the various chiefs. "We weren't able to be consistent because every new chief had different priorities." Interviewees noted that a two-year, grant-funded program was not necessarily a priority for some interim chiefs who knew they would be in charge of the Department for just a few months.

In addition to the instability with leadership, all of the interviewees commented on the constraints of working in such a small department. "We didn't have enough capacity in a time of dramatic and continuous change." As noted above, it was often the case that only one officer or no officers were available to work the details, rather than the planned two per detail for three nights each week. Officers mentioned that in order to conduct full operations as planned, including targeted searches and field investigations, two officers per shift were needed for adequate cover and safety.

A few officers commented on the importance of designating someone to identify appropriate candidates for the targeted searches (i.e., individuals on some form of supervision, who lived or frequented the area, and had a history with guns). In the early months of the project a crime analyst compiled a list of targets each week from several law enforcement databases, as described above. However, the crime analyst was let go in the fall of 2014 and several officers mentioned that after the departure of the analyst the names they were provided for searches often weren't appropriate targets.

Operation Silent Night: Targeted Area

When asked about the area in which Operation Silent Night was conducted, the feedback from officers was mixed. Some agreed that the Gardens hot spot and Beat 3 was a chronic problem in terms of shooting incidents and that it made sense to focus resources in that area. A few officers said they believed that the enhanced patrols during peak shooting times had an impact on the hot spot. "After several weeks the community knew the police were out Thursday night, Friday night, and Saturday night." Others felt that being restricted to one area was too limiting and expressed frustration at not be "allowed" to travel to

other parts of the City. The detail was a ten-hour shift (6:00 pm to 4:00 am) and a few respondents felt the targeted area was too small for 30 hours of patrol per week.

ShotSpotter: Introduction and Training[30]

Overall, the large majority of people interviewed had generally positive opinions about ShotSpotter and none had an overall negative view of the system. "ShotSpotter is one of the best tools for police on the street." Many interviewees said that they felt ShotSpotter helped provide enhanced mental awareness and situational awareness when arriving on a scene. None of the officers who were interviewed reported receiving any formal training when the system was launched or when they joined the Department if that occurred after the system was in place. That said, none of the officers felt like they needed any formal training, especially because, at the time of the interviews, the ShotSpotter system being installed in police cars was very limited.[31] In 2009 when the system was launched citywide, ShotSpotter provided training to San Mateo County dispatchers but not police officers or Police Department administrators. At the time, all written materials were geared toward dispatch. According to one interviewee, in the early years SST Inc. didn't really understand how police departments worked and the engineers weren't very knowledgeable about how the system could actually help police departments in a meaningful way. According to this person, this has been an area of continued improvement and the company is much better at meeting the needs of local police departments today than a few years ago. It is worth noting that the City of East Palo Alto was one of the earlier sites to launch the system on a wide scale and ShotSpotter has since developed several comprehensive training modules for district attorneys and prosecutors, dispatch, and police. ShotSpotter now offers many trainings and webinars that are targeted at different end-user groups.

ShotSpotter: False Positives and Response Time

For the first three and a half years of operation, ShotSpotter activations were reviewed by San Mateo County dispatchers to confirm or reclassify activations for shots fired before the Police Department was notified. Then in June of 2012 ShotSpotter introduced the FLEX program, through which ShotSpotter staff reviewed and confirmed activations for shots fired before contacting San Mateo County dispatchers. Several officers who were interviewed commented on the differences in ShotSpotter since the FLEX

[30] An assessment of formal changes in police department policies and protocols was initially a planned research task. However, there was no evidence of formal, written changes to police department protocols or policies related to the ShotSpotter system. It is worth noting that this does not include an assessment of changes made at San Mateo County Public Safety Communications.

