

Miami-Dade County
Office of Management and Budget

OMB ShotSpotter Benchmarking and Performance Measures Recommendations for
Miami-Dade Police Department

Background and Project Deliverables

The Office of Management and Budget Management Planning and Performance Analysis division (OMB) reached out to the Miami-Dade Police Department (MDPD) to assist in the development of performance measures that will be used to assess the effectiveness of ShotSpotter. ShotSpotter is a web-based service that uses acoustic sensors to triangulate incidents of gunfire within a specific area. In addition to notifying MDPD when gunfire is detected, ShotSpotter will be able to provide the time, exact location within 82 feet, and the number of shots fired for these incidents, typically, within 60 seconds.

As part of this project, OMB conducted a benchmarking survey that included seven law enforcement agencies across the country. Aside from general demographic questions, agencies were asked about their deployment and tracking of ShotSpotter. The input received from these agencies was considered when developing the recommended performance measures.

In addition to the benchmarking survey, OMB recommended seven performance measures that can be used to track the effectiveness of ShotSpotter. These measures along with the frequency in which they should be measured were provided to MDPD at the conclusion of this project.

Benchmarking

OMB reached out to approximately 11 law enforcement agencies across the country that have deployed ShotSpotter, and was successful in obtaining information from seven of those. Among the factors considered in selecting the agencies were the size of the agency and the length of time in which ShotSpotter had been deployed. While the intention of the benchmarking survey was to learn about the specific performance measures that agencies use to track ShotSpotter, OMB was also able to obtain and provide MDPD with additional tools, information and recommendations in regards to ShotSpotter. An executive summary of the benchmarking survey is attached.

All of the agencies surveyed reported an improvement in their response time to shots fired incidents within the ShotSpotter coverage area. Some agencies reported that officers are arriving to incidents prior to the call being dispatched via the police radio. OMB also found that all of the agencies collect and forensically analyze casings recovered at the scene of ShotSpotter incidents, regardless of whether or not there is a victim. This collection and analysis of evidence is crucial in the investigation of incidents as agencies can detect patterns and, ultimately, apprehend the offender(s) based on the gathered evidence.

While its use varies across all the agencies surveyed, successful deployments of ShotSpotter include integration with other available technological solutions. These technological solutions, most of which MDPD has already deployed, include body-worn cameras, both fixed and car-mounted license plate readers, surveillance cameras, social media monitoring tools, and ballistic identification systems among others.

The information gathered through the benchmarking survey informed the recommendations in regards to the performance measures and their feasibility.

Performance Measure Recommendations

Based on discussions with MDPD staff and other law enforcement agencies across the country, OMB recommends the following performance measures to assess the effectiveness of ShotSpotter. The measures along with a brief description can be found in.

Since MDPD's Real Time Crime Center will house ShotSpotter among other technological solutions, the decision on the tracking, collection, and analysis of the performance measures will be solely up to MDPD.

- Percentage change in shots fired incidents in areas with ShotSpotter
- Percentage of ShotSpotter alerts in which MDPD was not notified by the community
- Average time elapsed between a ShotSpotter alert and a notification by the community
- Count of ShotSpotter alerts
- Shell casings recovered and forensically analyzed
- Shell casings recovered and forensically analyzed without a 911 phone call
- Shots fired incidents that were not alerted by ShotSpotter

Additional Recommendations

Throughout the benchmarking survey, the officers and command staff involved in the use of ShotSpotter at other law enforcement agencies made additional recommendations. These suggestions and recommendations have been relayed to MDPD and some of these are included below. In addition, MDPD received the contact information for all of the law enforcement agencies OMB spoke with to conduct any additional follow up, if necessary.

- Analyze the incidents that were not picked up by ShotSpotter and investigate the reason(s) why. This analysis has resulted in the deployment of more sensors for other agencies
- Conduct quarterly reviews with ShotSpotter on the performance of the system, use these reviews to discuss incidents that were detected and/or missed
- Use a hard count on evidence recovered, not just a yes or no per incident
- Fully integrate ShotSpotter into existing crime and parolee maps to allow for comparison of incidents with things like noise complaints, house parties, and drug or gang activity
- Train patrol officers and tactical units prior to the system's deployment and make them aware of its capabilities
- Use ShotSpotter activation and mapping information to inform patrol officers of safe areas of entry into active scenes and potential avenues of escape for suspects
- Track and log ShotSpotter alerts with a unique code, based on how shots fired incidents are currently dispatched
- Integrate ShotSpotter into patrol operating procedures. Create a procedure for how officers should respond to all ShotSpotter alerts

For more information on the benchmarking survey and the recommended performance measures please contact Jose Espinoza, Assistant Business Analyst, Office of Management and Budget, at 305-375-2897.

