

JOURNAL
OF
LAW & INNOVATION

© 2023 *Journal of Law & Innovation*

VOL. 5

JANUARY 2023

No. 1

ARTICLE

The Dangers of Automated Gunshot Detection

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The 1968 decision, Terry v. Ohio, has been criticized for changing the landscape of encounters between police and citizens and leading to privacy intrusions, harassment, and violence against civilians. These harms are disproportionately suffered by members of Black, Brown, and other marginalized communities. Technological policing solutions that claim to reduce subjective, in-the-moment officer judgments and improve policing outcomes by giving police greater certainty of criminal activity before conducting a seizure or search are frequently hyped as a solution to abuses of police discretion.

This Article explores the role of one such widely used technology, the ShotSpotter gunshot detection system. It suggests that ShotSpotter evades

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meaningful analysis under the existing reasonable suspicion framework and erodes seizure and search protections. It also argues that ShotSpotter reinforces and exacerbates abuses that have become the unfortunate hallmark of Terry encounters. After setting forth these problems, the Article offers preliminary solutions.

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INTRODUCTION

In Chicago, Illinois, police officers responding to an alert from an automated gunshot detection technology stopped a man walking in the vicinity of the alleged location of the alert.¹ Citing the alert as justification, the officers patted him down.² They did not find a gun, ammunition, or anything else connecting the man to the alert that brought them to his block, but they did find an open can of alcohol, drugs, and a pipe.³ So, the officers arrested him for possessory alcohol and drug offenses, but not any gun-related crimes.⁴

In Columbus, Ohio, police officers responded to a residential neighborhood after receiving a report of gunfire from the same gunshot detection system used in Chicago.⁵ Officers ordered Jonathan Robinson and his family to come out of their home in order to investigate.⁶ When Robinson interjected and declined to move, one officer approached him with a shotgun, shoved him, and punched him in the neck.⁷ Police arrested Robinson for obstruction of police business and disorderly conduct.⁸ Robinson was never alleged to have been responsible for the gunshot alert and was never charged with any gun or related offenses that connected him to it.⁹ All charges against him were later dropped.¹⁰

In Brooklyn, New York, several New York City Police Department (“NYPD”) officers responded to a park after receiving an alert for shots fired from the same gunshot detection technology used in Chicago and Columbus.¹¹ They approached Fitzroy Gayle, who they claim was smoking

¹ CITY OF CHI. OFFICE OF THE INSPECTOR GEN., THE CHICAGO POLICE DEPARTMENT’S USE OF SHOTSPOTTER TECHNOLOGY 18 (Aug. 2021) [hereinafter CHICAGO OIG REPORT], <https://igchicago.org/wp-content/uploads/2021/08/Chicago-Police-Departments-Use-of-ShotSpotter-Technology.pdf> [https://perma.cc/5J2Q-FCLP].

² *Id.*

³ *Id.*

⁴ *Id.*

⁵ Prince Shakur, *Gunshot Detection Technology Raises Concerns of Bias and Inaccuracy*, CODA (Mar. 3, 2020), <https://www.codastory.com/authoritarian-tech/gun-violence-police-shotspotter/> [https://perma.cc/2A4P-FDAZ].

⁶ *Id.*

⁷ *Id.*

⁸ *Id.*

⁹ *Charges Dropped Against Man Punched by Columbus Police Officer*, WBNS 10TV (June 28, 2019), <https://www.10tv.com/article/news/local/charges-dropped-against-man-punched-columbus-police-officer-2019-jul/530-fccc69ea-279a-4eb8-885f-9dba97b8d00b> [https://perma.cc/CT7E-DLFP].

¹⁰ *Id.*

¹¹ Kristina Sgueglia, *NYPD Orders Internal Investigation After Video Showed Group of Officers Arresting Man*, CNN (Mar. 7, 2020), <https://www.cnn.com/2020/03/07/us/nypd-internal-investigation-of-arrest/index.html> [https://perma.cc/6REQ-AWC2].

marijuana in the park.¹² According to police, Gayle ran, prompting several officers to chase him.¹³ The officers accosted Gayle, pushed him against a wall, forced him to the floor, and held him down on the ground while he cried for help and asked what crime he had committed.¹⁴ Ultimately, the officers violently arrested Gayle for marijuana possession, resisting arrest, and obstructing government business, but not for any gun-related offenses.¹⁵ The NYPD did not claim Gayle had anything to do with the shots fired alert, but it admitted that the alert is what brought officers to the park.¹⁶ The charges against him were later dropped.¹⁷

Again in Chicago, a police officer responding to an alert for shots fired by the same gunshot detection system chased Adam Toledo into an alley.¹⁸ Though he was carrying a weapon when the chase began, Adam dropped it and turned around to face the officer with his hands up and empty one second before the officer shot and killed him.¹⁹ Adam did not fire the shots that triggered the alert that brought police to the alley; another young man is accused of doing so.²⁰ But police responding to the alert were geared up for an armed encounter and, in hot pursuit of the triggerman, an officer shot Adam instead.²¹ Adam was 13 years old when he was killed.²²

* * *

¹² *Id.*

¹³ *Id.*

¹⁴ *Id.*; Hayley Miller, *NYPD Announced Internal Review After Black Man's Violent Arrest. 3 Months Later, Silence.*, HUFFPOST (June 26, 2020), https://www.huffpost.com/entry/fitzroy-gayle-police-brutality-nypd_n_5ef49f9ac5b615e5cd39e4c5 [<https://perma.cc/PYN3-9P42>].

¹⁵ Sgueglia, *supra* note 11; Jake Offenhartz, *Video Shows NYPD Officers Violently Arresting Young Black Man for Allegedly Smoking Marijuana in Park*, GOTHAMIST (Mar. 5, 2020), <https://gothamist.com/news/video-shows-nypd-officers-violently-arresting-young-black-man-allegedly-smoking-marijuana-park> [<https://perma.cc/5ELM-YRDS>].

¹⁶ *Id.*; Sgueglia, *supra* note 11.

¹⁷ Miller, *supra* note 14.

¹⁸ Mark Guarino, Meryl Kornfield & Kim Bellware, *Chicago Releases Video of Officer Fatally Shooting 13-Year-Old Adam Toledo*, WASH. POST (Apr. 16, 2021), https://www.washingtonpost.com/national/adam-toledo-video/2021/04/15/939283cc-9e08-11eb-8005-bffc3a39f6d3_story.html [<https://perma.cc/JH78-UUSS>].

¹⁹ *Id.*

²⁰ *Prosecutors: Boy Shot by Police Was with Man Who Fired Gun*, ASSOCIATED PRESS (Apr. 10, 2021), <https://apnews.com/article/shootings-police-chicago-10f3df5a175d11a137d2d68d5d293a3f> [<https://perma.cc/9ESV-W6BL>].

²¹ *See Chicago Police Officers Won't Be Charged in Shooting of 13-year-old Adam Toledo*, THE GUARDIAN (Mar. 15, 2022) (discussing the case of Adam Toledo in the context of Chicago's officer pursuit policy), <https://www.theguardian.com/us-news/2022/mar/15/chicago-police-officers-wont-be-charged-fatal-shooting-of-13-year-old-adam-toledo> [<https://perma.cc/29W4-SHT5>]; Guarino, Kornfield & Bellware, *supra* note 18.

²² Guarino, Kornfield & Bellware, *supra* note 18.

In neighborhoods around the country, often unbeknownst to residents, police have affixed microphones to light posts, public and private buildings, and other structures.²³ These microphones, which listen continuously for the sounds of gunshots, are one component of a widely used software-based gunshot detection system, ShotSpotter Respond (“ShotSpotter”),²⁴ designed to automatically detect and alert police to the sounds and location of gunfire in real-time.²⁵

The company that produces the system and sells it to law enforcement, ShotSpotter Inc. (“SSTI”), has praise-worthy intentions.²⁶ SSTI argues that ShotSpotter can reduce gun violence and save lives.²⁷ It claims that ShotSpotter is more efficient and effective in identifying and pinpointing gunshots than civilian calls, allowing officers to respond to gunfire that goes unreported by individuals, and increases the speed and frequency of their response to shootings.²⁸

But community activists, researchers, and privacy advocates, among others, have concerns about whether ShotSpotter works as SSTI claims, or if the harms it causes outweigh any benefits—and its very high price tag.²⁹ There is some evidence to support SSTI’s claims; ShotSpotter is credited with helping police stop some shooters³⁰ and one research study found that ShotSpotter reduces the time it takes police to reach and transport shooting

²³ See *infra* Part I.A.

²⁴ See POLICING PROJECT, PRIVACY AUDIT & ASSESSMENT OF SHOTSPOTTER, INC.’S GUNSHOT DETECTION TECHNOLOGY 10 (2020) [hereinafter POLICING PROJECT AUDIT], <https://www.policingproject.org/shotspotter> [<https://perma.cc/9QNE-K34N>] (describing how ShotSpotter Flex works). ShotSpotter Respond was previously branded as ShotSpotter Flex. See Press Release, ShotSpotter, ShotSpotter Releases New Shooting Investigation Tool (Dec. 2, 2020), <https://www.shotspotter.com/press-releases/shotspotter-releases-new-shooting-investigation-tool/> [<https://perma.cc/SS6S-69FL>] (“[F]lagship ShotSpotter Respond gunshot detection solution [was] formerly known as ShotSpotter Flex.”).

²⁵ *ShotSpotter Respond*, SHOTSPOTTER, <https://www.shotspotter.com/law-enforcement/gunshot-detection-technology/> [<https://perma.cc/B8LE-WT23>] (last visited Oct. 4, 2022).

²⁶ *Id.*

²⁷ See *ShotSpotter’s Positive Impact on Public Safety*, SHOTSPOTTER, <https://www.shotspotter.com/public-safety-results/> [<https://perma.cc/5PVV-3P47>] (last visited Sept. 30, 2022) (arguing the safety benefits of ShotSpotter).

²⁸ *Id.*

²⁹ *ShotSpotter Frequently Asked Questions*, SHOTSPOTTER 1 (2018) [hereinafter *ShotSpotter 2018 FAQ*], https://www.ShotSpotter.com/system/content/uploads/SST_FAQ_January_2018.pdf [<https://perma.cc/KZ88-B7KJ>].

³⁰ See, e.g., Cole Sullivan, *Denver Police: Controversial ‘ShotSpotter’ Technology Helped Speed Response to Colfax Shooting*, 9NEWS (Nov. 10, 2022), <https://www.9news.com/article/news/local/denver-police-shotspotter/73-34a6e106-fb70-488b-84e2-305293023a23> [<https://perma.cc/KF8L-6QE3>] (describing officers’ quick response to a crime scene after receiving a ShotSpotter alert).

victims.³¹ Nevertheless, ShotSpotter is often used without the public having a clear understanding of how well it operates. In many cities, residents are not informed—let alone solicited for input—before the system is purchased and installed.³² Moreover, SSTI protects data on the system’s accuracy and error rates from scrutiny by researchers, journalists, and the public, leaving residents of ShotSpotter jurisdictions to rely on police departments’ assertions that it works.³³ The data that do exist present conflicting findings on whether the system accurately distinguishes gunfire from similar, innocent sounds.³⁴ Some research has found that ShotSpotter has no meaningful impact on crime solving.³⁵

ShotSpotter use has other troubling consequences. In many jurisdictions, ShotSpotter is deployed only in predominantly Black and Brown neighborhoods, rather than evenly throughout cities.³⁶ SSTI responds that the jurisdictions that purchase ShotSpotter—not the company—determine where to install the system and that they do so based on where gun violence is most prevalent, not racial demographics.³⁷ Even so, the result is the same: ShotSpotter is installed in Black and Brown communities³⁸ that may already be over-policed, in which tensions between police and residents may already

³¹ See Anna Goldenberg, Deviney Rattigan, Michael Dalton, John P. Gaughan, J. Scott Thomson, Kyle Remick, Christopher Butts & Joshua P. Hazelton, *Use of ShotSpotter Detection Technology Decreases Prehospital Time for Patients Sustaining Gunshot Wounds*, 87 J. TRAUMA & ACUTE CARE SURGERY 1253, 1257 (2019) (“ShotSpotter can significantly expedite the transport of gunshot victims to a trauma center due to police and EMS being dispatched more quickly . . .”). The study also found that after adjusting for various variables, mortality “was not significantly different” between ShotSpotter and non-ShotSpotter incidents. *Id.* at 1253. Notably, the study was limited to Camden, New Jersey. *Id.* at 1253, 1258.

³² See *infra* Part I.B.2.

³³ *Id.*

³⁴ See Donald Maye, *ShotSpotter Accuracy Debate Examined*, IPVM (June 25, 2021), <https://ipvm.com/reports/shotspotter-accuracy> [<https://perma.cc/FNB9-QLE6>] (discussing both sides of the ShotSpotter accuracy debate). *Compare ShotSpotter Creates Thousands of Unfounded Police Deployments, Fuels Unconstitutional Stop-and-frisk, and Can Lead to False Arrests.*, MACARTHUR JUST. CTR., <https://endpolicesurveillance.com/> [<https://perma.cc/K7LS-53LL>] (last visited Nov. 18, 2022) (finding that ShotSpotter is largely ineffective in identifying gunfire), *with* EDGEWORTH ANALYTICS, INDEPENDENT ANALYSIS OF THE MACARTHUR JUSTICE CENTER STUDY ON SHOTSPOTTER IN CHICAGO 1 (2021) [hereinafter EDGEWORTH ANALYTICS, INDEPENDENT ANALYSIS], <https://www.edgewortheconomics.com/assets/htmldocuments/Shotspotter%20MJC%207-23%20Nov%202022.pdf> [<https://perma.cc/ZBJ9-FLM6>] (“Edgeworth concludes that the MJC study fails to provide a rigorous, balanced, and objective assessment of the use of ShotSpotter in Chicago.”).

³⁵ See *infra* Part I.B.1.

³⁶ See *infra* Part I.B.3.

³⁷ EDGEWORTH ANALYTICS, INDEPENDENT ANALYSIS, *supra* note 34, at 7.

³⁸ See *infra* Part I.B.3 (discussing the racialized use of ShotSpotter).

be high,³⁹ and where residents may already feel like they are being watched too closely by police.⁴⁰

The alerts create a self-perpetuating policing cycle. Installing ShotSpotter in Black and Brown neighborhoods necessarily yields alerts in those neighborhoods. Those alerts bring police in response, resulting in more intrusions, including of people engaged in lawful behavior.⁴¹ An increase in stops and arrests can incentivize and encourage even more policing in already over-policed communities, perpetuating the cycle.⁴²

The problem is exacerbated by the fact that reliance on ShotSpotter to justify stop-and-frisks undermines traditional protections against unreasonable police intrusions. In the landmark case, *Terry v. Ohio*, the Supreme Court announced that police need only “reasonable articulable suspicion” to lawfully conduct a limited, temporary stop or search of a citizen to investigate whether they are engaged in criminal activity.⁴³ While the case opened the door to greater intrusions on privacy interests, the standard contains at least some built-in limits to prevent abuses. Before officers are permitted to conduct a stop, they must have reasonable suspicion both that (1) crime is afoot⁴⁴ and (2) a particular individual is responsible for the criminal activity.⁴⁵

³⁹ See *id.* (explaining that ShotSpotter’s racialized deployment exacerbates over-policing of marginalized communities).

⁴⁰ See Vincent M. Southerland, *The Master’s Tools and a Mission: Using Community Control and Oversight Laws to Resist and Abolish Police Surveillance Technologies*, UCLA L. REV. (forthcoming 2023) (manuscript at 10–19), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4048371 [<https://perma.cc/6AF3-49GM>] (describing centuries-long use of policing technologies to surveil and control communities of color).

