RESEARCH BRIEF

Gunshot Detection Technology Time Savings and Spatial Precision: An Exploratory Analysis in Kansas City

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Key Takeaways

- GDT alerts occurred a median of 93 seconds before the first 9-1-1 call for service (CFS)
- GDT alert locations were a median of 234.91 feet from the location reported via CFS
- In more than 26% of cases, GDT and CFS were geocoded to different street segments that do not intersect, meaning that officers responding to the CFS location would be a meaningful distance away from where the gunshot occurred
- Regression analysis findings suggest time savings and spatial precision decrease in cases more conducive to citizen reporting

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Research Summary:

Gunshot Detection Technology (GDT) is expected to impact gun violence by accelerating the discovery and response to gunfire. GDT consists of networks of acoustic sensors that detect and identify the location of gunfire in real time. This can help generate police response to shooting scenes quicker than when gunfire is reported by citizen calls to 9-1-1. GDT should further collect more accurate spatial data, given gunfire locations are assigned to the coordinates measured by the acoustic sensors rather than addresses reported second hand by callers to 9-1-1. However, little research has focused specifically on the level to which GDT offers such benefits.

The current study is a partnership between a multi-university research team and the Kansas City, Missouri Police Department (KCPD). KCPD data systems were triangulated to identify gunfire events reported by both GDT and a 9-1-1 call for service (CFS), with 2,946 such incidents included in the analysis. The study focuses on the time savings and spatial precision offered by GDT as compared to CFS over the first nearly 5 years of the program (9/14/2012-5/9/2017). Time savings measures the number of seconds between the GDT alert and the first CFS reporting the same gunfire event. Spatial precision measures the linear feet between the location detected by the GDT alert and the location reported by the CFS.

GDT generated an average time savings of 125.44 seconds, with a median of 93 seconds. To contextualize this value, police respond to reported gunfire in a median time of a 223 seconds according to KCPD data. Following arrival on scene, EMS responses have a median of 78 seconds, and the median time to the nearest trauma center is 480 seconds. The 93-second time savings represents nearly 12% (93 of 781 seconds) of the response and travel time.

The average level of spatial precision was 433.91 feet, with a median of 234.91 feet. In more than 50% of cases, GDT and CFS locations were geocoded to different street segments. In more than 26% of cases, GDT and CFS locations were geocoded to different street segments that do not intersect, meaning that officers responding to the CFS location would be a meaningful distance away from where the gunshot occurred.

Regression models, which incorporated 18 variables that could theoretically influence the reporting of gunfire, identified situational characteristics that influence GDT performance. The pattern of statistically significant variables suggests time savings decreases in cases that are more conducive to citizen reporting. For example, multiple gunshots detected and ambient population were negatively related to time savings. This suggests that the additional noise generated by multiple gunshots and more people on-street to hear such noises may lead to citizens calling 9-1-1 quicker. A similar theme was found in the spatial precision analysis. Levels of shots fired CFS and firearm-related crime reported on the street segments were consistently associated with decreased spatial precision. The relative proportion of residential parcels on a street segment was negatively associated with spatial precision. Taken together, this suggests that residents of street segments with high levels of illicit firearm activity may be better positioned to identify the source of gunfire.

Research brief and full article available at bit.ly/kc-gdt-precision