Attachments:




**Miami-Dade County
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ShotSpotter Benchmarking – Executive Summary**



- Miami-Dade County's Office of Management & Budget (OMB) surveyed seven police departments as part of an analysis aimed at developing performance measures that can be used to track ShotSpotter's effectiveness upon its deployment by the Miami-Dade Police Department. The agencies surveyed include five municipal police departments and two sheriff offices across five states: Florida, Illinois, Minnesota, Missouri, and New York. The point of contact at all of the agencies surveyed was the individual that oversees ShotSpotter at that agency
- OMB selected the agencies based on their size and the length of time in which they had deployed ShotSpotter, among other factors. The selected agencies range in size from around 215 sworn personnel in the Miami Gardens Police Department to approximately 36,000 sworn personnel in the New York City Police Department
- All seven of the agencies surveyed have or are in the process of creating a Real-Time Crime Center (RTCC). The exact structure and name of the center varies by agency but all house and monitor, or intend to house and monitor, ShotSpotter at their RTCC-type center. Approximately half of the agencies have personnel solely dedicated to ShotSpotter, while others have personnel for which ShotSpotter is only one of the technologies they work with
- The date in which ShotSpotter was deployed varied by agencies with the earliest having been deployed in 2007 by the Minneapolis Police Department and the most recent being Miami-Dade and Chicago Police Departments who intend to fully deploy ShotSpotter by early to mid-2017
- On average, the ShotSpotter coverage area for the agencies surveyed is 5.25 square miles. This average excludes New York City which has a 27 square mile coverage area and a planned expansion to 60 square miles of coverage
- Three of the agencies surveyed average more than 100 ShotSpotter alerts per month. The number of alerts per month range from about 30 or 40 for agencies with smaller coverage areas to about 180 alerts per month for agencies with larger coverage areas
- Four of the agencies surveyed estimate that anywhere between 70% and 90% of ShotSpotter alerts do not have a corresponding 911 call. This is to say that officers would not have responded to the incident where it not for the ShotSpotter alert
- All of the agencies surveyed have reported an improvement in their response time to shots fired incidents within the ShotSpotter coverage areas, some have even noticed that they are arriving to incidents prior to the call being dispatched via the police radio. The improvements in response time can be attributed to various factors, one of those being that officers received ShotSpotter alerts directly in their computers or mobile devices without the need for a 911 call from the community
- In addition, all of the agencies have technological solutions that, together with ShotSpotter, allow for a more integrated policing platform. These solutions include body-worn cameras, domain awareness systems, both fixed and car-mounted license plate readers, surveillance cameras, social media monitoring tools, and ballistic identification systems among others
- All of the agencies either collect or attempt to collect shell casings for the ShotSpotter alerts in which their officers respond to. Approximately half of the agencies surveyed submit the casings they recover into the Bureau of Alcohol, Tobacco, Firearms and Explosives' (ATF) National Integrated Ballistic Information Network (NIBIN)
- The findings from this benchmarking survey were used instrumental in developing performance measures that will be recommended to the Miami-Dade Police Department as part of its deployment of ShotSpotter