⁴¹ See Matt Masterson, *Lawsuit Alleges Chicago Police Made False Arrests Based on Faulty ShotSpotter Alerts*, WTTW NEWS (July 21, 2022, 4:48 PM), <https://news.wttw.com/2022/07/21/lawsuit-alleges-chicago-police-made-false-arrests-based-faulty-shotspotter-alerts> [<https://perma.cc/Z6AR-Y9ZM>] (describing allegations that ShotSpotter use contributes to greater policing in already over-policed neighborhoods and of false arrests of two men based on ShotSpotter alerts).

⁴² *ShotSpotter Is Deployed Overwhelmingly in Black and Latinx Neighborhoods in Chicago.*, MACARTHUR JUST. CTR., <https://endpolicesurveillance.com/burden-on-communities-of-color/> [<https://perma.cc/R98R-2EJ3>] (“ShotSpotter imposes a massive additional burden of unfounded and unnecessary police deployments . . .”).

⁴³ *Terry v. Ohio*, 392 U.S. 1, 30 (1968).

⁴⁴ With reasonable suspicion, an officer can conduct a stop of a person who has already committed a crime, is committing a crime, or is about to commit a crime. *Id.* (permitting temporary stop where police possess reasonable suspicion that crime is about to occur); *United States v. Hensley*, 469 U.S. 221, 227 (1985) (summarizing previous holdings permitting stops based on reasonable suspicion for crimes occurring or about to occur and extending rule allowing stops based on reasonable suspicion to cases involving already completed crimes).

⁴⁵ See *United States v. Cortez*, 449 U.S. 411, 417–18 (1981) (“[T]he detaining officers

ShotSpotter, however, is unmooring the reasonable suspicion doctrine from both of these original requirements. Police conduct stops based on ShotSpotter alerts without knowing the system's true accuracy—or whether those alerts actually signify criminal activity. Additionally, police officers increasingly point to ShotSpotter alerts to justify stop-and-frisks⁴⁶—and the eventual arrests—of people merely proximate, but otherwise unconnected, to an alert.⁴⁷ In other words, they conduct stop-and-frisks without true individualized suspicion.⁴⁸ Alerts thus effectively become a free pass for police to conduct blanket stop-and-frisks of a wide swath of people in the vicinity of an alert.

Increasingly, police also conduct stop-and-frisks based not on any *specific* ShotSpotter alert, but on the claim that ShotSpotter alerts are *generally* frequent in an area.⁴⁹ Without suspecting a particular gun crime or person, they treat the occurrence of ShotSpotter alerts *in the past* as justification for a stop *in the present*.

One case, *United States v. Rickmon*, illustrates many of these problems clearly. In *Rickmon*, an officer on patrol in Peoria, Illinois received ShotSpotter alerts for multiple shots fired.⁵⁰ As he approached the location indicated by ShotSpotter, the officer stopped the only vehicle nearby.⁵¹ Its occupants were not acting suspiciously, and the officer had no particularized suspicion that they were responsible for the alert; he stopped the vehicle merely because it was close to the alleged source of the gunfire.⁵²

must have a particularized and objective basis for suspecting the particular person stopped of criminal activity.”).

⁴⁶ *E.g.*, *United States v. Rickmon*, 952 F.3d 876, 882–84 (7th Cir. 2020) (finding ShotSpotter alerts as one factor supporting reasonable suspicion for a stop); *United States v. Jones*, 1 F.4th 50, 53 (D.C. Cir. 2021) (finding ShotSpotter provided reasonable suspicion for a stop); *Funderburk v. United States*, 260 A.3d 652, 657 (D.C. 2021) (finding that a ShotSpotter alert could contribute to reasonable suspicion); *State v. Carter*, 183 N.E.3d 611, 628–29 (Ohio Ct. App. 2022) (finding that a ShotSpotter alert was “relevant to the officers’ calculus in making the stop”); *People v. Haulcy*, No. C086525, 2019 WL 3071751 at *1, *4 (Cal. Ct. App. July 15, 2019) (finding that a ShotSpotter notification could contribute to an officer’s reasonable suspicion); *see also* CHICAGO OIG REPORT *supra* note 1, at 11, 16–18 (giving examples of searches predicated on ShotSpotter notifications).

⁴⁷ *See supra* notes 1–16 and accompanying text (providing examples of stops and arrests of people without any connection to the ShotSpotter alert that brought police to the area in question).

⁴⁸ *See Rickmon*, 952 F.3d at 885–86 (Woods, C.J., dissenting) (describing officer’s stop of *Rickmon* as based on his presence in the vicinity of a ShotSpotter alert rather than on true individualized suspicion).

⁴⁹ *See* CHICAGO OIG REPORT, *supra* note 1, at 19–22 (giving examples of officers making stops based on “frequent” notifications).

⁵⁰ *Rickmon*, 952 F.3d at 879.

⁵¹ *Id.*

⁵² *Id.* at 879–80; *see also id.* at 886 (Woods, C.J., dissenting) (“[The officer] frankly

Terrill Rickmon was arrested for possession of a firearm by a felon after the officer discovered a gun under the passenger seat, where he was sitting.⁵³ Rickmon had been shot in the leg, suggesting the person who shot him was more likely to be responsible for the alert.⁵⁴ Rickmon moved to suppress the gun, but the district court denied the motion and the Seventh Circuit Court of Appeals upheld the ruling, finding that the officer had reasonable suspicion to conduct the stop.⁵⁵ Its decision was based in significant part on the vehicle's temporal and physical proximity to the ShotSpotter alert, rather than suspicious conduct on Rickmon's part.⁵⁶

ShotSpotter challenges another aspect of *Terry*'s underpinnings too. The reasonable suspicion standard encourages deference to police officer judgment on the theory that officers are in the best position to distinguish criminal from non-criminal activity based on experience and expertise.⁵⁷ At the time *Terry* was decided, perhaps deference to police officer judgment and expertise made some sense; it was the officer who was on the ground, trying to decipher if criminal activity was occurring or not, in the moment.⁵⁸ The *Terry* majority, however, did not anticipate the direction policing would take over the next fifty-plus years. Today, police increasingly rely on technology to determine when, where, and what criminal activity is occurring, along with who is responsible for it.⁵⁹ Police thus outsource the on-the-ground

admitted that he would have stopped literally any car he saw . . .”).

⁵³ *Id.* at 879.

⁵⁴ *Id.* at 887 (Woods, C.J., dissenting).

⁵⁵ *Id.* at 879–80, 885.

⁵⁶ *Id.* at 882–885.

⁵⁷ *Terry v. Ohio*, 392 U.S. 1, 27 (1968) (“[D]ue weight must be given . . . to the specific reasonable inferences which [the officer] is entitled to draw from the facts in light of his experience.”).

⁵⁸ See ANDREW GUTHRIE FERGUSON, *THE RISE OF BIG DATA POLICING: SURVEILLANCE, RACE, AND THE FUTURE OF LAW ENFORCEMENT* 54 (2017) (“For decades, police officers in large urban jurisdictions patrolled the streets looking for criminal activities.”).

⁵⁹ See, e.g., Andrew Guthrie Ferguson, *Big Data and Predictive Reasonable Suspicion*, 163 U. PA. L. REV. 327, 329–30 (2015) (arguing that modern policing allows officers to “identify most unknown suspects, not through their observations, but by accessing a web of information containing extensive personal data about a suspect”). Policing has increasingly moved towards an “evidence-based” approach that aims to prioritize purportedly objective research and data over political or ideological motivations. See, e.g., Lawrence W. Sherman, *The Rise of Evidence-Based Policing: Targeting, Testing, and Tracking*, 42 CRIME & JUST. 377, 377–79 (2013) (describing the rise of evidence-based policing); Erin Collins, *Abolishing the Evidence-Based Paradigm*, BYU L. REV. (forthcoming 2022) (manuscript at 4), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4089681 [<https://perma.cc/WRX3-36J9>]. This approach has been persuasively criticized as biased and destined to replicate existing disparities. *Id.* at 4–5 (summarizing criticisms of evidence-based approaches in criminal legal settings). For a comprehensive critique, see generally *id.*

judgments they previously made on their own to policing technologies.⁶⁰

ShotSpotter is a prime example of this phenomenon. Instead of determining whether crime is occurring the old-fashioned way, police officers arrive at the location of ShotSpotter alerts under the belief that a gun-related crime likely occurred, even if the alert is incorrect. Thus, in ShotSpotter cases, ShotSpotter—not police officers—essentially makes the threshold Fourth Amendment determination required to justify a stop-and-frisk.

While scholars have examined the influence of many policing technologies on Fourth Amendment jurisprudence,⁶¹ ShotSpotter has received less attention despite its widespread use.⁶² This Article seeks to fill

⁶⁰ A dizzying array of technologies are used by police to justify suspicion, accost, stop, and frisk. Just a few examples are sophisticated crime prediction tools, facial recognition software, and aerial surveillance technologies. See Ferguson, *supra* note 59 at 387 (describing how big data can help officers gain reasonable suspicion); Michael L. Rich, *Machine Learning, Automated Suspicion Algorithms, and the Fourth Amendment*, 164 U. PA. L. REV. 871, 876 (2016) (describing automated suspicion algorithms (“ASAs”), programs used by police “to predict individual criminality”); Jennifer Valentino-DeVries, *How the Police Use Facial Recognition, and Where It Falls Short*, N.Y. TIMES (Jan. 12, 2020), <https://www.nytimes.com/2020/01/12/technology/facial-recognition-police.html> [<https://perma.cc/88ZP-DVC2>] (describing how law enforcement uses facial recognition); Lucius T. Outlaw III, *Look Up and Smile for Daddy Warbucks’s Surveillance Plane: Reforming the Standard for Determining When a Private Search Constitutes Government Action, And Why it’s Needed to Meet the Growing Fourth Amendment Problem of Privatized Surveillance*, 2021 MICH. ST. L. REV. 861, 868–85 (2021) (outlining the rise of the use of private surveillance by law enforcement); see also Southerland, *supra* note 40 (describing a range of technologies used by police to surveil communities of color).

⁶¹ See, e.g., Emily Berman, *Individualized Suspicion in the Age of Big Data*, 105 IOWA L. REV. 463 (2020) (arguing that reliance on algorithmic crime predictions undermines fundamental interests meant to be protected by the Fourth Amendment); Elizabeth E. Joh, *Policing by Numbers: Big Data and the Fourth Amendment*, 89 WASH. L. REV. 35 (2014) (discussing the impact of predictive policing, mass surveillance systems, and DNA databank samples on Fourth Amendment jurisprudence); Mailyn Fidler, *Local Police Surveillance and the Administrative Fourth Amendment*, 36 SANTA CLARA HIGH TECH. L. J., 481, 488 (2020) (arguing for local administrative governance of police technology to protect Fourth Amendment rights); Ferguson, *supra* note 59 (examining big data’s role in the reasonable suspicion standard); Rich, *supra* note 60, at 923 (concluding that ASA predictions should be treated as only one part of Fourth Amendment totality of circumstances analysis).

⁶² Elizabeth Joh has explored some unexpected consequences of ShotSpotter use on policing behaviors. Elizabeth E. Joh, *The Unexpected Consequences of Automation in Policing*, 75 SMU L. REV. 507 (2022). Student scholars have engaged with some aspects of ShotSpotter’s relationship to Fourth Amendment doctrine. See, e.g., Alexandra S. Gecas, Note, *Gunfire Game Changer or Big Brother’s Hidden Ears?: Fourth Amendment and Admissibility Quandaries Relating to ShotSpotter Technology*, 2016 U. ILL. L. REV. 1073 (2016) (arguing that ShotSpotter’s gunfire recognition function does not infringe an individual’s Fourth Amendment’s rights); Benjamin Goodman, Note, *ShotSpotter – The New Tool to Degrade What is Left of the Fourth Amendment*, 54 UIC L. REV. 797 (2021)

this gap. It explores whether treating ShotSpotter alerts as a basis for reasonable suspicion further erodes Fourth Amendment protections against unreasonable police intrusions and examines how ShotSpotter confounds traditional reasonable suspicion analysis. Thus, this Article makes two primary contributions. First, it builds on existing scholarship examining how policing technologies distort a reasonable suspicion framework developed in a pre-technological era. Second, it interrogates how ShotSpotter is influencing reasonable suspicion doctrine and offers preliminary ideas for how to halt continued erosion of Fourth Amendment protections.

This Article proceeds in four parts. Part I provides background on ShotSpotter. It includes an overview of the system and critiques that scholars, researchers, government watchdogs, community activists, and others have leveled against it. Part II briefly describes the reasonable suspicion standard and considers two particular lines of case law that have weakened Fourth Amendment protections and are important to understanding ShotSpotter's influence on the doctrine: the anonymous tip line and the high crime area line. Part III examines ShotSpotter's influence on reasonable suspicion jurisprudence and argues that reliance on ShotSpotter alerts to justify stop-and-frisks will further erode protections against unreasonable police intrusions and exacerbate existing harms of stop-and-frisk policing. Finally, Part IV presents preliminary ideas for remedying these issues. It considers both doctrinal and non-doctrinal approaches consistent with a non-reformist vision for reform to shore up privacy protections, prevent police abuse and reduce other harms, while limiting ShotSpotter's use overall.⁶³

I. SHOTSPOTTER

This Part provides an overview of SSTI and ShotSpotter and then briefly outlines the major critiques of each raised to date.

A. *Overview of the Company and Product*

SSTI is a publicly traded, for-profit company that develops “precision

(discussing negative effects of ShotSpotter use and analyzing the *Rickmon* decision to conclude that ShotSpotter alerts alone cannot justify Fourth Amendment stops).

⁶³ “Non-reformist reforms” refer to reforms that seek to transfer power away from and alleviate harms caused by the carceral state. *See* MARIAME KABA, WE DO THIS ‘TIL WE FREE US: ABOLITIONIST ORGANIZING AND TRANSFORMING JUSTICE 96 (Tamara K. Nopper ed., 2021) (describing non-reformist reforms as changes that do not make it more difficult to dismantle oppressive systems and which do not reproduce such systems in another form); RUTH WILSON GILMORE, GOLDEN GULAG: PRISONS, SURPLUS, CRISIS, AND OPPOSITION IN GLOBALIZING CALIFORNIA 242 (2007) (describing non-reformist reforms as interventions that “unravel rather than widen the net of social control through criminalization”).

policing solutions”⁶⁴ marketed to police departments,⁶⁵ including ShotSpotter, its flagship product.⁶⁶ ShotSpotter is a sophisticated automated gunshot detection system that utilizes an array of acoustic sensors connected to machine algorithms in an attempt to identify, locate, and alert law enforcement to gunfire seconds after it occurs.⁶⁷ The system can be understood as having three core components. First, acoustic sensors containing microphones affixed to light poles, public and private buildings, and other city structures record the time and audio associated with suspected gunfire.⁶⁸ The higher the sensors are placed, the easier it is to filter ambient street-level noise.⁶⁹ Multiple sensors must capture a sound before it can be considered as potential gunfire.⁷⁰ Second, proprietary software attempts to determine the precise location sounds originated from and whether the captured sounds are gunfire.⁷¹ The location of suspected gunfire is approximated through triangulation, i.e., by cross-referencing the amount of time it takes the sound to reach each of the sensors that detected it.⁷² An algorithm then attempts to separate ambient noise and other loud noises from gunshots.⁷³ Third, human analysts are tasked with determining whether the

⁶⁴ SSTI describes “precision policing” as a data-driven policing “philosophy” that leverages intelligence to better respond to and prevent crime and incorporates community protections and input. *Company Overview*, SHOTSPOTTER, <https://www.shotspotter.com/company/> [<https://perma.cc/Q5WL-QMXT>] (last visited Nov. 20, 2022).