[31] For the first several years it was primarily San Mateo County dispatchers who directly interacted with the system, as well as some command staff. Patrol officers did not have direct access to the system in their cars but that has since changed.

program started. Most of the comments reflected the sentiment that there were fewer "false alarms" than before FLEX was launched. "Early on it was the boy who cried wolf because we were sent to things that didn't turn out to be shootings. Now with FLEX the false alarms have gone down." One officer stated that in the beginning he felt the volume led to complacency. Not all of the feedback about FLEX was positive, however, as a few officers stated that they believe there is now a delay in dispatch as they wait for ShotSpotter to review activations.[32]

Consensus did not exist among the eight officers who were interviewed about whether the ShotSpotter system actually resulted in quicker response times, before or after the introduction of FLEX, as some officers said it reduced response times and others said it did not. Some said that more accurate location information helps officers get to scenes quicker because they don't have to canvas large areas upon arrival to identify the actual location of a shooting incident. "Because we get there quicker shootings are down. Criminals know we will arrive on-scene quickly." However, despite guarantees by the company that more than 90% of alerts will be communicated within 60 seconds, a few of the officers still believed that there was a delay because officers now have to wait for ShotSpotter to review the activations before being dispatched.

ShotSpotter: Accuracy and Coverage

The location accuracy of the system was generally viewed as very high for incidents that take place in areas with good coverage. This high location accuracy is especially valuable in the context of investigations. A few officers mentioned that coverage is weak on the west side of the City and, therefore, accuracy was not as good in those locations.[33] One officer mentioned a case where ShotSpotter's location was off by one block because it was in a bad coverage area. "My guys missed it but I saw a car with bullet holes in it one block from where the system said it was." The accuracy of sound classification is another issue that came up and several interviewees believed that there has been continued improvement in accurately identifying activations as gunshots rather than fireworks or construction noise.[34]

[32] It is worth noting that ShotSpotter guarantees that 90% of all alerts will be communicated to end users within 60 seconds and, in most cases, it is done in less than 20 seconds according to ShotSpotter training materials.
[33] It is worth noting that ShotSpotter does not guarantee coverage west of Highway 101.
[34] Based on a conversation with a ShotSpotter employee, the basic technology has not changed since the system was put in place and how sound is picked up has not changed. However, how sounds are classified has changed. The technology is supposed to learn from itself through review and reclassification to increase classification accuracy. The reclassification of sound types (from say a single gunshot to a firecracker) is how the system learns from itself and in the early years, prior to FLEX, dispatchers were not helping the system improve because so few reclassifications were happening.

ShotSpotter: Investigation and Prosecution

There was general agreement that the system was a good investigative tool and, specifically, the system's ability to help locate casings. Some interviewees felt the system's greatest value was in collecting evidence. A few officers mentioned ShotSpotter as an effective tool for the courtroom as well. "Playing the audio back to the jury in conjunction with pictures really puts them in the moment." Another officer stated, "If there is someone on the fence and they hear the audio, then it could help put a killer away." One interviewee described how system use by the Department has evolved over time. Initially, it was simply a source of information for dispatch. After the system was launched and once officers became more comfortable with it, they began referring to ShotSpotter in their field reports. Then investigators started to realize the value of the information and they started asking administrators to run ShotSpotter reports to assist with their investigations. Then ShotSpotter data and audio clips started being used in court.

Challenges of an Untested Data Source

The following discussion about ShotSpotter as an analytical tool is primarily based on research staff working with the data over the course of two years and feedback from interviews with "end users" including officers and dispatchers. Before discussing issues related to ShotSpotter data that emerged from the shooting analysis, it is worth highlighting some of the strengths of the ShotSpotter data as an analytical tool. Unlike UCR data or data on calls for service for shots fired, which are based on people making police aware of crime incidents or suspicious behavior, ShotSpotter provides a new measure of gunfire that is probably a closer estimate of the universe of shootings relative to these more traditional data sources. This is one of the biggest claims on the part of SST, Inc., as well as from many law enforcement agencies. The system is (theoretically) on all of the time and that there are so many more shooting activations than calls for shots fired is evidence of this more comprehensive data collection. In addition, identifying the precise location where shootings take place by all accounts is an improvement over UCR and calls for service. ShotSpotter data provides a measure of gunfire in the city, regardless of whether a victim or piece of property was hit. Despite these strengths, as the analysis progressed it became apparent that some of the assumptions being made about ShotSpotter data needed qualification.

