Gunshot Detection: Reducing Gunfire through Acoustic Technology

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SMART POLICING | Data. Analysis. Impact.

BJA Bureau of Justice Assistance U.S. Department of Justice

CNA ANALYSIS & SOLUTIONS

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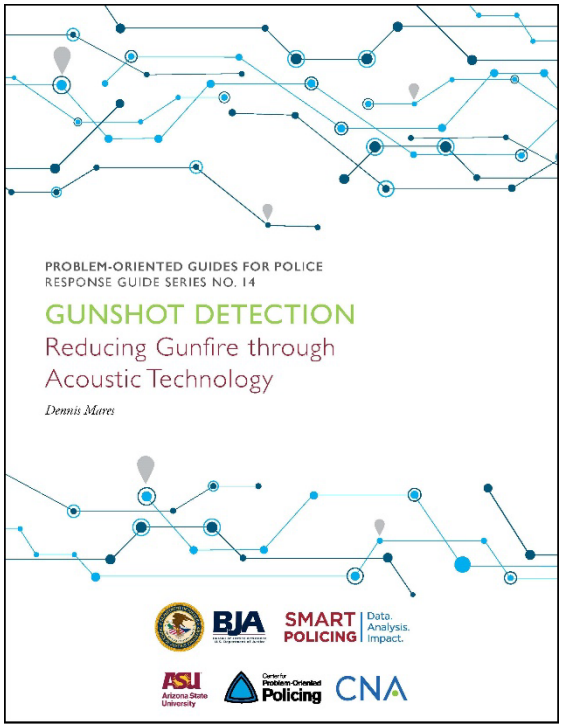
Webinar Agenda

- Overview and introductions.
- Discuss uses, effectiveness, and challenges of gunshot detection systems.
- Highlight Winston-Salem Police Department's efforts with a gunshot detection system.
- Question and answer.

Gunshot Detection POP Guide

- Released November 2022.
- Emerging need to understand effectiveness and best practice with gunshot detection systems.
- Based on contemporary research, evaluation, and implementation in agencies.



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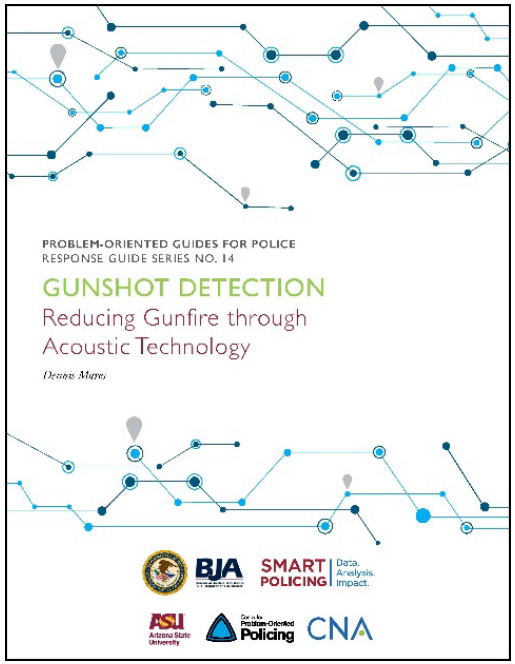
Gunshot Detection POP Guide

- Available on the SPI website.
  - https://www.smart-policing.com/tta/spotlight-reports/gunshot-detection-pop-guide



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Introductions

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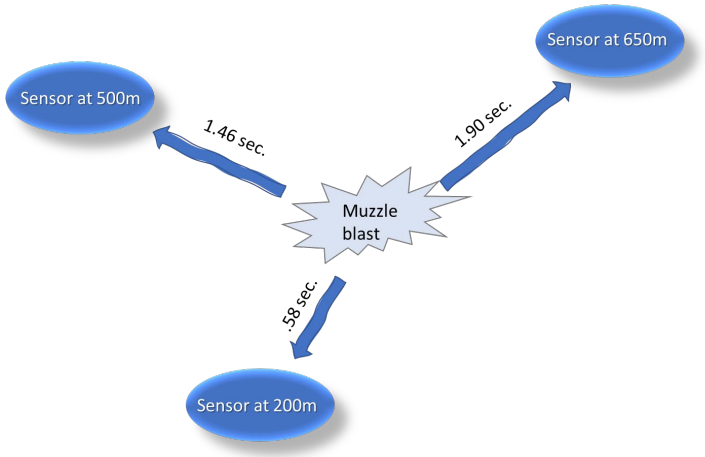
How Does Gunshot Detection Work?

- Sound wave detection.
  - Usually, multiple sensors in multiple locations that work together determining location.
  - Sounds is processed to match pattern of gunfire and filter out non-gunfire.
  - In some cases, reviewed by people.
- How accurate?
  - 80-90% accuracy in positively detecting gunfire in live tests.
  - Less clear is false positive hit rate.
- What can impact accuracy:
  - Buildings (echo).
  - Foliage.
  - Weather.
  - Ambient noise.