⁶⁵ *Id.*

⁶⁶ *ShotSpotter Technology - Introducing Our Cutting-edge Precision Policing Platform*, SHOTSPOTTER (last visited Nov. 14, 2022), <https://www.shotspotter.com/precision-policing-platform-technology/> [<https://perma.cc/6BNX-TF9X>].

⁶⁷ *Id.* (giving an overview of the ShotSpotter product); *ShotSpotter 2018 FAQ*, *supra* note 29, at 1 (describing how ShotSpotter works).

⁶⁸ ShotSpotter, *How ShotSpotter Gunshot Detection Works*, YOUTUBE (Aug. 24, 2021), <https://www.youtube.com/watch?v=Nk980tdlZFI> [<https://perma.cc/PE7L-NTCV>]; *see also* Third-Party Subpoena Recipient ShotSpotter, Inc.’s Mot. For Protective Order and to Quash Subpoenas *Duces Tecum* at 6, *State v. Hamilton* (Ill. Cir. Ct. June 21, 2021) (No. 19CR0653601) [hereinafter SSTI Mot. To Quash] (noting that some ShotSpotter sensors are “host[ed]” by “community members”).

⁶⁹ *See* Jay Stanley, *ShotSpotter CEO Answers Questions on Gunshot Detectors in Cities*, ACLU (May 5, 2015), <https://www.aclu.org/blog/privacy-technology/surveillance-technologies/ShotSpotter-ceo-answers-questions-gunshot> [<https://perma.cc/W5Y7-PQEV>]; POLICING PROJECT AUDIT, *supra* note 24, at 10 (“Sensors are placed [20 to 30 feet above ground] to . . . minimize street-level audio.”).

⁷⁰ *See* POLICING PROJECT AUDIT, *supra* note 24, at 11 (explaining that three or more sensors are used in an attempt to obtain a precise location).

⁷¹ *See id.* (“Whenever ShotSpotter’s algorithm detects an impulsive sound, the algorithm attempts to identify these sounds (e.g., ‘gunfire,’ ‘helicopter,’ ‘construction’).”).

⁷² ShotSpotter, *supra* note 68.

⁷³ *See ShotSpotter Responds to False Claims*, SHOTSPOTTER, <https://www.shotspotter.com/shotspotter-responds-to-false-claims/>

algorithm's classification is accurate in real-time.⁷⁴ The analysts are provided with the algorithm's suggested classification of the sound, an audio recording of the sound, a visualization of the sound that they are trained to interpret, and sundry additional data.⁷⁵ If the analyst confirms the sound as gunfire, an alert is sent to local law enforcement containing the time, location of shots fired, and the number of rounds fired.⁷⁶ Alerts may also contain additional information including whether shots were fired by an automatic weapon, whether multiple shooters were involved, and whether the shooter is on the move.⁷⁷ SSTI asserts that the entire process typically takes less than sixty seconds from the time of a shooting to a digital alert reaching a police officer.⁷⁸

By conventional measures, the company is successful.⁷⁹ Despite costing roughly \$65,000 to \$90,000 per year on top of an initial set-up fee,⁸⁰ ShotSpotter is active in over 130 cities.⁸¹ Additional locales are considering adopting the system.⁸²

SSTI believes ShotSpotter can have societal impact that goes beyond

[<https://perma.cc/UVQ6-FHVJ>] (explaining that one of ShotSpotter's algorithms attempts to "eliminate[] sounds that are not gunshots such as fireworks or helicopters").

⁷⁴ See HOW IT WORKS ENGLISH F4, *supra* note 68; Stanley, *supra* note 69 (explaining that humans analyze audio snippets in a review center).

⁷⁵ See POLICING PROJECT AUDIT, *supra* note 24, at 11–12 (summarizing the human analysis process).

⁷⁶ See *ShotSpotter 2018 FAQ*, *supra* note 29, at 1–2 (explaining the contextual information provided to law enforcement).

⁷⁷ See *id.* at 4 ("Included is additional contextual information such as multiple shooters, full automatic weapons, or moving shooter alerts . . .").

⁷⁸ See *id.* at 1 ("This process typically takes no more than 45 seconds from the time of the actual shooting to the digital alert . . ."). If information about an alert is used in court proceedings, a "senior forensic analyst" conducts a separate review of the data and prepares a report. SSTI Mot. to Quash, *supra* note 68, at 3.

⁷⁹ See *ShotSpotter Reports Second Quarter 2022 Financial Results*, GLOBENEWSWIRE (Aug. 9, 2022, 4:05 PM), <https://www.globenewswire.com/en/news-release/2022/08/09/2495309/0/en/ShotSpotter-Reports-Second-Quarter-2022-Financial-Results.html> [<https://perma.cc/ZE6N-V4VZ>] (providing an overview of the company's financial results, including an increase in revenues of 37% from the second quarter of 2021 to the second quarter of 2022).

⁸⁰ *ShotSpotter 2018 FAQ*, *supra* note 29, at 3.

⁸¹ See *More than 200 Customers Trust ShotSpotter Solutions to Drive More Efficient, Effective and Equitable Public Safety Outcomes*, SHOTSPOTTER, <https://www.shotspotter.com/cities/> [<https://perma.cc/K8WF-3MYJ>] (last visited Nov. 20, 2022).

⁸² See, e.g., Paris Dumford, Samantha O'Connor & Jeff Kurowski, *Holyoke Police Discuss Pros to Implementing ShotSpotter Technology*, W. MASS NEWS (Sept. 13, 2022), <https://www.westernmassnews.com/2022/09/13/holyoke-police-discuss-pros-implementing-shotspotter-technology/> [<https://perma.cc/K8JN-X269>] (describing Holyoke, Massachusetts city council's consideration of whether to adopt ShotSpotter).

meeting a discrete, technical objective of accurately identifying gunfire. It aspires to reduce gun violence by helping police recover weapons or evidence of shootings, locate shooters and victims, and otherwise enable solving gun crimes.⁸³ It argues that it is succeeding; SSTI claims it has had concrete impact on saving lives, reducing shootings, increasing evidence collection, and bettering overall crime solving.⁸⁴ Indeed, the company has been credited with assisting police to stop some high profile crimes.⁸⁵ SSTI also argues that ShotSpotter is effective in detecting and locating gunfire—boasting a “97% aggregate accuracy rate”⁸⁶—and that police therefore receive more reports of gunfire and better information on the location of crime scenes, are able to respond and transport victims more quickly, and collect more evidence in homicide cases.⁸⁷

B. Critiques of the Company and System

The company’s claims of success and benefit to society, however, are disputed. Researchers, government watchdogs, and community advocates, among others have raised concerns relating to ShotSpotter’s effectiveness, SSTI’s transparency, ShotSpotter’s implementation in predominantly Black and Brown communities, and ShotSpotter’s impact on privacy. These critiques are considered next.

⁸³ See *Save Lives and Find Critical Evidence with Proven Gunshot Detection*, SHOTSPOTTER, <https://www.shotspotter.com/law-enforcement/gunshot-detection-technology/> [<https://perma.cc/M6HC-JUD8>] (last visited Sept. 30, 2022) (summarizing ways in which SSTI believes ShotSpotter can assist police respond to gun violence); *ShotSpotter’s Positive Impact on Public Safety*, *supra* note 27 (“ShotSpotter is a tool that makes officers aware of gunfire incidents faster giving officers a better opportunity to save lives, improve evidence collection better serve their community.”).

⁸⁴ See *ShotSpotter’s Positive Impact on Public Safety*, *supra* note 27 (giving an overview of claimed positive impact in different cities).

⁸⁵ See, e.g., James Clayton, *Inside the Controversial US Gunshot-Detection Firm*, BBC NEWS (Oct. 29, 2021), <https://www.bbc.com/news/technology-59072745> [<https://perma.cc/Q7V2-H5PT>] (describing ShotSpotter’s success in tracking and facilitating the apprehension of an active shooter in Fresno, California); John Garcia, *ShotSpotter Chicago: How Police Use High-Tech Equipment to Fight Crime*, ABC7 NEWS, (Jan. 21, 2022), <https://abc7chicago.com/what-is-a-shotspotter-chicago-crime-police-technology/11493272/> [<https://perma.cc/6CVU-QQAF>] (crediting ShotSpotter with the speedy arrest of a suspect in Chicago).

⁸⁶ *ShotSpotter Respond Q&A*, SHOTSPOTTER 2 (2021), <https://www.shotspotter.com/wp-content/uploads/2021/07/ShotSpotter-Respond-FAQ-Jul-2021.pdf> [<https://perma.cc/8AK5-GL2X>].

⁸⁷ *Save Lives and Find Critical Evidence with Proven Gunshot Detection*, *supra* note 83; *ShotSpotter’s Positive Impact on Public Safety*, *supra* note 27.

1. Effectiveness

ShotSpotter's effectiveness can be measured in two ways. The first is its validity, or how well ShotSpotter performs its core technical functions of correctly identifying and locating gunfire. The second is ShotSpotter's effectiveness in achieving its overarching goals of reducing gun violence and improving policing outcomes related to gun crimes. This metric is referred to here as "policing effectiveness." To be clear, as used here "policing effectiveness" refers to ShotSpotter's impact on gun crimes specifically, rather than stops, arrests, or prosecutions for crime generally. ShotSpotter frequently leads to seizures unconnected to alerts.⁸⁸ But, "policing effectiveness" is meant here to measure ShotSpotter outcomes against SSTI's own stated goals of reducing gun crime and improving policing outcomes related to such crimes.

Both measures are important. Validity is important because it allows end-users and stakeholders to have assurance that the system performs as intended. Determining whether ShotSpotter is scientifically valid has limited value to police departments and communities alike if policing outcomes related to gun crimes remain unchanged with and without it. Emerging critiques suggest that the system's scientific validity has not been established and that it is ineffective in improving policing outcomes related to gun crimes.

a. Validity

An aura of reliability can pervade even unreliable technical evidence and contribute to unjust outcomes in criminal cases.⁸⁹ Accordingly, it is important

⁸⁸ See, e.g., *supra* notes 1–16 (providing examples of arrests unrelated to the reported shot); see also *infra* Part I.A.1.b (discussing research finding that ShotSpotter has minimal impact on policing outcomes related to gun crimes).

⁸⁹ See Maneka Sinha, *Junk Science at Sentencing*, 89 GEO. WASH. L. REV. 52, 80–81 (2021) ("Jurors and judges view information presented with the label of 'scientific,' 'technical,' or 'expert' as having a stamp of authority and reliability. Courts often warn that this 'aura of special reliability and trustworthiness' creates the potential for confusing the factfinder and prejudicing the defendant."); Keith A. Findley, *Innocents at Risk: Adversary Imbalance, Forensic Science, and the Search for Truth*, 38 SETON HALL L. REV. 893, 943 (2008); Mark A. Godsey & Marie Alou, *She Blinded Me with Science: Wrongful Convictions and the "Reverse CSI-Effect"*, 17 TEX. WESLEYAN L. REV. 481, 483 (2011) ("The Reverse CSI Effect . . . [where jurors] place too much weight on forensic evidence . . . result[s] in convictions in cases where the defendant probably should have been acquitted."). See also WENDY LEE, JUMANA MUSA & MICHAEL PINARD, GARBAGE IN, GOSPEL OUT 9 (2021), <https://www.nacdl.org/getattachment/eb6a04b2-4887-4a46-a708-dbaade82125/garbage-in-gospel-out-how-data-driven-policing-technologies-entrench-historic-racism-and-tech-wash-bias-in-the-criminal-legal-system-09142021.pdf> [<https://perma.cc/QD52-DQTS>] (explaining that people tend to believe computer-generated information over human-

that policing technologies are established as scientifically valid before being put to use. Validity—the idea that a method operates as it is intended to⁹⁰—requires not just that a system operates as intended *in theory*, but also that it operates reliably *as implemented* in a particular environment.⁹¹ A system that operates as intended in certain environments may not operate equally well in others.⁹²

Testing conditions matter; systems—including ShotSpotter—will not perform identically in all environments they are installed in. Determining whether a system will work in a particular environment requires testing under known conditions reflective of that environment.⁹³ Appropriate validation testing should be independent, or, conducted by those without any stake in the success or failure of the method.⁹⁴ Thus, establishing ShotSpotter’s

generated information, creating a risk that policing technologies will be highly trusted despite concealed errors).

⁹⁰ See *Why is Scientific Validity Important?*, WELLSOURCE, <https://www.wellsource.com/wp-content/uploads/2017/06/WSIV-Validity.pdf> [<https://perma.cc/KY9V-S2T9>] (“Validity refers to the degree to which a study or questionnaire accurately reflects or assesses the specific concept that the researcher is attempting to measure.”); see also *Validity*, THE ASS’N FOR QUALITATIVE RSCH., <https://www.aqr.org.uk/glossary/validity> [<https://perma.cc/V8S5-QVTQ>] (“[Validity] refers to how well a scientific test or piece of research actually measures what it sets out to”); DAVID L. FAIGMAN, EDWARD K. CHENG, JENNIFER L. MNOOKIN, ERIN E. MURPHY, JOSEPH SANDERS & CHRISTOPHER SLOBOGIN, 1 MODERN SCIENTIFIC EVIDENCE § 5:18 (2021–2022 ed.) (“A valid measuring instrument measures what it is supposed to.”).

⁹¹ See IEEE Standard for System, Software, and Hardware Verification and Validation, IEEE Standard 1012-2016, 15 (Sept. 2017) (hereinafter IEEE Standard 1012) (“[Verification and validation] processes determine whether the products of a given activity conform to the requirements of that activity and whether the product satisfies its intended use and user needs.”); see also FED. R. EVID. 702 (requiring expert evidence to be both the product of reliable methodology and reliable application in a particular case to be admissible).

⁹² See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 591 (1993) (“Scientific validity for one purpose is not necessarily scientific validity for other, unrelated purposes.”); IEEE-USA, Comment Letter on NIST Internal Report 8351-DRAFT *DNA Mixture Interpretation: A NIST Scientific Foundation Review* 7 (Nov. 18, 2021), <https://ieeeusa.org/assets/public-policy/policy-log/2021/111821.pdf> [<https://perma.cc/Y5KN-4WKY>] (“No software or hardware is ‘generally’ reliable – any technology is only fit for certain purposes.”).

⁹³ See Edward J. Imwinkelried, *The Admissibility of Scientific Evidence: Exploring the Significance of the Distinction Between Foundational Validity and Validity as Applied*, 70 SYRACUSE L. REV. 817, 822 (2020) (“[T]o validate the use of the methodology for forensic casework, . . . [testing] ought to control the variables by specifying conditions that are representative of real world cases.”).

⁹⁴ See IEEE Standard 1012, *supra* note 91, at 198; LEE, MUSA & PINARD, *supra* note 89, at 11 (“Allowing companies with a financial interest in the success of their tools to validate their own technologies with no outside scrutiny is scientifically suspect.”); IEEE-USA, *supra* note 92, at 2–3, 3 n.5 (arguing “forensic technologies that serve as automated decision systems” should be independently verified and validated pursuant to industry standards).

validity requires thorough independent testing in which its capacity to correctly identify and locate gunfire is tested under known conditions individualized to those present in the neighborhoods in which it will be used.⁹⁵ Validity cannot be established *after* ShotSpotter is implemented and in use because, absent clear independent evidence of gunshots separate from the alert, ground truth—or, whether a gun was actually fired—is never known.⁹⁶

The point of validation testing is not merely to show that a method generally works, but also to reveal the limitations of a system so that end-users know under which conditions a system may no longer produce accurate results.⁹⁷ Establishing the limits of ShotSpotter’s reliable use, and thus knowing when such errors are likely to occur, is crucial because false positive errors (when non-gunfire is identified as gunfire) have real-life consequences. Evidence shows police respond to ShotSpotter alerts revved up for armed

“Independent” is used here to mean free from conflict of interest, financial or otherwise, not merely to refer to a third party. See PRESIDENT’S COUNCIL OF ADVISORS ON SCI. & TECH., FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS 14 (2016), https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf [<https://perma.cc/T83F-8WNM>] (“To ensure the scientific judgments are unbiased and independent, such evaluations should be conducted by an agency which has no stake in the outcome.”); cf. *id.* at 81 (“[DNA validation] studies should be performed by or should include independent research groups not connected with the developers of the methods and with no stake in the outcome.”).