Figure 17. Selected Findings about Quality of ShotSpotter Data

Assumption	*Reality*
Consistent review and notification process since 2009	ShotSpotter took over review from county dispatch in June 2012
Consistent technology since 2009	Changed the "classifier" and system down for maintenance and repairs
Clean data	Included "noise" such as construction hot spots and duck hunting in wildlife preserve

Change in Review Process

One of the desirable features of ShotSpotter data in East Palo Alto was that it had been in operation for several years at the start of the project, making it a consistent data source for longitudinal analysis. However, the review process to verify that an activation was for shots fired changed in June 2012. Initially, San Mateo County dispatch was responsible for reviewing and confirming activations were for single gunshot, multiple gunshots, or possible gunshots before dispatching officers. With the launch of ShotSpotter's FLEX system, activations for shots fired were reviewed at ShotSpotter's Incident Review Center before being forwarded to San Mateo County dispatch.

Researchers were given access to some of the raw activation data before it was reviewed by San Mateo County dispatch or the Incident Review Center ("pre-review" data) as well as the activation data after it had been reviewed and possibly reclassified ("post-review" data). A comparison of pre-review and post-review data over time shows the extent to which activations were reclassified changed notably in 2012. As shown in Figure 18, the share of all activations that were reclassified increased from 11% in 2010 and 12% in 2012 to 29% in 2012 and 40% in the first four months of 2013. This significant change in process means that East Palo Alto's ShotSpotter activation data is not a good source for a longitudinal analysis prior to June 2012. Said another way, changes in the total volume of shootings might be attributable to the switch to FLEX and not attributable to changes in the actual number of shootings taking place.

Figure 18. Percent of All Activations that were Reclassified Upon Review

2009	20%
2010	11%
2011	12%
2012	29%
2013 (through April)	40%

Change in Technology

Another assumption at the launch of East Palo Alto's SPI was that the technology had not changed in any notable ways. In some regards this was true, as the fundamental technology and how the sound gets picked up (i.e., sensors triangulating sound) were relatively stable. However, interviews revealed that there had been improvements to the "classifier," which is the component that identifies the type of sound that triggered an activation. As one example, based on "pre-review" data there were 24 activations for helicopters in 2011 and that number jumped to 1,110 in 2012. While we are unable to say with certainty that this is attributable to changes to the "classifier" this dramatic change in the raw, not-yet-reviewed data does imply that the system was classifying sounds differently from one year to the next. Again, this has implications for longitudinal analysis in that changes in levels of shootings may be attributable to underlying changes in how sounds were classified.

Another aspect of the technology that had data implications was the "health" of the system. It was assumed early on that the system was running 24 hours per day for 365 days per year. However, the data analysis revealed no activations over a 19–day period in 2012. Based on interviews, it was deduced that a stretch for such a long period of time with no activations meant that the system was probably down for routine maintenance or repairs and not that the City of East Palo Alto experienced no sounds citywide that triggered the system for two and a half weeks. Yet again, this has implications for longitudinal analysis.

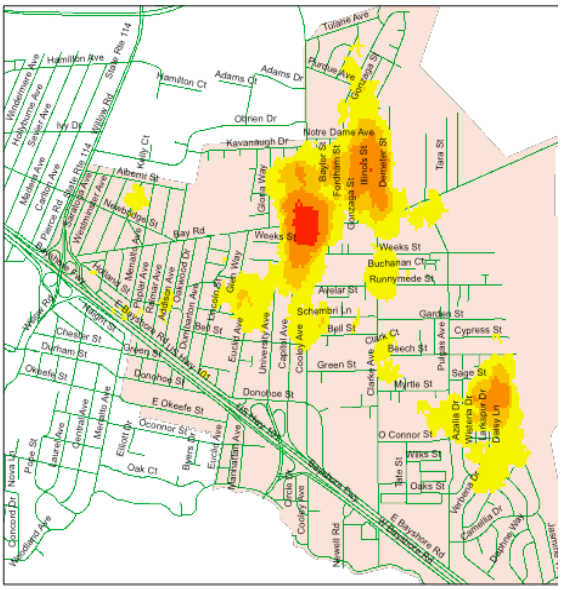
"Noise" in the Data

As noted earlier, as part of the process for identifying chronic hot spots to target the intervention a series of heat maps covering various time periods was developed. This process revealed a hot spot on Myrtle Street during the period July 2010 to June 2011. Interestingly, very few activations for shots were recorded in this area during the previous year or the following two years (See Figure 19). Said another way, data analysis showed an intense shooting hot spot on Myrtle Street but only during one year of a four-year period. A site visit revealed a new school at the location of the short-lived hot spot and researchers believe that nail guns and other noises from construction were the cause of many of the activations for shots fired. Further analysis of the time and dates of activations support this notion, as 98% of activations in the Myrtle Street hotspot occurred during weekdays between the hours of 7:30 am and 2:30 pm.[35]