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Known Benefits?

- Enhances overall responses to gunfire.
  - Most are not reported.
- Improves speed of response.
- Improves spatial accuracy of response.
- Many sites indicate drop in calls for service from public.
- Improves evidence recovery.

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Why is Gunshot Detection Better Than Resident Calls?

- Even in places where residents reliably call in gunfire, gunshot detection is more spatially accurate.
- Typically, only about 10 - 20% of gunfire is reported.
  - Residents are asleep when much gunfire occurs (10 p.m. - 2 a.m.)
  - Gunfire is higher during times when HVAC is running.
  - The more shots fired the likelier that people will call, but reporting is especially low if only one or two rounds are fired.

Other possible benefits?

- May reduce gun violence, but evidence remains mixed and appears closely related to implementation differences.
- May improve time to aid for victims and thereby improve medical outcomes.
- Can be used to better assess hot spots.
- Can provide opportunities for interactions with community.

Drawbacks?

- Some see its use as targeting communities of color.
- False positives can take up valuable resources and sour officers on the use of the technology.
- A relatively small percentage are actual blood shootings.
- May increase dangerous interactions.

- How to minimize these potential issues:
  - Develop a clear response policy and evaluate its impact.
  - Communicate with communities about the system.

Implementing Gunshot Detection

1. Find a system that provides the features that are important:
   - Understand gun issues in your community first.
     - What is spatial extent of problems?
     - Talk to prosecution about implications.
     - Match budget to reality.
2. Develop a sound policy that specifies:
   - Response priority and procedures.
   - Who responds.
   - Investigation of location.
   - Handling of evidence.
   - Follow-up investigations.
   - Interaction with residents.
   - Tracking of data and outcomes.

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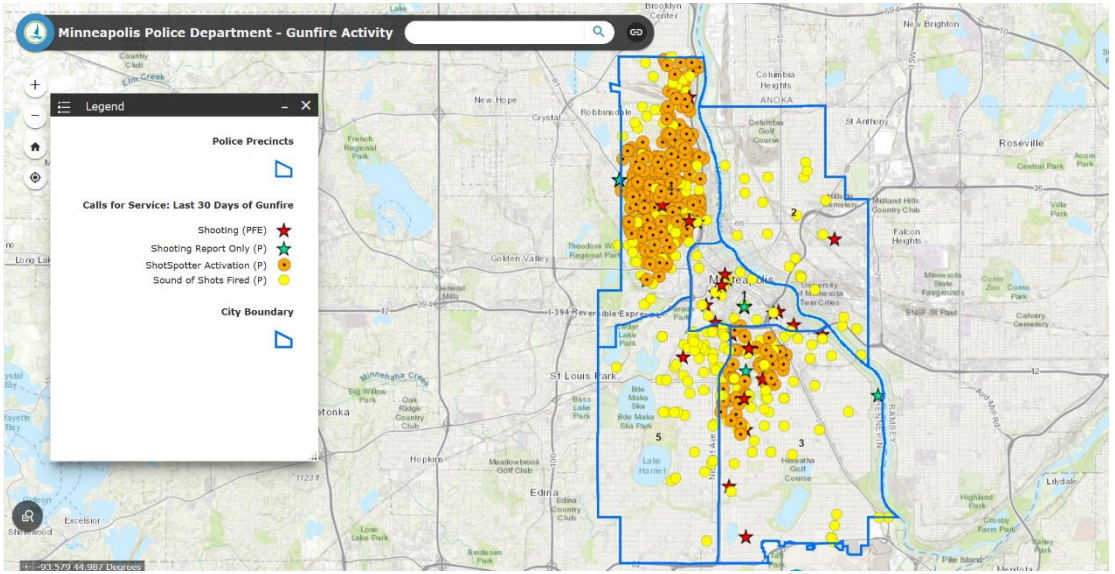
Implementing Gunshot Detection

3. Determine coverage area.
   - Ideally do not cover all high gunfire locations at once, this allows better tracking of results and cost-benefit yields.
4. Engage community.
   - Inform community of current issues and why gunshot detection.
   - Transparency.



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Implementing Gunshot Detection

5. Establish how you will evaluate outcomes based on priorities for PD/city.
    - Gun violence.
    - Gun/evidence recoveries.
    - Arrests.
    - Reduction in fatalities.
    - Response times.
    - Keep in mind that blood shootings/homicides are rare events and subject to large swings even in high crime communities.

Best Practices – Response

- High priority, but may not always be feasible → if high volume, prioritize by number of shots fired.
- Review sound files.
- Respond using mapped location, not address.
- Thoroughly look for evidence (ideally within parameters provided by vendor). Schedule follow-up if nothing is found during nighttime.
- Process all ballistics found.
- Talk to neighboring residents and/or leave flier.
- Equip and train officers with quick clot, tourniquets and other life-saving supplies (https://www.stopthebleed.org/).