⁹⁵ See Imwinkelried, *supra* note 93, at 833 (explaining that validity cannot be assumed beyond the range of validation); Donald Maye, *MacArthur Justice Center vs. ShotSpotter Commissioned Report*, IPVIM (Aug. 13, 2021), <https://ipvm.com/reports/macarthuredgeworth?code=jsly> [<https://perma.cc/2S6H-5PXD>] (describing the MacArthur Justice Center’s explanation of proper validation).

⁹⁶ Ground truth refers to information that is known to be real or true. *Ground Truth*, TECHOPEDIA, <https://www.techopedia.com/definition/32514/ground-truth> [<https://perma.cc/JM4L-PQ8K>] (last accessed May 8, 2022). In crime scene case work, without independent evidence, ground truth cannot be known. See Jillian B. Carr & Jennifer L. Doleac, *The Geography, Incidence, and Underreporting of Gun Violence: New Evidence Using ShotSpotter Data*, BROOKINGS INST. 5 (Apr. 2016), https://www.brookings.edu/wp-content/uploads/2016/07/Carr_Doleac_gunfire_underreporting.pdf [<https://perma.cc/HE9Z-6GQ5>] (“[I]t is typically impossible to distinguish false positives from gunshots that cannot be corroborated by other evidence.”); Simon A. Cole, “Implicit Testing”: *Can Casework Validate Forensic Techniques?*, 46 JURIMETRICS J. 117, 127–128 n.58 (2006) (describing the “ground truth” problem in the context of fingerprint examination); *id.* at 123; Imwinkelried, *supra* note 93, at 822 (“[T]o make reliable [validity] assessments, the researcher must know the ground truth.”).

⁹⁷ See HUMAN FACTORS COMM., ORG. OF SCI. AREA COMMS. FOR FORENSIC SCI., HUMAN FACTORS IN VALIDATION AND PERFORMANCE TESTING OF FORENSIC SCIENCE 6 (2020), <https://doi.org/10.29325/OSAC.TS.0004> [<https://perma.cc/2WYZ-GMTN>] (explaining that validation testing allows determination of the limitations of a methodology).

encounters that can lead to harassment and violence.⁹⁸

While some testing has been done to assess ShotSpotter's reliability, that testing lacks rigor.⁹⁹ Not all jurisdictions that use ShotSpotter have conducted their own testing¹⁰⁰ and it is not clear how rigorous testing has been in those jurisdictions that have.¹⁰¹ It is also unclear whether or how thoroughly the accuracy of ShotSpotter's human analysts has been tested.¹⁰²

⁹⁸ CHICAGO OIG REPORT, *supra* note 1, at 3 (“ShotSpotter technology in Chicago has changed the way some CPD members perceive and interact with individuals present in areas where ShotSpotter alerts are frequent.”); *see* MACARTHUR JUST. CTR., *supra* note 34 (“[ShotSpotter] primes police to believe that they are heading to a dangerous location [and can lead to] volatile deployments [that] can go wrong in an instant.”); Andrew Guthrie Ferguson, *Surveillance and the Tyrant Test*, 110 GEO. L.J. 205, 255–56 (2021) (“[T]hese gunshot reports encourage an increased police presence by officers primed to respond to potential gun violence.”).

⁹⁹ *See* Carr & Doleac, *supra* note 96, at 4–5 (describing limits to available ShotSpotter data and flaws in some studies attempting to assess ShotSpotter accuracy); LORRAINE G. MAZEROLLE, JAMES FRANK, DENNIS ROGAN & CORY WATKINS, A FIELD EVALUATION OF THE SHOTSPOTTER GUNSHOT LOCATION SYSTEM: FINAL REPORT ON THE REDWOOD CITY FIELD TRIAL 11–19 (Nov. 1999), <https://www.ojp.gov/ncjrs/virtual-library/abstracts/field-evaluation-shotspotter-gunshot-location-system-final-report> [<https://perma.cc/EDR9-ZQ2R>] (describing study design in which ShotSpotter's ability to discern test-fired gunshots was examined, but its ability to distinguish non-gunfire from true gunfire was not; background noise was artificially reduced to avoid false positives; and the type of weapon used was altered mid-study after it was determined that the first weapon type used was less likely to be identified by ShotSpotter); John H.L. Hansen & Hynek Boril, *Gunshot Detection Systems: Methods, Challenges, and Can They Be Trusted?*, 151 AUDIO ENG'G SOC'Y CONVENTION 1, 2 (Oct. 13, 2021), <https://www.aes.org/e-lib/browse.cfm?elib=21504> [<https://perma.cc/6NH9-CWLT>] (“[There is] limited publicly available, independent conducted validation studies of [gunshot detection systems].”); *see also* Brief for Chicago Community-Based Organizations as Amici Curiae at 4, *State v. Williams*, No. 20 CR 0899601 (Ill. Cir. Ct. May 3, 2021) [hereinafter *Amici Curiae Brief*], <https://endpolicesurveillance.com/documents/2021-05-03-Motion-for-Leave-to-File-Brief-as-Amici-Curiae-with-Ex.-A-Amicus-Brief-attached.pdf> [<https://perma.cc/5HKM-M668>] (“[SSTI] has never provided validated studies to back up its . . . claim[s] of . . . accuracy.”).

¹⁰⁰ *See* *Amici Curiae Brief*, *supra* note 99, at 4–5 n.2 (quoting a letter from Mike Will, Vice President of ShotSpotter, to Patrick Waller, Assistant State's Attorney, in which Will writes that the Chicago Police Department did not conduct “Deployment Qualification testing” or live fire testing prior to deploying ShotSpotter).

¹⁰¹ *See* *ShotSpotter System Tested in East Baltimore Tuesday Night*, WMAR2NEWS (July 10, 2018), <https://www.wmar2news.com/news/region/baltimore-city/shotspotter-system-tested-in-east-baltimore-tuesday-night> [<https://perma.cc/AA4L-MA33>] (reporting on the testing of ShotSpotter in Baltimore without details on testing conditions or methods); *see also* *State v. Hill*, 288 Neb. 767, 776 (2014) (describing testimony of ShotSpotter employee that SSTI conducted a “live fire test” before deployment in area of use but had not done additional testing in roughly three years since).

¹⁰² The accuracy of experts' conclusions can be affected by context and external information. *See* Jeff Kukucka & Itiel E. Dror, *Human Factors in Forensic Science: Psychological causes of Bias and Error*, in THE OXFORD HANDBOOK OF PSYCHOLOGY AND

Based on the available data, ShotSpotter's stated 97 percent aggregate accuracy rate seems overblown.¹⁰³ Significant evidence suggests that ShotSpotter has not been properly scientifically validated; some researchers have concluded that little meaningful evidence of ShotSpotter's accuracy currently exists.¹⁰⁴ On top of all this, the statistic is based on police department *reporting*—or, police officials' beliefs about accuracy—rather than testing of the system.¹⁰⁵ Basing accuracy claims on police reports rather than testing is misleading; police officials typically cannot know what caused an alert or when an alert is erroneous.¹⁰⁶

Additionally, what SSTI means by “aggregate” accuracy is unclear. ShotSpotter has at least two specific functions—identifying gunfire and locating it, each with its own accuracy and error rates. Assuming the aggregate accuracy rate refers at least in part to the true positive rate—or the rate at which ShotSpotter correctly identifies actual gunfire—it conflicts with other studies, which have found that the majority of ShotSpotter alerts do not lead to any evidence of gunfire.¹⁰⁷ Moreover, the true positive rate may be a

LAW (D. DeMatteo & K. C. Scherr eds., forthcoming 2023) (manuscript at 3), <https://psyarxiv.com/8pqyt/> [<https://perma.cc/3GWJ-C5UZ>] (explaining that psychologists have long understood that contextual factors can lead people to interpret the same information differently).

¹⁰³ See JILLIAN MAMMINO, ACOUSTIC GUNSHOT DETECTION SYSTEMS: COMMUNITY & POLICY CONSIDERATIONS 2 (2022), <https://stpp.fordschool.umich.edu/sites/stpp/files/2022-08/STPP%20Acoustic%20Gunshot%20Detection%20Systems%20June%202022.pdf> [<https://perma.cc/HS8C-CSMR>] (describing ShotSpotter's 97 percent accuracy statistic as ignoring false positives and including as errors solely failures to identify a verified gunshot or mislocation of a gunshot).

¹⁰⁴ Carr & Doleac, *supra* note 96, at 4 (“[T]here is limited independent, published evidence of [ShotSpotter's] current accuracy.”).

¹⁰⁵ See *ShotSpotter Responds to False Claims*, *supra* note 73 (“[Accuracy rate] was derived directly from police department reporting to ShotSpotter.”); MACARTHUR JUST. CTR., *supra* note 34 (noting that more than 90% of alerts yield no evidence to corroborate gunfire).

¹⁰⁶ See Maye, *supra* note 95 (quoting the MacArthur Justice Center as arguing that, “When a police officer arrives at the scene and doesn't find anything, they have no idea what the source of the sound was.”); Carr & Doleac, *supra* note 96 at 5 (“[I]t is important to note that it is typically impossible to distinguish false positives from gunshots that cannot be corroborated by other evidence”); see also *supra* note 96 and accompanying text (describing ground truth).

¹⁰⁷ See MACARTHUR JUST. CTR., *supra* note 34 (finding that more than 90% of alerts led to no evidence of gunfire); CHICAGO OIG REPORT, *supra* note 1, at 3 (noting that in only 9.1% of Chicago Police Department responses to alerts with a reported disposition was evidence of gun-related crime found); see also Erica Gunderson, *Study Questions Accuracy, Utility of ShotSpotter Technology*, WTTW NEWS (May 9, 2021, 5:30 PM), <https://news.wttw.com/2021/05/09/study-questions-accuracy-utility-shotspotter-technology> [<https://perma.cc/KKA6-KVX7>] (“A new study by Northwestern University's MacArthur Justice Center found that 86% of ShotSpotter alerts did not result in a police report of any

less important figure than the false positive rate (the rate at which ShotSpotter misclassifies non-gunfire as gunfire) because erroneous alerts drive police into communities in response and can lead to volatile encounters as well as stops and arrests. ShotSpotter reports a strikingly low false positive rate of half a percent,¹⁰⁸ but available data contradicts this; one research study found that there is “no reliable evidence about the rate of false positives in actual ShotSpotter data.”¹⁰⁹

SSTI counters that “independent” research has confirmed its stated accuracy rates.¹¹⁰ That research, however, is not appropriately classified as independent because it was commissioned by SSTI.¹¹¹ It is also flawed. Edgeworth Analytics, which conducted the research, relied on data provided by SSTI—the very same problematic data reported by police departments—instead of conducting actual testing.¹¹²

Anecdotal evidence supports concerns raised over ShotSpotter’s accuracy. Analysts have been accused of changing sound classifications at police request to better fit evidence¹¹³ and have testified that police departments frequently do ask them to change ShotSpotter classifications.¹¹⁴

crime or incident, leading to questions of the technology’s value in violence reduction.”).

¹⁰⁸ *ShotSpotter Responds to False Claims*, *supra* note 73 (claiming a 0.5% false positive rate for all customers over the last three years).

¹⁰⁹ Carr & Doleac, *supra* note 96, at 5.

¹¹⁰ *ShotSpotter Responds to False Claims*, *supra* note 73 (“[Accuracy and false positive rate data] has been independently confirmed by Edgeworth Analysis, a data science firm in Washington D.C.”).

¹¹¹ See *supra* note 94 (explaining that independence requires absence of conflict of interest). Despite being commissioned by SSTI, Edgeworth Analytics describes its study as an “independent audit.” EDGEWORTH ANALYTICS, INDEPENDENT AUDIT OF THE SHOTSPOTTER ACCURACY 2 (2022) [hereinafter EDGEWORTH ANALYTICS, INDEPENDENT AUDIT], <https://www.edgewortheconomics.com/assets/htmldocuments/Shotspotter-2022-Accuracy-Study.pdf> [<https://perma.cc/G6HT-ZH44>].

¹¹² See EDGEWORTH ANALYTICS, INDEPENDENT AUDIT, *supra* note 111, at 2 (“Edgeworth Analytics obtained data from ShotSpotter for 2019 to 2021.”); Maye, *supra* note 95 (noting that Edgeworth Analytics based its analysis on customer feedback, not testing).

¹¹³ See Garance Burke, Martha Mendoza, Juliet Linderman & Michael Tarm, *How AI-Powered Tech Landed Man in Jail with Scant Evidence*, ASSOCIATED PRESS (Mar. 5, 2022), <https://apnews.com/article/artificial-intelligence-algorithm-technology-police-crime-7e3345485aa668c97606d4b54f9b6220> [<https://perma.cc/M5QV-FALT>] (describing how SSTI employees sometimes reclassify sounds after listening to audio and “can and do modify” other information at police request); Garance Burke, Martha Mendoza, Juliet Linderman & Michael Tarm, *Police Jailed a Man for Murder; Algorithm Was Key Evidence*, ASSOCIATED PRESS (Mar. 5, 2022), <https://apnews.com/article/technology-24f5e12df10879dcbdbb950128fd1707> [<https://perma.cc/6HEQ-HBR5>] (“[E]vidence in pre-trial hearings shows ShotSpotter first said the noise the sensor picked up was a firecracker but a ShotSpotter employee relabeled it a gunshot.”).

¹¹⁴ See, e.g., *United States v. Godinez*, 7 F.4th 628, 633 (7th Cir. 2021) (describing

ShotSpotter has misclassified innocent sounds like fireworks or a car backfiring as gunfire¹¹⁵ and missed live fire squarely within the range of its sensors.¹¹⁶ One investigation found that tall buildings can interfere with ShotSpotter's ability to detect gunfire.¹¹⁷ Other research has shown that background noise, particularly in loud urban environments—precisely where ShotSpotter is often deployed—can cause gunshot detection systems to miss actual gunfire and falsely identify non-gunfire as gunfire.¹¹⁸ One investigation reported that ShotSpotter provides police with an incorrect location for gunfire upwards of twenty percent of the time.¹¹⁹

SSTI itself has acknowledged that ShotSpotter is inaccurate in detecting gunfire originating indoors, shots fired at a person at close range, and shots fired by specific weapons and that its algorithm has had difficulty separating ambient noise from gunfire.¹²⁰ It has also admitted that other errors or bugs

testimony of SSTI employee that police “semiregular[ly]” contact SSTI to ask it to identify sounds not previously identified by the system as gunfire).

¹¹⁵ See Burke, Mendoza, Linderman & Tarm, *How AI-Powered Tech Landed Man in Jail with Scant Evidence*, *supra* note 113; Andras Petho, David S. Fallis & Dan Keating, *ShotSpotter Detection System Documents 39,000 Shooting Incidents in the District*, WASH. POST (Nov. 2, 2013), https://www.washingtonpost.com/investigations/shotspotter-detection-system-documents-39000-shooting-incidents-in-the-district/2013/11/02/055f8e9c-2ab1-11e3-8ade-a1f23cda135e_story.html [<https://perma.cc/J7R9-VYKK>] (“Some sounds, such as fireworks, can be mistaken for gunfire”); Carr & Doleac, *supra* note 96, at 5 (“[L]arge spikes in detected gunfire incidents on New Year’s Eve and July 4th suggest that the [ShotSpotter] algorithm sometimes confuses fireworks and firecrackers with gunfire.”). *But see id.* at 4–5 (summarizing two studies finding ShotSpotter was accurate in detecting and locating gunfire).