ShotSpotter - Benchmarking

	Miami-Dade Police Department	New York City Police Department	Miami Gardens Police Department	Minneapolis Police Department	Hillsborough County Sheriff's Office	Kansas City Police Department	Chicago Police Department
Contact person	Sergeant Arturo Rivera III	Sergeant Joseph Freer	Sergeant Erik Gleason	Lieutenant Jeff Rugel	Captain David Fleet	Sergeant Jacob Becchina	Captain Martin E. Ryczek
Agency's sworn personnel	Approximately 2,400	Approximately 36,000	215	Approximately 850	1,200 agencywide. 230 sworn officers in district that ShotSpotter is deployed in	Approximately 1,400 sworn	Approximately 12,000
What kind of infrastructure is in place to support ShotSpotter? (i.e. Crime Center, Intelligence Unit)	Real-Time Crime Center	24 hour Operations Center and Real Time Crime Center, mobile devices for each officer, and a centralized awareness platform (Domain Awareness System) to seamlessly display data	<ul style="list-style-type: none"> - In the process of implementing a Real Time Crime Center that will monitor ShotSpotter alerts - Created a Gun Squad that has the primary task of monitoring, analyzing, and responding to violent crimes and ShotSpotter alerts 	Run a Real Time Crime Center although ShotSpotter activations are handled by the 911 call center. RTCC provides support and follow up for investigations	<ul style="list-style-type: none"> - Surveillance cameras in the areas covered by ShotSpotter with over 100 video feeds and 13 license plate recognition cameras. All of this technology is monitored within the communications facility (911 and dispatch center) as well as in the district - All patrol vehicles have access to all of these technologies and use them in near real time - In the process of outfitting a consolidated center including analytical resources (real time crime type center) 	The ShotSpotter program is primarily administrated in the Real-Time Crime Center, within the Law Enforcement Resource Center Division. This division handles all intel gathering analysis and dissemination for the department	ShotSpotter is housed out of the Crime Prevention Information Center
Number of agency's personnel assigned to work with ShotSpotter	16	<ul style="list-style-type: none"> Program Management – 1 Project Management – 1 Stats/Tracking – 2 Dispatch/Operations – 1 person 24/7 	<ul style="list-style-type: none"> - Operations Division, which includes patrol officers and the Gun Squad, along with future RTCC personnel - RTCC will be manned 22 hours a day, 7 days a week by 11 sworn and civilian personnel 	<ul style="list-style-type: none"> - RTCC has a staff of 21, but have other duties besides ShotSpotter - 2 investigators <i>only</i> handle ShotSpotter follow up (canvassing, day time follow up looking for evidence, follow up search warrants, pattern identification, etc.) 	All of the District detectives work with and use the ShotSpotter investigative portal. Cameras are staffed about 18 hours a day (2 people total). Communications center has 2 stations up and running at all times and is a 24/7 operation	<ul style="list-style-type: none"> Program Administrator – 1 Training Coordinator in Dispatch Communications – 1 Real-Time Operators – 4 Analyst for part-time analysis of ShotSpotter data – 1 	600 patrol officers in the two districts in which ShotSpotter will be deployed
When was ShotSpotter initially deployed in your jurisdiction?	N/A*	March 2015	December 2012	2007	January 2016	September 2012	Complete by early 2017*
What size is the area covered by ShotSpotter, in square miles?	8 sq. miles, total	Began with 15 sq. miles, currently at 27 sq. miles with a planned expansion to 60 sq. miles	4.5 sq. miles, approximately 20% of the City	Began with 3.5 sq. miles in two zones. Have expanded to 6.5 sq. miles in two zones	4.5 sq. miles in two zones	3.5 sq. miles, in one contiguous zone	4.5 sq. miles in two districts
How many ShotSpotter alerts does your jurisdiction average per month?	N/A	Average 187 alerts per month	In 2012, averaged 70 alerts per month. In 2016, have averaged 40 alerts per month	In 2016, about 180 alerts per month	Average 30-40 alerts per month	<ul style="list-style-type: none"> Last 30 days - 81 alerts Last 365 days - 1,580 alerts In 2015 - 1,399 alerts 	N/A
What % of ShotSpotter alerts does your Agency <u>not</u> receive a 911 call for?	N/A	76% of alerts do not have a corresponding 911 call	Do not track the information but estimate approximately 80%	N/A	90% of alerts do not have a corresponding 911 call	Informal analysis revealed that 70% of alerts do not have a corresponding 911 call	Approximately 20% of alerts did not have a corresponding 911 call
What performance measures do you use to track the effectiveness and results from ShotSpotter?	N/A	<ul style="list-style-type: none"> - Shootings are checked against the coverage area to determine if it was detected or missed. Missed cases are reviewed to determine if it falls within SLA (outdoor, unsuppressed and greater than .25 caliber) - Number of evidence recoveries - Time officers spend on scene and if a supervisor responds - Number of firearms recovered as a result of alerts - ShotSpotter has been added as a layer to existing crime maps, alerts can be mapped in relation to other issues like 311 complaints of house parties, narcotics sales, etc. - All recovered ballistics are sent to the lab for matching. In 2015, 1 in 5 casings matched other recovered ballistics in NYC 	Track ShotSpotter incidents on a monthly basis. Incidents are tracked through an internal e-mail distribution group and logged in a spreadsheet that includes casings and firearms recovered, offenders arrested, among other items	<ul style="list-style-type: none"> - Response time - Response accuracy: the number of times the actual location of shots is found and evidence (casings) is recovered, particularly in incidents where no human shooting victim is involved 	<ul style="list-style-type: none"> - Shell casings recovered - Guns recovered - Arrests - Actual shootings identified - How many times a shooting event is misidentified or outside the 25 meter range 	<ul style="list-style-type: none"> - Arrests - Convicted felons arrested in possession of a firearm - Firearms recovered - Narcotics recovered - Shell casings recovered 	N/A