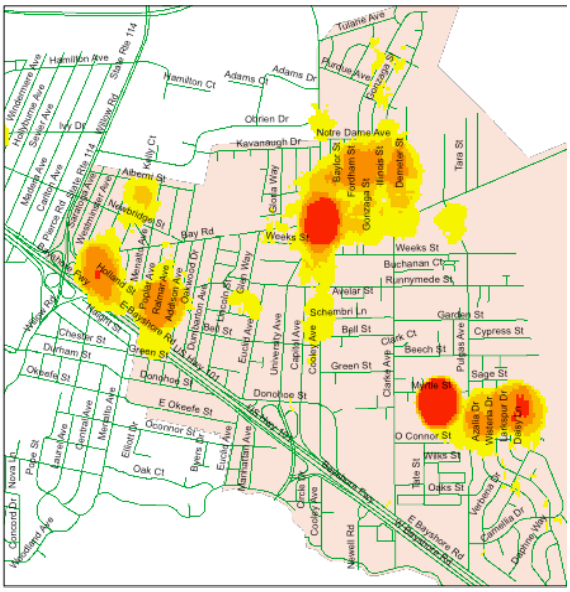
[35] It is worth noting that this construction hot spot occurred prior to the launch of the FLEX system.

Figure 19. Myrtle Street "Hot Spot"

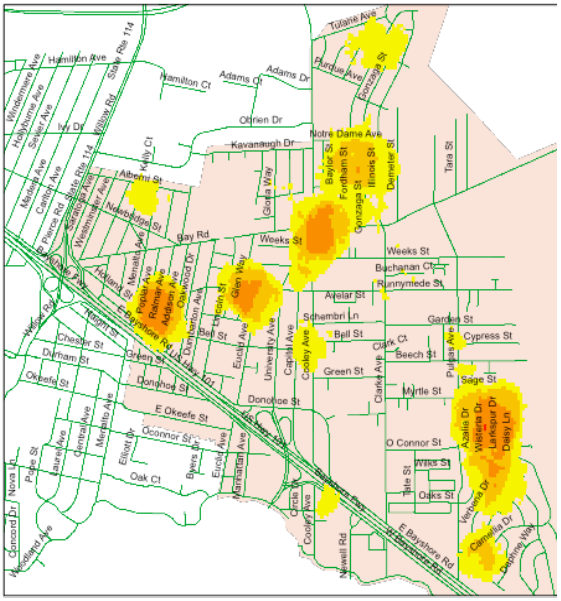
July 2009 – June 2010



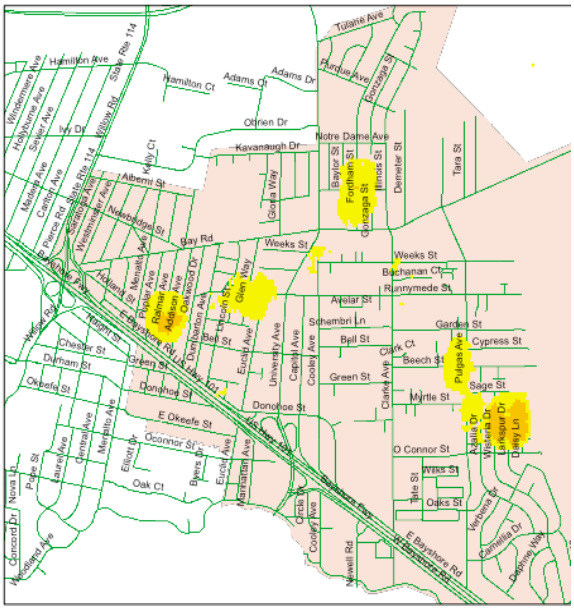
July 2010 – June 2011



July 2011 – June 2012



July 2012 – June 2013



East Palo Alto is home to the Ravenswood Open Space Preserve, which is a 376-acre preserve on San Francisco Bay.[36] Shooting heat maps revealed acute hot spots in the preserve, far from residences or commercial buildings. These activations are likely from duck hunting, which is allowed during certain months of the year. According to officers who were interviewed, ShotSpotter was often activated during duck hunting season.