¹¹⁶ See Burke, Mendoza, Linderman & Tarm, *How AI-Powered Tech Landed Man in Jail with Scant Evidence*, *supra* note 113 (“AP’s investigation found the system can miss live gunfire right under its microphones”).

¹¹⁷ See Bonnie Berkowitz, Emily Chow, Dan Keating & James Smallwood, *Shots Heard Around the District*, WASH. POST (Nov. 2, 2013), <https://www.washingtonpost.com/wp-srv/special/local/dc-shot-spotter/> [<https://perma.cc/43BG-WTDC>] (“Tall buildings cause sound to bounce around so much that it loses energy and may travel only a few hundred feet. And because sound bends in an arc, a sensor on top of the nearest building may not even pick it up.”).

¹¹⁸ See William Renda & Charlie H. Zhang, *Comparative Analysis of Firearm Discharge Recorded by Gunshot Detection Technology and Calls for Service in Louisville, KY*, 8 INT’L J. OF GEO-INFO. 1 (2019) (“Heavily noisy environments, such as real-world urban settings, have been shown to affect [gun detection technologies’] effectiveness where up to 9% of actual gunfire is not detected and approximately 25% of non-gunfire events with a similar acoustic signature . . . were falsely identified as gunfire.”).

¹¹⁹ *Guns and America’s Murder Board*, REVEAL (Apr. 23, 2016), <https://revealnews.org/podcast/guns-and-americas-murder-board/> [<https://perma.cc/6EKB-UWSD>] (“ShotSpotter gives the wrong location up to 20% of the time.”).

¹²⁰ See *ShotSpotter’s Response to Associated Press Article*, SHOTSPOTTER (Aug. 21, 2021), <https://www.shotspotter.com/law-enforcement/shotspotter-response-to-associated->

may occur in ShotSpotter's software.¹²¹

b. Policing Effectiveness

On top of technical accuracy concerns, some researchers have concluded that ShotSpotter has minimal impact on policing outcomes related to gun crimes. In a first-of-its-kind longitudinal study of ShotSpotter's effects on homicides, homicide arrests, and weapons arrests over a seven-year period, researchers found that "implementing ShotSpotter technology has no significant impact on firearms-related homicides or arrest outcomes."¹²²

Though some jurisdictions do not track arrests connected to ShotSpotter,¹²³ much of the available city-specific data corroborates these findings of minimal impact. Data released from when ShotSpotter was implemented in Baltimore in 2018 shows that evidence of a shooting was recovered only 1,725 times for 8,529 alerts, i.e., just twenty percent of the time.¹²⁴ Notably, the data released does not include accuracy statistics regarding false positives or false negatives.¹²⁵ An investigation of

press-article/ [https://perma.cc/J8VQ-KHD6] ("Our forensic reports make it clear that this court-admissible evidence is for instances of outdoor gunfire, not indoor or in-car weapon discharges."); Stanley, *supra* note 69 (reporting that Ralph Clark, SSTI's CEO, admitted that ambient noise "complicates" ShotSpotter's analysis); *see also* United States v. King, 439 F. Supp. 3d. 1051, 1055 n.2 (N.D. Ill. 2020) ("[ShotSpotter] struggles to detect .22 caliber rounds . . .").

¹²¹ See ShotSpotter, Inc., Quarterly Report (Form 10-Q) 46 (Nov. 12, 2021), https://ir.shotspotter.com/quarterly-reports/content/0000950170-21-004414/ssti-20210930.htm?TB_iframe=true&height=auto&width=auto&preload=false [https://perma.cc/C22S-SCNM] (admitting to errors and bugs in the software due to its complex nature).

¹²² Mitchell L. Doucette, Christa Green, Jennifer Necci Dineen, David Shapiro & Kerri M. Raissian, *Impact of ShotSpotter Technology on Firearm Homicides and Arrests Among Large Metropolitan Counties: A Longitudinal Analysis, 1999–2016*, 98 J. URBAN HEALTH 609, 609, 616 (2021). The study controlled for a variety of factors including firearms laws known to impact gun violence. *Id.* at 616–18. Another study found that a different gunshot detection system did not significantly impact the number of confirmed shootings in the area of study. *See* Jerry H. Ratcliffe, Matthew Lattanzio, George Kikuchi & Kevin Thomas, *A Partially Randomized Field Experiment on the Effect of an Acoustic Gunshot Detection System on Police Incident Reports*, 15 J. EXPERIMENTAL CRIMINOLOGY 67, 67 (2019) ("[T]here was no significant increase in the number of confirmed shootings [after the implementation of an acoustic gunshot detection system].").

¹²³ Petho et al., *supra* note 115.

¹²⁴ Jessica Anderson, *Baltimore's Spending Panel Approves \$760,000 to Extend ShotSpotter Gunfire Detection System*, BALT. SUN (Nov. 3, 2021), <https://www.baltimoresun.com/maryland/baltimore-city/bs-md-ci-shot-spotter-20211103-yepjbyhpvgbbjx4k5fme3chlu-story.html> [https://perma.cc/LDF9-F79X].

¹²⁵ *See id.* ("[The police department] did not provide data on how many of the

ShotSpotter alerts in San Francisco over a two-and-a-half year period beginning in January 2013 revealed that no evidence of gunshots was discovered by police in almost two-thirds of over three thousand calls for alerts.¹²⁶ Only two arrests were made in response to those calls; one was unrelated to gunfire.¹²⁷

Studies of St. Louis and St. Louis County found that over a five-year period, fewer than one percent of ShotSpotter alerts resulted in sufficient evidence to generate a police report and that from 2008 to 2018, over 19,000 alerts resulted in only thirteen arrests related to the alerts.¹²⁸ Researchers found mixed results as to ShotSpotter's effect on response times, but significantly less efficiency in "uncovering and responding to criminal behavior" as compared to traditional calls for service and little effectiveness in reducing gun crime.¹²⁹

Data from Chicago is perhaps the most revealing. In a study of ShotSpotter alerts from July 1, 2019 to April 14, 2021, the MacArthur Justice Center at Northwestern University Law School found that eighty-nine percent of ShotSpotter alerts in Chicago resulted in no evidence of a gun crime.¹³⁰ It described over 40,000 alerts in that period as "unfounded."¹³¹ In another Chicago study over the period January 1, 2020 to May 31, 2021, the Chicago Office of the Inspector General, a non-partisan oversight agency,¹³²

ShotSpotter alerts were the result of something other than gunfire.”).

¹²⁶ *Guns and America's Murder Board*, *supra* note 119.

¹²⁷ *See id.* (noting that in one of the two arrests, police found “a drunk man with an outstanding warrant” but no evidence of a gunshot).

¹²⁸ Erin Heffernan, *St. Louis Technology Detects Lots of Gunfire, But Calls Often Lead to a Dead End*, ST. LOUIS POST-DISPATCH (May 31, 2021), https://www.stltoday.com/news/local/crime-and-courts/st-louis-technology-detects-lots-of-gunfire-but-calls-often-lead-to-a-dead-end/article_882b0aa5-653c-5657-8410-bd8af2997e21.html [<https://perma.cc/YL96-B79H>] (“From 2008 to early 2018 there were more than 19,000 ShotSpotter calls for service in [St. Louis], but only 13 arrests uniquely tied to the alerts . . .”).

¹²⁹ Dennis Mares & Emily Blackburn, *Acoustic Gunshot Detection Systems: A Quasi-experimental Evaluation in St. Louis, MO*, 17 J. EXPERIMENTAL CRIMINOLOGY 193, 201 (2021); *id.* at 193, 195, 197, 199, 206–07.

¹³⁰ *Numerous Analyses From Across the Country Have Found That ShotSpotter Generates a Huge Proportion of Unfounded Deployments That Turn Up No Evidence of Gun Crime.*, MACARTHUR JUST. CTR. (last visited Nov. 14, 2022), <https://endpolicessurveillance.com/research-findings/> [<https://perma.cc/R7JM-9XPJ>]. An SSTI-commissioned study complained that the MacArthur Justice Center's data source was incomplete, but that same study used police-reported data. *See* EDGEWORTH ANALYTICS, INDEPENDENT AUDIT, *supra* note 111 at 2 (“[I]nformation on potential errors relies on clients reporting those potential errors to ShotSpotter.”); *Maye*, *supra* note 95 (noting that Edgeworth Analytics based their findings on “client reports”).

¹³¹ MACARTHUR JUST. CTR., *supra* note 130.

¹³² *See About Us*, OFF. OF INSPECTOR GEN., CITY OF CHICAGO, <https://igchicago.org/about-the-office/> [<https://perma.cc/SJE3-NA2T>] (describing itself as

found that police “responses to ShotSpotter alerts can seldom be shown to lead to investigatory stops which might have investigative value and rarely produce evidence of a gun-related crime.”¹³³ Of 50,176 confirmed ShotSpotter alerts in that period, 41,830 reported the outcome of the police response to the alert.¹³⁴ Of those 41,830, only 4,556, or just over ten percent, indicated evidence of a gun crime.¹³⁵

SSTI disputes claims that ShotSpotter has little impact on policing outcomes.¹³⁶ While limited evidence suggests ShotSpotter can help police find shooters and reduce the time it takes to reach and transport gunshot victims,¹³⁷ the significant majority of research—in particular, independent research—finds that the system has minimal impact on policing outcomes related to gun crimes.

2. Transparency

Concerns related to ShotSpotter’s validity are exacerbated by efforts by SSTI and the jurisdictions that have adopted ShotSpotter to avoid opening the system up to meaningful review. The system has been purchased and installed without providing notice to residents in areas where it is being deployed or making its data publicly available for evaluation. In several jurisdictions, ShotSpotter has been implemented with minimal to no community input or oversight.¹³⁸ SSTI shields ShotSpotter data from

independent and non-partisan).

¹³³ Press Release, City of Chicago, *OIG Finds That ShotSpotter Alerts Rarely Lead to Evidence of a Gun-related Crime and That Presence of the Technology Changes Police Behavior* (Aug. 24, 2021), <https://igchicago.org/2021/08/24/oig-finds-that-shotspotter-alerts-rarely-lead-to-evidence-of-a-gun-related-crime-and-that-presence-of-the-technology-changes-police-behavior/> [<https://perma.cc/HZB2-UZNE>].

¹³⁴ *Id.*

¹³⁵ *Id.*; CHICAGO OIG REPORT, *supra* note 1, at 13–14 (reporting the findings of the Office of the Inspector General in more detail).

¹³⁶ See *ShotSpotter Responds to False Claims*, *supra* note 73 (arguing that ShotSpotter has positively impacted communities).

¹³⁷ See Goldenberg, et al., *supra* note 31, at 1253 (“ShotSpotter activation significantly reduced both the response time as well as transport time for both police and EMS.”); Clayton, *supra* note 85 (describing how police were able to apprehend an active shooter in Fresno, California within minutes with the assistance of ShotSpotter alerts).

¹³⁸ See, e.g., Tom Schuba, *Activists Slam City for Extending ShotSpotter Contract Amid Mounting Criticism of the Gunshot Detection System*, CHI. SUN TIMES (Aug. 19, 2021), <https://chicago.suntimes.com/crime/2021/8/19/22633412/activists-slam-city-shotspotter-contract-gunshot-detection-system-policing> [<https://perma.cc/53LD-JKAC>] (describing Chicago’s extension of its ShotSpotter contract despite activists’ argument that the extension occurred “without any public comment or notification to members of City Council”); Gecas, *supra* note 62, at 1087 (“Police have lied to citizens about when the technology has gone ‘live’ in their city.”); Angel Diaz, *New York City Police Department Surveillance Technology*, BRENNAN CTR. FOR JUST. (Oct. 4, 2019), <https://www.brennancenter.org/our->

journalists, researchers, and others who hope to study the system.¹³⁹ The company has gone so far as to pressure jurisdictions utilizing the system not to release their own ShotSpotter data.¹⁴⁰ While some jurisdictions have released ShotSpotter data anyway, the amount of information currently available for independent review is limited.¹⁴¹

3. Racialized Deployment

Understanding the concrete impact of these concerns requires context on how ShotSpotter is deployed. Because ShotSpotter is expensive, it is not deployed equally throughout all parts of cities. Rather, police departments typically deploy the system in neighborhoods where they believe gun crimes are most likely to occur,¹⁴² which are often predominantly Black and Brown communities.¹⁴³ In turn, ShotSpotter is installed in neighborhoods with disparately larger concentrations of Black and Brown residents.¹⁴⁴ The MacArthur Justice Center found that in Chicago, ShotSpotter is deployed only in the half of the city's police districts¹⁴⁵ with the highest proportions of Black and Brown residents.¹⁴⁶ ShotSpotter sensors are distributed similarly

work/research-reports/new-york-city-police-department-surveillance-technology [https://perma.cc/2KXF-BTN4] (“The New York Police Department . . . has purchased and used new surveillance technologies [including ShotSpotter] while attempting to keep the public and the City Council in the dark.”).

¹³⁹ See, e.g., Maye, *supra* note 95 (noting that SSTI declined to allow IPVM to test ShotSpotter).

¹⁴⁰ Hannah Bloch-Wehba, *Access to Algorithms*, 88 FORDHAM L. REV. 1265, 1284 (2020) (“When journalists and researchers began requesting the data from police, ShotSpotter sent out a ‘nationwide memo’ urging cities not to disclose it.”).

¹⁴¹ See *id.* (noting that some jurisdictions released ShotSpotter data over objections by SSTI); Carr & Doleac, *supra* note 96, at 6 (“At this time, data are freely-available to researchers for only a small subset of ShotSpotter cities.”).

¹⁴² EDGEWORTH ANALYTICS, INDEPENDENT ANALYSIS, *supra* note 34.

¹⁴³ See David A. Harris, *Factors for Reasonable Suspicion: When Black and Poor Means Stopped and Frisked*, 69 IND. L.J. 659, 677–78 (1994) [hereinafter *Factors*] (“African Americans and Hispanic Americans make up almost all of the population in most of the neighborhoods the police regard as high crime areas.”).

¹⁴⁴ Todd Feathers, *Gunshot-Detecting Tech Is Summoning Armed Police to Black Neighborhoods*, VICE (July 19, 2021), <https://www.vice.com/en/article/88nd3z/gunshot-detecting-tech-is-summoning-armed-police-to-black-neighborhoods> [https://perma.cc/BZ5K-MSWX] (“In [Kansas City, Cleveland, Atlanta, and Chicago], the data shows that the sensors are . . . placed almost exclusively in majority Black and brown neighborhoods, based on population data from the U.S. Census.”).

¹⁴⁵ MACARTHUR JUST. CTR., *supra* note 42 (listing twenty-four total police districts in Chicago and noting that ShotSpotter is deployed in twelve of those districts).

¹⁴⁶ See *id.* (“The twelve ShotSpotter districts are exactly those with the highest proportion of Black and Latinx residents—and the lowest proportion of White residents.”).

in other cities.¹⁴⁷

The decision of where to deploy ShotSpotter exacerbates existing tensions between police and residents in Black and Brown neighborhoods¹⁴⁸ by, for example, bringing more police to these neighborhoods in response to alerts.¹⁴⁹ ShotSpotter alerts have routinely led to arrests of individuals not associated with the triggering event.¹⁵⁰ And, ShotSpotter creates circumstances ripe for volatile police-citizen encounters. Police respond to ShotSpotter alerts primed to believe anyone nearby is—and treat anyone nearby as—a potential armed suspect, making encounters very high stakes.¹⁵¹

¹⁴⁷ See Feathers, *supra* note 144 (describing similar trends in Kansas City, Cleveland, and Atlanta); see also Chris Mills Rodrigo, *Gunshot Detection Firm ShotSpotter Expands with New DC Office*, THE HILL (July 14, 2021), <https://thehill.com/policy/technology/563028-gunshot-detection-firm-shotspotter-expands-with-new-dc-office> [<https://perma.cc/6NPE-XN3X>] (“The only police district in D.C. not covered by ShotSpotter sensors is composed primarily of two city wards that have a high concentration of white residents.”).