Questions	Miami-Dade Police Department	New York City Police Department	Miami Gardens Police Department	Minneapolis Police Department	Hillsborough County Sheriff's Office	Kansas City Police Department	Chicago Police Department	
How has your response time been affected in areas with ShotSpotter as opposed to those without the system?	N/A	Response time is faster as alerts go right to the officers' phones, in addition to their laptops and the dispatch through the police radio. Average trigger time to NYPD unit on scene is less than 3 minutes	Response time is faster, there are often times that officers are arriving to the scene as the 911 call comes through the radio	Response time is faster, response accuracy is where they have seen the most improvement	Response time is faster, there is not a specific value that can be applied since many times no one is calling 911 to report the incident	Response time is faster, in part due to the way patrol officers receive the alerts - directly in their vehicles via laptop or mobile device	Response time is faster as alerts typically come in 2 minutes before a 911 call	
What technological solutions does your Agency have in place or plans to deploy to use in conjunction with ShotSpotter? (i.e. License Plate Readers, Body Cameras)	License Plate Readers	ShotSpotter is integrated into the Domain Awareness System, which is NYPD's premier intelligence led policing platform. Hundreds of sources, from license plate readers to city street cameras, are integrated into one common platform which gives users and analysts access to data in one program	Purchased an Application Interface (API) which will be linked to the Video Management System. This will allow the Pan Title Zoom cameras to focus in on the location of the GPS coordinated location of an alert; under 500 cameras will be deployed by the end of the project	Use squad video, body cameras, license plate readers, public safety cameras, social media monitoring tools, citizen tip app, among others	Currently have tag readers, surveillance cameras and recently purchased an Ibis Brasstrax NIBIN entry and correlation machine	Access to a citywide network of approximately 2,000 cameras, some of which are in the coverage area. Cameras, in conjunction with Shotspotter alerts, are monitored in the RTCC. Also have LPR's on some patrol vehicles and fixed LPR's in several locations throughout the city. In addition, have a Crime Gun Intelligence Center Task Force with the ATF that uses NIBIN to chronicle and analyze shell casings recovered and use for their follow up referrals	Currently have license plate readers, approximately 20,000 surveillance cameras agencywide, about 2,100 body cameras and are in the process of implementing a domain awareness-type solution	
What are your Agency's Standard Operating Procedures in regards to collecting, tracking, and/or logging shell casings recovered? Especially in instances where there is not a victim.	Pilot project with the Forensic Services Bureau	<ul style="list-style-type: none"> - A supervisor is required to respond to every alert, this is tracked through the CAD system to ensure compliance - If ballistics are recovered, with or without a victim, a complaint report is prepared, the evidence is vouchered and sent to the lab for analysis. A case is also opened with the detective squad for investigation, with or without a victim - In cases with no evidence recovered, the incident is logged and mapped in the DAS system for commanders to determine "hot spots". They can overlay wanted persons and person(s) on parole or probation to conduct further investigations 	Recover and submit all evidence to MDPD's Crime Laboratory for analysis	Attempt to collect casings at every shots fired call, including going back in daylight to try and recover them if none are found in the dark. All casings are entered in NIBIN	Impound all shell casings and submit them into NIBIN	Every time shell casings are discovered they are recovered by the responding patrol officer and entered into NIBIN	All casings are recovered and submitted for forensic analysis	
What would you say are some of your best practices in regards to ShotSpotter?	N/A	<ul style="list-style-type: none"> - Daylight searches: Send a local community resource officer back the next day to look for evidence and engage the community for witnesses - Door hangers (in development) in the area of the alerts lets the residents know you are out there and looking, and encourages them to call for rewards/tips - Compstat: ShotSpotter is fully integrated into Compstat - Miss Tracking: Diligently send every miss and misclass to ShotSpotter - Ground Truth: Report confirmed alerts to ShotSpotter, this helps them better understand how the system behaves in your topography and geography - Integration: Can't simply use their investigator portal and tools, need to fully integrate ShotSpotter into Agency's crime reporting and analysis platforms 	In regards to celebratory gunfire. On New Year's Eve in 2012-2013, 169 alerts were received. Over the same period in 2015-2016, 46 were received. Data from the previous year and throughout the month of December is analyzed and a team is assigned to visit the residences that had multiple alerts or high capacity alerts to let them know the police department is aware of the celebratory gunfire in that area the prior year. Residents reminded of the dangers and legality of celebratory gunfire and encourage them to call the police if they see anyone participating in this type of behavior	<ul style="list-style-type: none"> - Collecting casings, entering them into NIBIN, and demonstrating linked cases to investigators. Have linked hundreds of shots/shootings that previously would have been seen as possible isolated incidents - Having dedicated investigators to follow up on ShotSpotter alerts ensures that nothing falls through the cracks 	<ul style="list-style-type: none"> - Responding to alerts as an in-progress call - Dedicating analytical resources and patrol resources for follow up on cases - Crimestopper rewards for information on shootings - Neighborhood follow ups the next day - Media announcements on fireworks and celebratory gunfire holidays 	<ul style="list-style-type: none"> - Sending the alerts directly to patrol officers in their vehicles - ShotSpotter activation and mapping information is used to inform patrol officers of safe areas of entry and potential avenues of suspects to enhance likelihood of apprehension - Use a form of intelligence-led policing in which patrol officers saturate an area in order to conduct follow up on alerts 	<ul style="list-style-type: none"> - Recognizing the importance of using and integrating ShotSpotter along with all other technological solutions and available statistics 	
If you were implementing ShotSpotter again, is there anything you would change or do differently? (i.e. process, tracking of data, deployment, use)	N/A	<ul style="list-style-type: none"> - More resources for tracking/stats - Direct CAD integration from day 1 - Contract for staggered deployment. Changed in subsequent amendments to allow each 3 sq./mi zone to go live independently - Better ground outreach to cops. Sent out an operations order but never sat with the patrol officers in training sessions or roll call briefs to go over this with them. As a result it took some time to get buy in until they started seeing more guns and evidence recovered. Did do community outreach, but forgot our officers - Bring in prosecutors from day 1. Let them meet with and engage ShotSpotter to plan for prosecutions 	Would develop or take into account an expedited analysis from casings recovered. Find that casings are often linked to cases but the turnaround time from the Crime Laboratory lags when compared to the rest of the nation	Initially, Minneapolis PD 'owned' the system, meaning that they housed the physical servers and managed all the location contracts. Their dispatchers also received the alerts, listened to the shots audio and made a determination on dispatching. Now they use the ShotSpotter service where they handle everything, all PD has to do is receive the alerts	No changes, process went well	Would have placed someone originally tasked with more immediate follow up and analysis of the activations. Would like to be able to go back over each alert and track what was done, what was recovered, if an arrest was made, and make intel referrals to someone based on each one	N/A	
* Miami-Dade PD is in the process of deploying ShotSpotter							* Chicago PD is in the process of deploying ShotSpotter	