The above examples are intended to illustrate how, despite the many notable strengths of ShotSpotter as an analytical tool, using shooting data in the aggregate should be approached with some caution. Raw data taken directly from the system is not necessarily "clean" and an in-depth examination of the records will help identify outliers, such as the system being down for days for maintenance or temporary, "artificial" hot spots from construction sites. While arguably, "noise" in the data has been on the decline since the launch of the FLEX system, attention to the details behind the totals would still be beneficial. An overall quality assessment is warranted when using ShotSpotter data in the aggregate.

Key Findings and Recommendations

The City of East Palo Alto deployed ShotSpotter in 2009 and after years of using the system almost exclusively as a rapid response tool, in 2012 expanded its use for strategic planning and analysis and problem-oriented policing through it's Smart Policing Initiative. Data was analyzed to better understand shooting incidents and identify shooting hot spots within the City. The findings from the shooting analysis were the starting point for a Gunshot Reduction Team that devised a two-pronged approach referred to as Operation Silent Night that included targeted patrols and community outreach. Below are some key findings based on the quantitative analysis of ShotSpotter data, interviews conducted throughout the course of the project, and a review of relevant documents. The report closes with some recommendations for the East Palo Alto Police Department related to future use of ShotSpotter data and grant-funded initiatives.

Key Findings

Even within a City as small as East Palo Alto, at 2.5 square miles, concentrated areas accounted for a disproportionate share of shootings. As depicted in several maps above, gunplay is pervasive across the City but smaller areas, just a few blocks in size, experience a disproportionately high percentage of shootings. The three hot spots that accounted for the largest volume of shooting incidents over a four-year period accounted for 13% of the City but 25% of the shootings.

[36] http://www.openspace.org/preserves/pr_ravenswood.asp.

The locations of the hottest shooting hot spots were remarkably stable over time. The analysis showed that the locations of shooting hot spots were remarkably stable between 2009 and 2013. The same areas were identified as having the highest levels of shooting incidents when looking at one year, two years, or four years of data.

Celebratory gunfire accounted for a notable share of shootings in the City. Gunplay around New Year's Eve and the Fourth of July accounted for a notable share of all shootings. Only nine calendar days around these two holiday (2.5% of the days in a year) accounted for 22.5% of all shooting activations in a year.

Overall, officers were very positive about the ShotSpotter system as a rapid response tool and an investigative tool. The majority of people interviewed had generally positive opinions about ShotSpotter. One of the most frequently cited benefits was the system helping to provide enhanced mental awareness and situational awareness when arriving on a scene. Officers generally felt that the introduction of the FLEX system has reduced the number of false positive activations. ShotSpotter as a beneficial investigative tool was also frequently mentioned.

There is strong potential for using ShotSpotter activation data as an analytical tool, but departments that adopt this strategy must conduct a thorough examination of data quality. ShotSpotter provides a new measure of gunfire that is probably a closer estimate of the universe of shootings relative to more traditional data sources such as calls for service for shots fired. This is one of the biggest claims on the part of SST, Inc., as well as from many law enforcement agencies. The system is (theoretically) on all of the time and the fact that there are so many more shooting activations than calls for service for shots fired is evidence of this more comprehensive data collection. In addition, identifying the precise location of where shootings took place by all accounts is an improvement over UCR data and calls for service data. ShotSpotter data provides a measure of gunfire in the city, regardless of whether a victim or piece of property was hit. Despite these strengths, using ShotSpotter data in the aggregate should be approached with some caution. Raw data taken directly from the system is not necessarily "clean" and an in-depth examination of the records will help identify outliers, such as the system being down for days for maintenance or temporary, "artificial" hot spots from construction sites. An overall quality assessment is warranted when using ShotSpotter data in the aggregate.

Substantial turnover in leadership at the East Palo Alto Police Department as well as staffing constraints resulted in less than robust implementation of Operation Silent Night than was originally planned. Several individuals in the chief's office over the course of the SPI grant (six chiefs in less than 18 months) didn't allow for consistent direction or attention from Department leadership. The

sworn and non-sworn staff who were involved with Operation Silent Night demonstrated professionalism and commitment to the program. However, there was only so much line staff could do and a lack of a champion for the project at the level of command staff probably weakened the overall success of the initiative.