¹⁴⁸ See Nancy La Vigne, Jocelyn Fontaine & Anamika Dwivedi, *How Do People in High-Crime, Low-Income Communities View the Police?*, URB. INST. (Feb. 2017), https://www.urban.org/sites/default/files/publication/88476/how_do_people_in_high-crime_view_the_police.pdf [<https://perma.cc/LP23-LPW5>] (“[A]reas with high levels of mistrust tend to be those that are heavily policed, where police use tactics such as pretextual stops that damage their relationship with the people they are charged to protect.”); MAMMINO, *supra* note 103, at 3 (explaining ShotSpotter’s deployment in areas “already overburdened by the criminal legal system”).

¹⁴⁹ POLICING PROJECT, MEASURING THE EFFECTS OF SHOTSPOTTER ON GUNFIRE IN ST. LOUIS COUNTY, MO 4 (Jan. 2021), <https://static1.squarespace.com/static/58a33e881b631bc60d4f8b31/t/603923e3a32c3f57d67dabec/1614357476874/Measuring+the+Effects+of+Shotspotter+on+Gunfire+in+St.+Louis+County%2C+MO.pdf> [<https://perma.cc/E4HS-QH5K>] (“ShotSpotter can result in heavier police presence in communities of color, negative stereotyping of neighborhoods that have the technology, and greater CCTV surveillance in those areas.”).

¹⁵⁰ See, e.g., Sgueglia, *supra* note 11 (describing NYPD’s arrest of Fitzroy Gayle); Gabriel Sandoval & Rachel Holliday Smith, ‘ShotSpotter’ Tested as Shootings and Fireworks Soar, While Civil Rights Questions Linger, THE CITY (July 5, 2020), <https://www.thecity.nyc/2020/7/5/21312671/shotspotter-nyc-shootings-fireworks-nypd-civil-rights> [<https://perma.cc/N3LW-ZTV7>] (describing incidents in which ShotSpotter alerts resulted in arrests of individuals unassociated with the triggering alert and the assertion of Jerome Greco, head of the Legal Aid Society of New York’s Digital Forensics Unit, that ShotSpotter alerts lead to charges unrelated to gun offenses); *Guns and America’s Murder Board*, *supra* note 119 (noting that in a two-and-a-half-year period from 2013 to 2016 in which police made roughly three thousand calls for ShotSpotter alerts in San Francisco, only two arrests were made, one of which was unrelated to gun fire or a gun crime).

¹⁵¹ See *supra* note 98 (explaining that ShotSpotter can change the way police interact with individuals); Gunderson, *supra* note 107 (quoting Freddy Martinez, director of Lucy Parsons Lab) (“You have police officers thinking there’s gunfire, racing to the scene where Black and brown people are hanging out, and really just thinking that everyone is an armed suspect. It’s quite dangerous and leads to very harmful interactions . . .”). ShotSpotter disputes such claims. *ShotSpotter Responds to False Claims*, *supra* note 73 (“[T]here is no

In some high profile cases, police responding to ShotSpotter alerts have harassed, used violence against, and even killed citizens.¹⁵²

4. Privacy

Some have also expressed concerns over ShotSpotter's enablement of surveillance and privacy invasions because of the system's use of recording microphones.¹⁵³ Although ShotSpotter's microphones are designed to record only when potential gunfire is detected, some fear that they can be turned against citizens to conduct constant real-time recording and targeted surveillance¹⁵⁴ or may inadvertently pick up private conversations which can be used in court. In some cases, prosecutors have tried to admit statements recorded by ShotSpotter's sensors.¹⁵⁵ Some cities have declined to adopt ShotSpotter over such privacy concerns.¹⁵⁶

In response to these concerns, SSTI contracted the Policing Project at the New York University School of Law ("Policing Project") to conduct a privacy audit of the system.¹⁵⁷ Notably, the audit was not independent; SSTI commissioned the report, it provides funding to the Policing Project and SSTI's CEO served on its board at the time of the audit.¹⁵⁸

evidence supporting the claim that ShotSpotter alerts result in police arriving on scene 'hyped up' potentially creating dangerous situations.").

¹⁵² See *supra* notes 5–22 and accompanying text (providing examples of harassment and violence in police responses to ShotSpotter alerts).

¹⁵³ See Matthew Guariglia, *It's Time for Police to Stop Using ShotSpotter*, ELEC. FRONTIER FOUND. (July 29, 2021), <https://www.eff.org/deeplinks/2021/07/its-time-police-stop-using-shotspotter> [<https://perma.cc/3E63-Q2P7>] ("[T]here is . . . a civil liberties concern posed by the fact that these microphones intended to detect gunshots can also record human voices."); POLICING PROJECT AUDIT, *supra* note 24, at 14 ("[S]ome have raised the concern that ShotSpotter might be used as a voice surveillance tool . . .").

¹⁵⁴ See POLICING PROJECT AUDIT, *supra* note 24, at 14 (describing concerns expressed by communities of color over the potential for ShotSpotter to be used for voice surveillance).

¹⁵⁵ See, e.g., *People v. Johnson*, No. A131317, 2013 WL 740387, at *4 (Cal. Ct. App. Feb. 27, 2013) (describing ShotSpotter recording containing victim's voice among evidence against defendant); *T.D.P. v. City of Oakland*, 2019 WL 913840, *4 (N.D. Cal. 2019) (considering ShotSpotter audio recordings containing audible statements admitted as evidence); Cale Guthrie Weissman, *The NYPD's Newest Technology May Be Recording Conversations*, BUS. INSIDER (Mar. 26, 2015), <https://www.businessinsider.com/the-nypds-newest-technology-may-be-recording-conversations-2015-3> [<https://perma.cc/C8UP-E9LK>] (describing the prosecution's use of a ShotSpotter recording containing a shooting victim's last words in the trial against his alleged shooter).

¹⁵⁶ See, e.g., Kevin Connor, *Legal Issues Prompt Toronto Police to Scrap ShotSpotter*, TORONTO SUN (Feb. 14, 2019), <https://torontosun.com/news/local-news/legal-issues-prompt-toronto-police-to-scrap-shotspotter> [<https://perma.cc/5JKY-7BTV>] (reporting that Toronto decided not to adopt ShotSpotter after some city councilors raised privacy concerns).

¹⁵⁷ POLICING PROJECT AUDIT, *supra* note 24, at 7.

¹⁵⁸ *Id.* at 4, 7; *Advisory Board*, POLICING PROJECT AT NYU SCHOOL OF LAW,

The Policing Project found that ShotSpotter presents only minor privacy concerns for the following reasons: ShotSpotter stores recordings only temporarily; recordings are periodically purged; SSTI, not law enforcement, retains control over recordings; the system is not calibrated or designed to record conversations; and SSTI substantially adopted a swath of further reforms the Policing Project suggested.¹⁵⁹ The Policing Project’s conclusion, however, only suggests that SSTI is currently taking steps to mitigate privacy concerns related to ShotSpotter’s recording capacity. SSTI’s voluntary actions do not resolve the critiques relating to ShotSpotter’s validity, policing effectiveness, transparency, racialized deployment, and enablement of over-policing of communities of color. Nor can they prevent ShotSpotter’s contribution to the erosion of search and seizure protections. This problem is considered next.

II. THE EROSION OF REASONABLE SUSPICION

This Part provides the background context necessary to understanding ShotSpotter’s potential to erode reasonable suspicion doctrine. It briefly outlines the reasonable suspicion standard, its impact on street encounters between police and citizens, and how it has been expanded to create conditions ripe for police abuse.

A. *The Reasonable Suspicion Standard*

The Fourth Amendment draws a line between police and citizens, protecting against unreasonable police intrusions.¹⁶⁰ Over time, its original

<https://www.policingproject.org/advisory-board> [<https://perma.cc/8NK3-ER3A>] (last visited Oct. 4, 2022) (listing SSTI CEO Ralph Clark among the Policing Project’s Advisory Board alumni). Others have described the Policing Project audit as independent. *See Carr & Doleac, supra* note 96, at 5 (describing the Policing Project audit as “independent” while recognizing that it was funded by ShotSpotter). Because of the relationship between SSTI and the Policing Project, the audit cannot accurately be characterized this way. *See supra* note 94 (defining independence). A lack of true independence is not uncommon in research on ShotSpotter. *See, e.g.,* NICK SELBY, DAVID HENDERSON & TARA TAYYABKHAN, CSG ANALYSIS, SHOTSPOTTER GUNSHOT LOCATION SYSTEM EFFICACY STUDY 4 (2011), https://www.shotspotter.com/wp-content/uploads/2020/12/ShotSpotter_Efficacy_Study_062311_FPV.pdf [<https://perma.cc/4YK5-4X9Z>] (“This research was commissioned by ShotSpotter . . .”); EDGEWORTH ANALYTICS, INDEPENDENT ANALYSIS, *supra* note 34, at 1 (providing the results of an analysis commissioned by SSTI); EDGEWORTH ANALYTICS, INDEPENDENT AUDIT, *supra* note 111, at 1 (providing the results of an audit commissioned by SSTI).

¹⁵⁹ *See* POLICING PROJECT AUDIT, *supra* note 24 at 4, 15–16, 20 (listing the Policing Project’s findings, the bases for its findings, and SSTI’s response to those findings).

¹⁶⁰ U.S. CONST. amend. IV.

protections have dwindled, particularly in the context of street encounters.¹⁶¹ A crucial domino fell in 1968, when the Supreme Court decided the watershed case *Terry v. Ohio*.¹⁶² In a dramatic shift in Fourth Amendment doctrine, the Court formally sanctioned limited searches and seizures conducted on less than probable cause in a novel “reasonable suspicion” standard.¹⁶³

The central idea behind *Terry* is that police can perform a temporary, limited stop for investigatory purposes if they reasonably suspect a particular person is engaging in a specific crime.¹⁶⁴ Reasonable suspicion must be based on objective,¹⁶⁵ “specific and articulable” facts¹⁶⁶ learned prior to the stop¹⁶⁷ that bear some indicia of reliability.¹⁶⁸ Whether reasonable suspicion exists is determined by balancing governmental interests against intrusions on private interests under a “totality of circumstances” standard.¹⁶⁹

The standard has two essential prongs. Before an officer conducts a stop, they must have particularized suspicion (1) of criminal activity afoot¹⁷⁰ and (2) that the specific person they wish to stop has engaged in such activity.¹⁷¹ Both prongs must be satisfied. Suspicion that crime is generally afoot is

¹⁶¹ See, e.g., Tracey Maclin, *Terry v. Ohio's Fourth Amendment Legacy: Black Men and Police Discretion*, 72 ST. JOHN'S L. REV. 1271, 1309 (1998) (discussing how *Terry* “gave officers enormous discretion and diminished the constitutional freedom of the individual”); Julian A. Cook, III, *Suspicionless Policing*, 89 GEO. WASH. L. REV. 1568, 1575 (2021); Renée McDonald Hutchins, *Policing the Prosecutor: Race, the Fourth Amendment, and the Prosecution of Criminal Cases*, A.B.A. (2018), https://www.americanbar.org/groups/criminal_justice/publications/criminal-justice-magazine/2018/fall/policing-prosecutor/ [<https://perma.cc/F7EU-26KE>]; see also Utah v. Strieff, 579 U.S. 232, 252 (2016) (Sotomayor, J., dissenting) (listing post-*Terry* cases which expand justifications for an investigatory stop).

¹⁶² *Terry v. Ohio*, 392 U.S. 1 (1968). But see Thomas Y. Davies, *The Supreme Court Giveth and the Supreme Court Taketh Away: The Century of Fourth Amendment "Search and Seizure" Doctrine*, 100 J. CRIM. L. & CRIMINOLOGY 933, 987–88 (2010) (noting that while the standard set out in *Terry* is “disturbingly formless and potentially permissive[.] . . . *Terry* extended Fourth Amendment protections to a police ‘stop and frisk’ practice that was already commonplace in American cities, and thus subjected that practice to legal review”).

¹⁶³ *Terry*, 392 U.S. at 27.

¹⁶⁴ *Id.* at 27.

¹⁶⁵ *Brown v. Texas*, 443 U.S. 47, 51 (1979).

¹⁶⁶ *Terry*, 392 U.S. at 21.

¹⁶⁷ *Florida v. J.L.*, 529 U.S. 266, 271 (2000).

¹⁶⁸ *Alabama v. White*, 496 U.S. 325, 329 (1990); Steven Grossman, *Whither Reasonable Suspicion: The Supreme Court's Functional Abandonment of the Reasonableness Requirement for Fourth Amendment Seizures*, 53 AM. CRIM. L. REV. 349, 349 (2016).

¹⁶⁹ *United States v. Cortez*, 449 U.S. 411, 417 (1981).

¹⁷⁰ Reasonable suspicion may support stops for completed criminal activity, criminal activity that is occurring, or criminal activity that is about to occur. *United States v. Hensley*, 469 U.S. 221, 227 (1985).

¹⁷¹ *Cortez*, 449 U.S. at 417–18.

insufficient; the officer must have objective reason to believe that the particular individual being stopped and investigated is involved in the suspected criminal activity.¹⁷² Conversely, a generalized belief that a person is suspicious untethered to an indication of actual criminal activity is also insufficient.¹⁷³ A frisk, or limited, protective pat down of a suspect's outer clothing, is permissible if an officer has reasonable articulable suspicion that the person is armed and dangerous.¹⁷⁴

Some features of the reasonable suspicion standard bear emphasis. First, the Court declined to precisely set out the contours of what constitutes reasonable suspicion.¹⁷⁵ It deferred that question to future case-by-case analysis,¹⁷⁶ putting in place a standard that remains ambiguous over a half-century after *Terry* was decided.¹⁷⁷

Second, the *Terry* Court stressed the importance of police judgment and expertise in evaluating the reasonableness of a stop-and-frisk¹⁷⁸ even after acknowledging that allowing police to conduct seizures and searches—albeit those considered to be limited—on less than probable cause would result in Fourth Amendment violations.¹⁷⁹ The Court's observation was prescient, but it undersold the gravity of the problem.¹⁸⁰ The vagueness of the reasonable suspicion standard, coupled with the weight placed on officers' judgment in stop-and-frisk scenarios, has led to constant privacy and Fourth Amendment violations¹⁸¹ and ever-increasing deference by courts to police experience and

¹⁷² *Id.* at 417–18 (“[T]he detaining officers must have a particularized and objective basis for suspecting the particular person stopped of criminal activity.”).

¹⁷³ *See Florida v. J.L.*, 529 U.S. 266, 272 (2000) (“[R]easonable suspicion here at issue requires that a tip be reliable in its assertion of illegality, not just in its tendency to identify a determinate person.”).

¹⁷⁴ *E.g.*, *Terry v. Ohio*, 392 U.S. 1, 24 (1968); *Arizona v. Johnson*, 555 U.S. 323, 326–27 (2009).

¹⁷⁵ *Terry*, 392 U.S. at 29 (“[The Court] need not develop at length . . . the limitations which the Fourth Amendment places upon a protective seizure and search for weapons.”).

¹⁷⁶ *Id.* at 30 (“Each case of this sort will, of course, have to be decided on its own facts.”).

¹⁷⁷ FERGUSON, *supra* note 58, at 338; Jeffrey Fagan, *Terry's Original Sin*, 2016 U. CHI. LEGAL F. 43, 52 (2016) (“[T]he *Terry* standard remains rather opaque.”).

¹⁷⁸ *Terry*, 392 U.S. at 27 (“[I]n determining whether the officer acted reasonably . . . due weight must be given . . . to the specific reasonable inferences which he is entitled to draw from the facts in light of his experience.”).