Shotspotter Performance Measures Office of Management & Budget



Based on discussions with Miami-Dade Police Department (MDPD) staff and six other law enforcement agencies across the country, below are the performance measures that the Office of Management and Budget (OMB) is recommending be used to track data related to the implementation and deployment of ShotSpotter:

- **Percentage change in shots fired incidents in areas with ShotSpotter**: This measure will track the change in these incidents after the deployment of the system
- **Percentage of ShotSpotter alerts in which MDPD was not notified by the community**: The measure tracks the number of ShotSpotter alerts in which MDPD was not contacted, either via 911 or other reporting mechanisms
- **Average time elapsed between a ShotSpotter alert and a notification by the community**: The measure tracks the time elapsed from when MDPD receives a ShotSpotter alert to the time that MDPD receives a 911 call or another form of alert from the community in reference to the same incident. The measure would only track incidents where MDPD is contacted by the community, while recognizing that MDPD isn't notified by the community for all incidents
- **Count of ShotSpotter alerts**: The measure will count the amount of ShotSpotter alerts that are transmitted to the Real Time Crime Center (RTCC)
- **Shell casings recovered and forensically analyzed**: On incidents that resulted in a ShotSpotter alert, the measure would track the amount of individual shell casings that are recovered and forensically analyzed by MDPD, and entered into the National Integrated Ballistic Information Network (NIBIN) database, or another similar state or nationwide database
- **Shell casings recovered and forensically analyzed without a 911 phone call**: Of the shell casings tracked in the measure above, this tracks the number of casings recovered for incidents in which MDPD was not contacted via 911 or other reporting mechanisms
- **Shots fired incidents that were not alerted by ShotSpotter**: This measure will track the number of shots fired incidents in which ShotSpotter did not alert the RTCC

The collection and analysis of this data will be conducted by MDPD staff at the RTCC. The RTCC will house Shotspotter in addition to other technological solutions that will enhance the delivery of MDPD's services to the residents of Miami-Dade County.