East Palo Alto PD is a small department with an authorized strength of 36 sworn officers, yet the actual number of sworn officers available at any given time is typically lower because of unfilled positions and officers out on injury leave. The level of human resources needed to sustain the enhanced patrols may have been too large for a department of this size. Two officers working a ten-hour shift three nights a week proved hard to maintain. Thus significant gaps in staffing of Operation Silent Night resulted. As one interviewee stated: "We didn't have enough capacity in a time of dramatic and continuous change."

A bigger picture understanding of SPI within the Department could have strengthened implementation. Data, staffing, and leadership challenges aside, there are also lessons to be learned about conducting an innovative, problem-oriented policing initiative. East Palo Alto's Smart Policing Initiative may have been stronger if command staff at the Department made greater efforts to increase engagement and buy-in on the part of the sworn staff working Operation Silent Night, including the Gunshot Reduction Team, regardless of who was in the chief's office. This is especially true for the initial stages of the project. Training and education on problem-oriented policing for officers involved with this initiative may have helped to strengthen commitment and a bigger picture understanding of the goals. Designing strategies to address entrenched shooting hot spots (above and beyond enhanced patrols and targeted searches) could have been stronger by supplementing the ShotSpotter analysis with more on-the-ground intelligence. Addressing questions such as, is the main contributor to high levels of shootings people (who are the shooters and the people who are likely to be shot) or is the main contributor place (why are people attracted to that location)? Why are the shootings happening? Is it a drug market? Is it gangs? Empowering officers to think critically and creatively about out what is going on in the hot spot may have resulted in a stronger response. Interviews revealed that some officers did not feel empowered to think creatively and design new and innovative approaches. Indeed, the context of instability in Department leadership and a police force already feeling squeezed did not lend itself to an environment of thinking big, taking risks, and trying something new.

Along those lines, interviews with officers and researchers' participation in some of the planning meetings revealed that staff involved with the initiative – from the chief to the patrol officers - did not have a shared understanding of the goals of East Palo Alto's Smart Policing Initiative. This was evidenced by the differing opinions about where the efforts should be focused (entrenched hot spots versus areas experiencing

recent spikes in shootings) and about who should be targeted for searches (individuals with a history guns versus anyone under community supervision in the hot spot). Clear communication about the goals of the project that was consistent over time may have reduced the extent to which some individuals felt frustrated by how the Operation was being run.

Recommendations

Recommendation 1: The Police Department should continue to engage in problem-oriented policing to address chronic shooting hot spots. While EPA has seen notable improvements in shooting levels citywide in 2014, there is still work to be done to ensure reductions are sustained and to make further improvements. The efforts related to Operation Silent Night were focused on a single hot spot but the results of the analysis of ShotSpotter data can continue to serve as a starting point for future problem-oriented policing efforts. Under the leadership of Chief Pardini the Department should continue to leverage the valuable information gleaned from the City's ShotSpotter system and supplement that with the on-the-ground intelligence of officers to engage in problem oriented policing around the City's chronic shooting hot spots.

Recommendation 2: The Police Department should continue to use ShotSpotter data as an analytical and strategic tool, as long as a thorough examination of data quality is performed. As discussed throughout this report, the ShotSpotter data has some notable strengths over the more traditional data sources and the Department should continue to use this data source as an analytical tool. The work conducted for this SPI, while in-depth, still leaves lots of room for additional analysis and learning. That said, future work should always include quality assessment to identify outliers and anomalies in the data that are acknowledged and, when appropriate, accounted for.

Recommendation 3: Staffing capacity should be considered for the sustainability of future initiatives. Enhanced patrols and targeted searches in the hot spot during peak hours was a sensible strategy to addressing the targeted problem: shootings. However, the reality of staffing two officers for ten-hour shift three nights a week proved challenging for the small Department that was already stretched thin. The feasibility of staffing special projects or programs should be part of the design and planning process. If the Department had been able to staff Operation Silent Night as intended and was able to sustain that level of commitment, the outcomes may have been stronger.