¹⁷⁹ *Id.* at 13–14.

¹⁸⁰ *See* David A. Harris, *Frisking Every Suspect: The Withering of Terry*, 28 U.C. DAVIS L. REV. 1, 4 (1994) [hereinafter *Frisking*] (describing often unconstitutional stop-and-frisk practices of various police departments).

¹⁸¹ *See, e.g., id.* at 4–6 (warning that widespread use of unjustified stop-and-frisks and courts' heavy deference to police testimony will result in the *Terry* exception to the probable cause requirement “swallow[ing] the rule”); Cook, *supra* note 161, at 1577; *Floyd v. City of New York*, 959 F. Supp. 2d 540, 660 (S.D.N.Y. 2013) (“[The NYPD has [a] practice of making stops that lack individualized reasonable suspicion . . . so pervasive and persistent as

decision-making in reasonable suspicion determinations.¹⁸²

These factors have contributed to an extreme erosion of the Fourth Amendment's promised protections.¹⁸³ Pervasive use of unlawful stop-and-frisk practices have been documented in Baltimore,¹⁸⁴ Chicago,¹⁸⁵ Ferguson,¹⁸⁶ and New York City,¹⁸⁷ among other places.¹⁸⁸ Stops and frisks purportedly based on reasonable suspicion have led to police harassment, police abuse, and police violence—including killings—against citizens.¹⁸⁹

to become not only a part of the NYPD's standard operating procedure, but a fact of daily life in some New York City neighborhoods.”)

¹⁸² See, e.g., Anna Lvovsky, *Rethinking Police Expertise*, 131 YALE L.J. 475, 488 (2021) (“[C]ourts have sanctioned searches and seizures on increasingly thin grounds”); Eric J. Miller, *Detective Fiction: Race, Authority, and the Fourth Amendment*, 44 ARIZ. ST. L.J. 213, 223–24 (2012) (“[T]he Court . . . removes both judicial and public scrutiny through deference to some inarticulate police ‘sixth sense’ about crime.”); see also *United States v. Cortez*, 449 U.S. 411, 419–20 (1981); *United States v. Sokolow*, 490 U.S. 1, 9–11 (1989) (deferring to Drug Enforcement Administration agents’ assessment that factors individually consistent with innocence cumulatively amounted to reasonable suspicion of drug trafficking); *id.* at 11 (emphasizing need to avoid “hamper[ing] the police’s ability to make swift, on-the-spot decisions”).

¹⁸³ Maclin, *supra* note 161, at 1309 (1998); Cook, *supra* note 161, at 1574–75.

¹⁸⁴ U.S. DEP’T OF JUST., CIV. RTS. DIV., INVESTIGATION OF THE BALTIMORE CITY POLICE DEPARTMENT 24 (Aug. 10, 2016), <https://www.justice.gov/opa/file/883366/download> [<https://perma.cc/KD3M-KVH8>].

¹⁸⁵ ACLU OF ILL., STOP AND FRISK IN CHICAGO 6 (Mar. 2015), https://www.aclu-il.org/sites/default/files/wp-content/uploads/2015/03/ACLU_StopandFrisk_6.pdf [<https://perma.cc/RC63-MB9R>].

¹⁸⁶ U.S. DEP’T OF JUST., CIV. RTS. DIV., INVESTIGATION OF THE FERGUSON POLICE DEPARTMENT 16 (Mar. 4, 2015), https://www.justice.gov/sites/default/files/opa/press-releases/attachments/2015/03/04/ferguson_police_department_report.pdf [<https://perma.cc/6XXX-7H2D>].

¹⁸⁷ *Floyd v. City of New York*, 959 F. Supp. 2d 540, 590 (S.D.N.Y. 2013).

¹⁸⁸ See Tracey L. Meares, *Programming Errors: Understanding the Constitutionality of Stop-and-Frisk as a Program, Not an Incident*, 82 U. CHI. L. REV. 159, 162 (2015) (“[I]n reality stop-and-frisk is more typically carried out by a police force en masse as a program.”).

¹⁸⁹ See David H. Gans, *“We Do Not Want to Be Hunted”: The Right to Be Secure and Our Constitutional Story of Race and Policing*, 11 COLUM. J. RACE & L. 239, 309 (2021) (“[Stop-and-frisk policing] creates the potential for a tragic violent encounter between the police and the populace”); Josephine Ross, *Warning: Stop-and-Frisk May Be Hazardous to Your Health*, 25 WM. & MARY BILL RTS. J. 689, 722 (2016) (explaining the results of a 2014 study which found that *Terry* stops frequently involve “physical violence, racial/ethnic degradation, and homophobia”); Michael D. White, Henry F. Fradella, Weston J. Morrow & Doug Mellom, *Federal Civil Litigation As an Instrument of Police Reform: A Natural Experiment Exploring the Effects of the Floyd Ruling on Stop-and-Frisk Activities in New York City*, 14 OHIO ST. J. CRIM. L. 9, 10 (2016) (noting that the deaths of Eric Garner, Michael Brown, and Freddie Gray all occurred after *Terry* stops); Yvette N. Pappoe, Note, *Remediating the Effects of Government-Sanctioned Segregation in A Post-Freddie Gray Baltimore*, 16 U. MD. L.J. RACE, RELIGION, GENDER & CLASS 115, 131 (2016) (noting that Freddie Gray’s death in police custody followed a *Terry* stop).

Black and Brown communities bear the brunt of these consequences.¹⁹⁰

The Court was aware of these potential societal consequences of *Terry*. It acknowledged that tensions stemming from harassment and unlawful encounters existed between police and Black and other minority communities.¹⁹¹ The deployment of ShotSpotter in predominantly Black and Brown communities and the over-policing of those communities that it leads to is one example of why the Court's acknowledgment was well-founded.

B. *Erosion of the Standard*

Since *Terry*, the reasonable suspicion standard has repeatedly been diluted further.¹⁹² The Court lessened the quantum of evidence required to establish reasonable suspicion.¹⁹³ It narrowed what constitutes a seizure, allowing greater invasive police conduct to fall outside of the protections of the Fourth Amendment.¹⁹⁴ It limited the circumstances in which police

¹⁹⁰ Lynne Peeples, *What the Data Say About Police Brutality and Racial Bias—and Which Reforms Might Work*, NATURE (May 26, 2021), <https://www.nature.com/articles/d41586-020-01846-z> [https://perma.cc/59HV-QPNJ] (providing statistics about police violence disproportionately affecting Black and Brown people); Cook, *supra* note 161, at 1577; *see also* Tracey Maclin, *Race and the Fourth Amendment*, 51 VAND. L. REV. 333, 340 (1998) (examining the relationship between race and pretextual traffic stops).

¹⁹¹ *Terry v. Ohio*, 392 U.S. 1, 14–15.

¹⁹² *See, e.g.*, Henry F. Fradella, Weston J. Morrow & Michael D. White, *An Empirical Analysis of the Racial/Ethnic and Sex Differences in NYPD Stop-and-Frisk Practices*, 21 NEV. L.J. 1151, 1152 (2021) (“[Courts have] expanded law enforcement authority to conduct stops beyond the limited circumstances set forth in the *Terry* decision.”); Lauryn P. Gouldin, *Redefining Reasonable Seizures*, 93 DENV. L. REV. 53, 61 (2015) (“Decisions issued by the Supreme Court since 2000 have broadly expanded the government's power to seize people.”).

¹⁹³ *See Harris, Factors, supra* note 143, at 660 (explaining that *Terry*'s progeny “gradually required less and less evidence for a stop and frisk”); Gouldin, *supra* note 192, at 72–73 (describing post-*Terry* cases which lower the bar of what is required to establish reasonable suspicion).

¹⁹⁴ *See* Lewis R. Katz, *Terry v. Ohio at Thirty-Five: A Revisionist View*, 74 MISS. L.J. 423, 462 (2004) (arguing post-*Terry* “Supreme Court decisions ... [have] eliminate[d] very coercive police encounters from the scope of the Fourth Amendment guarantee of reasonableness, freeing the police on those occasions from all judicial oversight”); *id.* at 463–83 (tracing cases that narrow the scope of a *Terry* seizure); *see also* *United States v. Mendenhall*, 446 U.S. 544, 554 (1980) (holding that a seizure occurs “only if . . . a reasonable person would have believed that he was not free to leave” and finding that *Mendenhall* was not seized when she was approached at an airport by federal agents who questioned her and asked for her credentials); *California v. Hodari D.*, 499 U.S. 621, 625–26 (1991) (holding that, in the absence of an application of force, a seizure requires both a show of authority by police and submission to that authority); *Torres v. Madrid*, 141 S. Ct. 989, 998–99 (2021) (finding that a seizure by force requires application of force and intent to restrain and emphasizing that not “every physical contact between a government employee and a member of the public [will transform] into a Fourth Amendment seizure”).

conduct will transform an investigatory seizure into an arrest requiring probable cause.¹⁹⁵ It increased the number of end-arounds that will cleanse the taint of an unlawful stop.¹⁹⁶ It expanded the areas that police may search in a *Terry* frisk beyond a person's outer clothing.¹⁹⁷ It has repeatedly undermined the requirement that suspicion be particularized as to a person.¹⁹⁸

Two lines of case law are particularly salient to understanding how reliance on ShotSpotter to establish reasonable suspicion has the potential to contribute to additional erosion of the doctrine and enabling of police intrusions. The first, because courts have likened ShotSpotter to a high-tech police tip, is the Court's anonymous tip jurisprudence. The second, because ShotSpotter is by definition deployed in so-called high crime areas, is its "high crime area" jurisprudence.

1. Anonymous Tips

The reasonable suspicion standard at least originally required officers to point to their own observations on the street to justify a stop.¹⁹⁹ This assured—to at least some degree—that a stop was based on reliable information.²⁰⁰ But in the decades since *Terry* was decided, this requirement has gone by the wayside. The Court has since permitted reasonable suspicion to rely on third-party information relayed to police, including anonymous tips.²⁰¹

The Court has stated that information from an anonymous tip can only

¹⁹⁵ *United States v. Sharpe*, 470 U.S. 675, 687–88 (1985).

¹⁹⁶ *Utah v. Strieff*, 579 U.S. 232, 242 (finding that officer's discovery of an open arrest warrant absolves an otherwise unlawful stop); *see also* *Cook*, *supra* note 161, at 1587 (describing *Strieff* as "a case that provides law enforcement with a pathway to evade a constitutional responsibility").

¹⁹⁷ *Michigan v. Long*, 463 U.S. 1032, 1033 (1983) (holding that a *Terry* frisk may extend to the passenger compartment of a vehicle).

¹⁹⁸ *See, e.g.,* *Mich. Dept. of State Police v. Sitz*, 496 U.S. 444, 447 (1990) (finding that a Michigan sobriety checkpoint program under which all vehicles that passed a checkpoint were stopped for a intoxication examination did not violate the Fourth Amendment); *Delaware v. Prouse*, 440 U.S. 648, 663 (1979) (suggesting that "roadblock-type stops" of "all oncoming traffic" to check drivers' licenses and registration would be consistent with the Fourth Amendment); *see also* *Katz*, *supra* note 194, at 493 (asserting that the Supreme Court has sent a "clear message" that "in 'high crime' . . . areas, i.e. the inner city, the possibility of criminal activity is so substantial as to make everyone in the area subject to police inquiry").

¹⁹⁹ *Terry v. Ohio*, 392 U.S. 1, 21 (1968).

²⁰⁰ *See* *Jones v. United States*, 362 U.S. 257, 270 (1960) (explaining that while personal observations may be more "judicially competent or persuasive," hearsay information may establish the probable cause required for a warrant to issue), *overruled on other grounds by* *United States v. Salvucci*, 448 U.S. 83 (1980).

²⁰¹ *Alabama v. White*, 496 U.S. 325, 332 (1990).

support reasonable suspicion if reliable.²⁰² But its decisions are contrary to its words. In 1990 in *Alabama v. White*,²⁰³ the Court found an anonymous tip sufficiently reliable to establish reasonable suspicion because, it reasoned, the tip contained detail that demonstrated “special familiarity” with the suspect²⁰⁴ and the tip’s prediction of the suspect’s future conduct gave officers the ability to corroborate the provided details.²⁰⁵

The Court’s reasoning was dubious: The officers could not corroborate some parts of the tip and their observations contradicted other parts.²⁰⁶ Additionally, as the dissent highlighted, much of the provided information was readily knowable, undermining the majority’s position that the tipster had “inside information” about the suspect.²⁰⁷

Since *White* was decided, the anonymous tip doctrine has been stretched to near meaninglessness.²⁰⁸ By 2014, in *Navarette v. California*, the Court upheld a *Terry* stop based on a tip lacking even the bare indicia of reliability present in *White*.²⁰⁹ In *Navarette*, an anonymous 911 caller reported that a vehicle had run her off the road.²¹⁰ She identified the vehicle’s direction of travel and the highway it was traveling on, various of the vehicle’s characteristics, and its license plate number.²¹¹ Police found the vehicle, but did not witness any suspicious activity in five minutes of observation. They conducted a traffic stop nonetheless, discovered marijuana, and arrested the Navarettes.²¹²

Justice Thomas, writing for the majority, reasoned that the tip was sufficiently reliable because it established suspicion of drunk driving,²¹³ the caller had eyewitness knowledge of the event,²¹⁴ the caller reported the incident soon after it occurred,²¹⁵ and the tipster’s 911 call demonstrated her

²⁰² *Id.* at 328 (“[A]n informant’s ‘veracity,’ ‘reliability,’ and ‘basis of knowledge’ – remain ‘highly relevant in determining the value of his report.’” (citation omitted)).

²⁰³ *Id.* at 328, 331–32.

²⁰⁴ *Id.* at 330 (“Reasonable suspicion, like probable cause, is dependent upon both the content of information possessed by police and its degree of reliability.”).

²⁰⁵ *Id.* at 330.

²⁰⁶ *Id.* at 327, 331–32.

²⁰⁷ *Id.* at 338 (Stevens, J., dissenting); *id.* at 332. It is also easy to lie about eyewitness observation; eyewitness observation only adds to reliability when external indicators of reliability exist. Grossman, *supra* note 168, at 362–63.

²⁰⁸ See Fagan, *supra* note 177, at 55 (“[T]he Court largely abandoned the reliability doctrine.”).

²⁰⁹ *Navarette v. California*, 572 U.S. 393 (2014). See also Grossman, *supra* note 168, at 349 (“[T]he Court largely abandoned the requirement that . . . reliability be meaningful.”).

²¹⁰ *Navarette*, 572 U.S. at 395.

²¹¹ *Id.* at 395, 399.

²¹² *Id.* at 395–96, 403; *id.* at 411–412 (Scalia, J., dissenting).

²¹³ *Id.* at 401–402.

²¹⁴ *Id.* at 399.

²¹⁵ *Id.* at 399–400.

veracity because 911 calls may be traceable.²¹⁶

Again, the majority's reasoning was strained.²¹⁷ The majority opinion skates around the first prong of reasonable suspicion requiring particularized suspicion of criminal activity. Arguably, the tip only suggested a single non-criminal move rather than criminal activity.²¹⁸ On top of that, it only provided publicly observable characteristics rather than predictive detail of future activities demonstrative of true familiarity with the suspect.²¹⁹ The caller had sufficient time after the event to exaggerate or falsify her claims.²²⁰ And, as the dissent pointed out, the majority failed to recognize that the traceability of 911 calls only adds to reliability if a caller is aware of this fact.²²¹

In each of the successive cases discussed in detail—from *Terry*, to *White*, to *Navarette*—the Court continually undermined protections against unreasonable police intrusions. Where the anonymous tip reliability framework stands today is that very little information in an anonymous tip will satisfy reasonable suspicion.²²²

2. High Crime Areas

The requirement that reasonable suspicion be supported by suspicion of criminal activity *and* of a particular person engaged in that activity have both

²¹⁶ *Id.* at 400–01.