Response vs Prevention

- Gunfire data allow better assessment (more data points) of gun problems and micro hot spots
- This can be used to develop prevention programs
  - Hot spots policing at time and place of concentrations
  - Problem-Oriented Policing.
    - Reduce environmental factors
    - Use violence interrupters
    - Target sites with (mobile) surveillance

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Best Practices - Investigations

- Collect all gunshot data that occurred in the area matching possible times for the incidents.
  - This may include dismissed gunfire alerts by your vendor, if available.
  - Listen to audio files to determine rounds fired and determine if all casings have been found.
- Expand the search for other gunfire alerts prior to the shooting, as this may indicate retaliatory/ongoing nature of incidents.
- Find any footage from close-circuit television (CCTV) and automated license place readers (ALPR) systems that may give clues to entry and exit of victims and offenders, including recent prior events as this may help identify persons or vehicles of interest. Work closely with real-time crime centers (RTCC).
- Prioritize processing and matching of any casings/projectiles. Work closely crime gun intelligence centers (CGIC).

Integration of Other Technologies

- Gunshot detection can be integrated with other technologies:
  - Cameras
  - ALPRs
  - Mobile.
- This has the benefit of providing real-time and investigative intelligence.
- However, research has not yet found improvements in gun violence reduction.
  - This does not mean gunshot detection does not improve investigative outcome, rather tracking of investigative outcomes with technology is poorly measured.

Be Evidence-Based and Assess Cost-Benefits

- It is important to recognize that while society may benefit from gunfire reductions, PDs carry the cost; while grants may cover initial service, ongoing cost will come out of your operating budget.
- Key Inputs:
  - Purchase and maintenance/service.
  - Personnel.
  - Evidence processing.
- Key Outputs:
  - Quality of life improvements.
  - Reduced fatalities (prevention and/or faster emergency response).
  - Reduced gun violence.

Data considerations

- Gunfire alerts can produce additional layers of complexity.
  - This may include data on possible gunfire that was misidentified.
  - It is therefore important investigators are trained in understanding how to access and interpret the data, not just the data that are forwarded for dispatch.
- Be mindful of how the data are used and extracted.
  - For gunfire related incidents multiple calls and call codes may exist for one incident (duplicates).

Winston-Salem Police Department: ShotSpotter Implementation

Winston-Salem Police Department (WSPD) ShotSpotter Implementation

- Data-driven, precision policing.
- Three square miles of coverage area.
- Coverage area determined by data associated with shootings and discharging firearms calls for service.
- System went live on August 19, 2021.
- Integrated into Real-Time Crime Center.

Review of 1st Year of Gunshot Detection

- **TOTAL ALERTS: 1,398**
  - 78% of these alerts did NOT have corresponding 911 call for service
  - 22% of the alerts did have a 911 call associated with the incident
- **TOTAL SHELL CASINGS RECOVERED IN COVERAGE AREA ALONE: 3,678**

  Same time period last year: 4,317 shell casings recovered **citywide** between WSPD and Forsyth County Sheriff's Office.

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Review of 1st Year of Gunshot Detection (continued)

- **99% detection rate includes:**
  - 3 missed incidents.
  - 1 mislocated event.
  - 13 misclassified incidents.
  - 7 false positives.
  - 6 false negatives.
- **47 firearms recovered.**
- **55 Alerts involving a victim, 27 total victims.**
- **2 lives saved.**

WSPD Gunshot Detection Implementation

- Improve community relationships – transparency.
- One piece of the puzzle.
- Success depends on how the system is used.
- Data and performance independently tracked by WSPD.
- "Ground Truth" reports by WSPD to vendor.
  - Helps to correct the data and improve the system.

Implementation Challenges

- Selection of coverage area.
- Privacy concerns.
- Data tracking.
- Buy-in from internal & external partners.
- Understanding the data.
- Report writing.

WSPD Success Story #1

https://www.youtube.com/watch?v=6jlj0l0l-xo

WSPD Success Story #2

https://www.youtube.com/watch?v=NYHBJcI1NaE

Implementation & Policy Recommendations

- Select coverage area – data-driven decision.
- Identify best practices.
- Agency-wide training.
- Draft comprehensive policy:
  - Data tracking.
  - Report writing.
  - Response procedures.
  - Follow-up.
  - Success stories.
  - Transparency & education (including elected officials & community members).

Questions?

Wrap Up

- Slides and a recording of the webinar will be available at:
  - https://www.smart-policing.com/tta/webinars/gunshot-detection-pop-guide-release-webinar
- Evaluation link in checkbox upon exiting.
  - Follow-up with slides for all that registered.

Thank you!

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