Recommendation 4: Strengthening buy-in and ownership on the part of involved staff should be a focus of future initiatives. A shared understanding of the goals of the project did not exist among all of the staff involved and many individuals were not familiar with the larger context of the Bureau of Justice Assistance's Smart Policing Initiative. Taking the time to strengthen buy-in on the part of the staff who

were involved with the project by providing more information and education in the early stages may have mitigated some of the confusion and frustration that arose during the project. Members of the East Palo Alto Police Department, both sworn and non-sworn, have, as a whole, tremendous talent and show commitment to making East Palo Alto safer. Future initiatives should better leverage that talent and commitment and make concerted efforts to increase ownership on the part of the men and women who are engaged in these types of efforts from day one.

East Palo Alto's Smart Policing Initiative was a combination of successes and challenges. It yielded a significant amount of learning. Learning about the strengths and weaknesses of an untested data source; learning about navigating a grant-funded program in a small department through a period of significant change; learning about how to design and implement problem-oriented policing strategies; and learning in great detail about shooting incidents in the City of East Pal Alto.

Appendix A. Gunshot Safety Flier

HELP MAKE EAST PALO ALTO A BETTER COMMUNITY

Reducing gunshots is a priority for the East Palo Alto Police Department (EPAPD). With support from the Bureau of Justice Assistance's Smart Policing Initiative, EPAPD is implementing a gunshot reduction effort called "Operation Silent Night." We use data from ShotSpotter technology and investigative tools to guide our gunshot reduction efforts.

You can help reduce gunshots for a better East Palo Alto by:

- Not negligently firing your weapons
- Encouraging your neighbors and friends not to negligently fire their weapons
- Reporting people who fire weapons:
  - o Call 911
  - o Leave an anonymous voice mail by calling 650-409-6792
  - o Send an anonymous text from your cell phone to 650-409-6792
  - o Send an anonymous email to epa@tipnow.org

Gunfire Devastates Our Community

East Palo Alto Police Department's gunshot reduction efforts have helped decrease gunshots in the city, but there are still far too many gunshots in East Palo Alto.

- 2,148 shooting incidents in 2011
- 1,496 shooting incidents in 2012
- 1,127 shooting incidents in 2013

These shootings damaged our community by:

- Taking the lives of our loved ones: 21 people were killed by gunfire in East Palo Alto from 2011 through 2013
- Injuring our loved ones
- Damaging our property

East Palo Alto was burdened by nearly 500 assaults with firearms from 2011 through 2013

- Causing psychological trauma: gunshots cause fear and stress that impacts our residents' ability to function at school, work, and in everyday relationships.
- Physical illness: stress often leads to physical problems such as high blood pressure. Furthermore, fear prevents our residents from engaging in physcial activities in their neighborhoods; contributing to high chronic disease and obesity rates
- Increasing financial burdens: our residents have to pay for funeral and medical bills, repair costs for damaged property, and lost wages due to injuries and stress. Furthermore, the City of East Palo Alto has to spend significant resources on shooting investigations that could be spent in other ways to improve the city

We can improve East Palo Alto for all residents by decreasing gunshots in our community.

Negligently Shooting Your Firearm is Illegal

Penal Code 246.3 PC, California's "negligently discharging a firearm" law, prohibits willfully firing a gun or BB device in a grossly negligent manner that could result in death or injury to a person."

When you act in a grossly negligent manner it means that you act in a reckless way that:

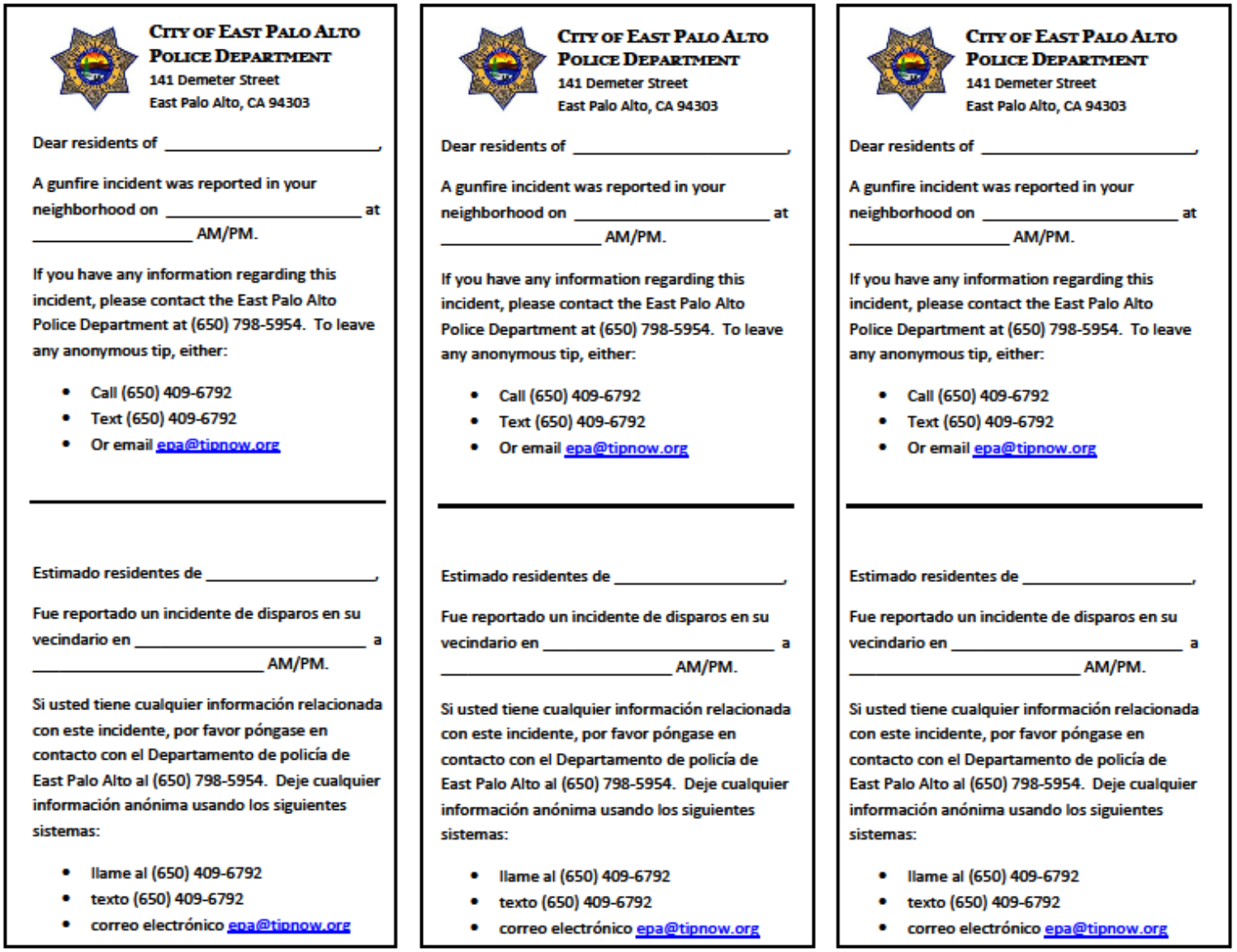
- Creates a high risk of death or great bodily injury,
- Demonstrates a disregard for human life or an indifference to the consequences, and
- Is such that a "reasonable" person would have recognized the nature of the risk.

Penalties for negligent use of a firearm

Negligently discharging your firearm could result in you being charged with a misdemeanor or a felony. The District Attorney has discretion to choose how to prosecute you

- If convicted of negligently discharging a firearm as a misdemeanor, you face up to one year in a county jail and a maximum $1,000 fine.
- If convicted of this offense as a felony, you face 16 months, or two or three years in the California State Prison and a maximum $10,000 fine.
- In addition to the above penalties, a conviction under Penal Code 246.3 will result in the loss of your Second Amendment right to bear arms.

Appendix B. Post-Shooting Door Tag



CITY OF EAST PALO ALTO
POLICE DEPARTMENT
141 Demeter Street
East Palo Alto, CA 94303

Dear residents of _____,

A gunfire incident was reported in your neighborhood on _____ at _____ AM/PM.

If you have any information regarding this incident, please contact the East Palo Alto Police Department at (650) 798-5954. To leave any anonymous tip, either:

- Call (650) 409-6792
- Text (650) 409-6792
- Or email epa@tipnow.org

Estimado residentes de _____,

Fue reportado un incidente de disparos en su vecindario en _____ a _____ AM/PM.

Si usted tiene cualquier información relacionada con este incidente, por favor póngase en contacto con el Departamento de policía de East Palo Alto al (650) 798-5954. Deje cualquier información anónima usando los siguientes sistemas:

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