²¹⁷ In dissent, Justice Scalia mocked it as a “freedom-destroying cocktail consisting of . . . patent falsity . . .” *Id.* at 413 (Scalia, J., dissenting); *see also* Grossman, *supra* note 168, at 359 (arguing that none of the factors considered by the *Navarette* majority “when applied to the facts of *Navarette*, make out a convincing case for the presence of the type of reliability required to constitute reasonable suspicion for Fourth Amendment purposes”); WAYNE R. LAFAVE, SEARCH AND SEIZURE: A TREATISE ON THE FOURTH AMENDMENT § 9.5(i) (6th ed. 2021) (describing aspects of the *Navarette* majority’s reliability analysis as “weak” and “open to serious question”); Gouldin, *supra* note 192, at 96 (“By basing that claim of reasonable suspicion on an anonymous tip that the officers could not confirm, the [*Navarette*] majority significantly broadened the definition of reasonable suspicion.”).

²¹⁸ *Navarette*, 572 U.S. at 409–10 (Scalia, J., dissenting).

²¹⁹ *Id.* at 406–07 (Scalia, J., dissenting).

²²⁰ *Id.* at 408 (Scalia, J., dissenting).

²²¹ *Id.* at 409 (Scalia, J., dissenting); *see also* LaFave, *supra* note 217, at § 9.5(i) (describing the *Navarette* majority’s analysis with respect to the traceability of the 911 call as “at best, weak”). The majority additionally pointed to the purported dangerousness of the alleged conduct, even though dangerousness has no direct relationship to reliability. *Navarette*, 572 U.S. at 402–03.

²²² *See* Gouldin, *supra* note 192, at 72–73 (“After *Navarette*, not much is required to make an anonymous tip reliable enough to justify [a stop].”); *Navarette*, 572 U.S. at 413–14 (Scalia, J., dissenting) (“All the malevolent 911 caller need do is assert a traffic violation, and the targeted car will be stopped, forcibly if necessary, by the police . . . all of us on the road . . . are at risk of having our freedom of movement curtailed on suspicion of drunkenness, based upon a phone tip, true or false, of a single instance of careless driving.”).

been undermined by the Court’s high crime area doctrine.²²³ With respect to establishing individualized suspicion, many courts have found that a person’s temporal and physical proximity to criminal activity will suffice, even when officers have neither a description of a suspect nor any specific information connecting a person to a suspected crime.²²⁴

In *Illinois v. Wardlow*,²²⁵ the Court held that in determining whether a stop is justified, police officers may take into account the “relevant characteristics of a location,” including whether it is a “high crime area” as well as a suspect’s unprovoked flight.²²⁶ *Wardlow*’s legacy is that two people engaging in identical conduct, one in a “high crime area” and one not, enjoy different degrees of protection under the Fourth Amendment.²²⁷ Even worse, police have equated “high crime” areas with Black and Brown areas²²⁸ and *Wardlow* has resulted in disproportionately more stops and frisks of Black and Brown people than of members of non-marginalized communities.²²⁹

Since *Wardlow* was decided, “high crime area” has taken on talismanic significance. When invoked, the phrase will nearly always be found to justify a stop-and-frisk, with courts routinely upholding stops based on little more than a suspect’s presence in an alleged high crime area,²³⁰ thus incentivizing police to make that claim.²³¹

²²³ See LAFAYE, *supra* note 217, at § 9.5(c) (describing the emergence of the view that *Terry* requires only generalized suspicion of criminality rather than particularized suspicion of a specific crime); Margaret Anne Hoehl, Note, *Usual Suspects Beware: “Walk, Don’t Run” Through Dangerous Neighborhoods*, 35 U. RICH. L. REV. 111, 137 (2001) (“*Wardlow* ultimately represents yet another step away from the basic, underlying principles of *Terry*, for it essentially obliterates any meaningful standard by which individualized suspicion may be judged.”).

²²⁴ See *United States v. Funderburk*, No. 2017 CF2 21521, 2018 D.C. Super. LEXIS 14, *11–12 (“[A]n individual’s temporal and geographic proximity to the commission of a crime . . . justifies an investigatory stop . . .”), *aff’d*, 260 A.3d 652 (D.C. 2021).

²²⁵ *Illinois v. Wardlow*, 528 U.S. 119 (2000).

²²⁶ *Id.* at 124.

²²⁷ *Id.* at 124; see also Andrew Guthrie Ferguson & Damien Bernache, *The “High-Crime Area” Question: Requiring Verifiable and Quantifiable Evidence for Fourth Amendment Reasonable Suspicion Analysis*, 57 AM. UNIV. L. REV. 1587, 1589 (2008).

²²⁸ See Katz, *supra* note 194, at 480–81 (“Location in America, in this context, is a proxy for race or ethnicity. By sanctioning investigative stops on little more than the area in which the stop takes place, the phrase ‘high crime area’ has the effect of criminalizing race.”).

²²⁹ *Id.*; see also Ben Grunwald & Jeffrey Fagan, *The End of Intuition-Based High-Crime Areas*, 107 CALIF. L. REV. 345, 387 (2019) (“[W]e find that [NYPD] officers are more likely to invoke HCA [high crime area] against young Black male suspects.”).

²³⁰ Katz, *supra* note 194, at 493.

²³¹ See, e.g., U.S. DEP’T OF JUST., CIV. RTS. DIV., *supra* note 184, at 25–29, 31; Grunwald & Fagan, *supra* note 229, at 383 (“[NYPD] officers invoke HCA quite frequently—in 59 percent of all stops—more often than any other basis of reasonable suspicion . . .”). Empirical data suggests that officers claim *post hoc* that an area is high crime in order to justify “weak” stops where reasonable suspicion is lacking. *Id.* at 396. Data

III. SHOTSPOTTER AND REASONABLE SUSPICION

While ShotSpotter's surveillance capabilities have been critically examined,²³² ShotSpotter's potential to exacerbate already significant erosion of reasonable suspicion doctrine remains underexplored. This Part considers this issue.

A. Reliability of the Tech-Tipster

Courts have begun treating ShotSpotter alerts as high-tech anonymous tips.²³³ ShotSpotter, however, worsens the impact of the poorly-reasoned anonymous tip doctrine because the tech-tipster's²³⁴—i.e., ShotSpotter's—reliability cannot be evaluated the same way as a traditional tipster's. Courts could use a more suitable framework for assessing ShotSpotter's reliability to at least determine whether ShotSpotter alerts reliably establish that a crime has occurred. But, because they do not identify an actor, even this would not resolve a second issue—that ShotSpotter alerts undermine the individualized suspicion prong.

1. The Anonymous Tip Reliability Factors

Whatever protections against police intrusions the anonymous tip reliability framework continues to afford are further limited when applied to ShotSpotter. Some of the factors the Court has used to analyze the reliability of tips no longer make sense in the context of a tech-tipster; those that do apply reveal that permitting ShotSpotter alerts on their own to justify even a

also suggest that police officers describe nearly all blocks as high crime, police officer determinations of high crime areas “are only weakly correlated with actual crime rates” and suspect *race* is as good a predictor of whether an officer claims an area is high in crime as the *actual* crime rate. *Id.*

²³² See POLICING PROJECT AUDIT, *supra* note 24; Guariglia, *supra* note 153 (arguing that ShotSpotter's recording capability presents a “civil liberties concern”); Gecas, *supra* note 62, at 1088–96 (applying Fourth Amendment reasonable expectation of privacy analysis to ShotSpotter's surveillance capabilities).

²³³ *E.g.*, United States v. Rickmon, 952 F.3d 876, 882 (“[W]hat Officer Ellefritz ends up with is an anonymous tip from ShotSpotter that the 911 calls then independently confirmed.”); State v. Bellamy, No. A–2978–16T2, 2018 N.J. Super. Unpub. LEXIS 1363, at *9 (2018) (*per curiam*).

²³⁴ This Article uses “tech-tipster” to refer to technology-based information provided to or received by police containing information about potential criminal activity that replaces a human tipster. The tech-tipster also replaces or supplements officers' traditional, personal observation-based assessments of whether crime is occurring. This Article focuses on ShotSpotter as the tech-tipster, but a tech-tipster can be any form of technology that provides an informational tip.

temporary intrusion undermines even already-lessened Fourth Amendment protections.

As a baseline, ShotSpotter alerts never provide particularized suspicion of a *suspect*; they provide information only about likely criminal *conduct*.²³⁵ Reliance on ShotSpotter alerts without more to justify stops thus undermines the requirement that reasonable suspicion be particularized to a person.

Additionally, ShotSpotter never provides the type of information most typically pointed to by courts to find an anonymous tip sufficiently reliable to support reasonable suspicion – predictive information indicative of personal knowledge or insider information.²³⁶ An officer cannot know whether a specific ShotSpotter alert correctly identifies gunfire.²³⁷ In the traditional tipster context, the question of whether a tip truly indicates criminal activity is dealt with by requiring provision of some predictive detail that demonstrates the tipster’s familiarity with a subject that police can corroborate through observation.²³⁸ ShotSpotter, however, is backwards looking; it never provides predictive information about a suspect. Unless officers arrive in the vicinity of an alert and observe evidence of shooting activity, which, as mentioned, is a rarity,²³⁹ ShotSpotter alerts will never contain the type of information that police can verify typically required of traditional anonymous tips.

It is true that a traditional 911 caller reporting the sounds of gunshots might also fail to provide predictive information or point out a suspect. But, according to the Court, using the 911 system adds some reliability because a 911 call is traceable and once tracked down, the tipster can be prosecuted for

²³⁵ See *ShotSpotter’s Response to Associated Press Article*, *supra* note 120 (“ShotSpotter’s real-time alerts and forensic reports have never, will never, and technologically cannot identify shooters . . .”); cf. Andrew Guthrie Ferguson, *Predictive Policing and Reasonable Suspicion*, 62 EMORY L.J. 259, 305 (2012) (arguing analogously that another type of policing technology, predictive algorithms that seek to identify locations of particular crimes, “are no help in identifying particular persons suspected[,]” and “[t]hus, the core logic of the tip cases falls away”).

²³⁶ See, e.g., *Alabama v. White*, 496 U.S. 325, 332 (1990); *Navarette v. California*, 572 U.S. 393, 398–99 (2014). Other scholars have made this point in the context of different policing technologies to argue that the tip and informant cases have limited applicability for assessing whether such technologies generate reasonable suspicion. See Ferguson, *supra* note 235, at 305 (“[P]redictive policing includes no personal knowledge in its forecast of potential criminal activity. This is an important distinction that removes predictive policing from the reasoning of [the informant and tip cases], in that there is no ‘inside’ information that can help evaluate the reliability of the tip.”); Rich, *supra* note 60, at 911 (“ASAs claim no . . . inside information; rather, their ‘tips’ are based on an enormous amount of past data[,] . . . the ‘basis of knowledge’ analysis in the informant context provides no insight into how an ASA’s prediction should be incorporated into the individualized suspicion analysis.”).

²³⁷ See *supra* note 96 and accompanying text.

²³⁸ *White*, 496 U.S. at 332.

²³⁹ See *supra* notes 124–135 and accompanying text.

false reporting.²⁴⁰ The caller's veracity can also be tested by posing questions to the tipster under penalty of perjury, assessing their tone and demeanor, and by other traditional means. Knowing all this theoretically serves as a deterrent against making a false 911 report.²⁴¹ ShotSpotter's veracity, however, cannot be tested in those traditional ways.²⁴² First, there is no correlation between the ability to trace a ShotSpotter alert and the alert's reliability; traceability does not deter falsification as it might a human tipster. Second, traditional means of assessing truthfulness do not reveal the reliability of a tech-tipster because honesty does not correlate to reliability in the ShotSpotter context.

The remaining factors the Court has used to assess the reliability of anonymous tips are equally inapplicable to ShotSpotter. The closeness in time of a tip to an event, which in the traditional tipster context may suggest limited ability to falsify or exaggerate, has no relationship to reliability when applied to ShotSpotter. ShotSpotter is designed to detect and alert in near real-time and will always do so. While ShotSpotter may be incorrect, it cannot falsify or exaggerate the way a human tipster can, meaning lag time between an event and an alert does not necessarily imply inaccuracy.²⁴³ The best indicators of reliability, validation testing data and the error rates calculated in the validation process, are not required considerations in reasonable suspicion determinations involving anonymous tips or otherwise.

Finally, courts have held that reasonable suspicion may be established where a tip identifies an event that is particularly dangerous.²⁴⁴ But this is a

²⁴⁰ *Navarette*, 572 U.S. at 400–01.

²⁴¹ *Id.* at 401.

²⁴² See Andrea Roth, *Machine Testimony*, 126 YALE L.J. 1972, 1978 (2017) (“A machine’s output could be imprecise or ambiguous because of human error at the programming, input, or operation stage, or because of machine error due to degradation and environmental forces.”).

²⁴³ Cf. Rich, *supra* note 60, at 909 (“ASAs are not people with . . . the capacity for honesty and dishonesty. As such, a discussion of an ASA’s veracity is nonsensical.”). It is theoretically possible that the timing of human analysis of a ShotSpotter alert may relate to reliability if classification changes are made by the analyst prior to an alert being pushed to police or based on the ease or difficulty of classifying a sound. An easily-analyzed sound may result in police receiving an alert more quickly than they would otherwise and may also be more accurate. Difficult to classify sounds might take longer to analyze, and the delay between event and alert may correspond to a lower degree of reliability. But other factors unrelated to reliability, such as volume of cases and the number of analysts working at a given time, might also contribute to a delay between the event and alert. I did not identify any studies that currently address the relationship between the timing of ShotSpotter alerts and their reliability.

²⁴⁴ *E.g.*, *City of Indianapolis v. Edmond*, 531 U.S. 32, 44 (2000) (“[T]he Fourth Amendment would almost certainly permit an appropriately tailored roadblock set up to thwart an imminent terrorist attack or to catch a dangerous criminal who is likely to flee”); *United States v. Goodwin*, 449 F.3d 766, 769 (7th Cir. 2006) (“[I]f the crime being investigated is grave enough, the police can stop and frisk without as much suspicion

problematic precedent when transposed onto the ShotSpotter context. If assumed to be accurate, ShotSpotter alerts are, by definition, indicative of dangerous activity. Thus, courts can nearly always bypass a substantive reliability analysis and instead find reasonable suspicion based on ShotSpotter's indication that a gun crime may be occurring.²⁴⁵

Despite the inapplicability of the anonymous tip reliability framework to ShotSpotter, courts already treat alerts as anonymous tips and find that alerts coupled with little else is sufficient to establish reasonable suspicion.²⁴⁶

2. Evidentiary Reliability and Scientific Validity

Not only does the test for assessing the reliability of anonymous tips not fit ShotSpotter, but courts also fail to engage in the type of analysis that *could* reveal its reliability. In *Daubert v. Merrell Dow Pharmaceuticals*, the Court established a framework for assessing the reliability of scientific evidence²⁴⁷ that has since been incorporated into Federal Rule of Evidence 702 (“Rule 702”)²⁴⁸ and various corresponding state rules²⁴⁹ that govern the admissibility of scientific, technical, and specialized evidence at trials. Under that test, the key measure of ShotSpotter's reliability is whether it is scientifically valid.²⁵⁰

as would be required in a less serious criminal case”); *Navarette*, 572 U.S. at 401.

²⁴⁵ *State v. Carter*, 183 N.E.3d 611, 628–29 (Ohio Ct. App. 2022) (declining to reach the question of ShotSpotter's reliability and emphasizing that an alert of shots fired is “inherently dangerous”).

²⁴⁶ *See United States v. Rickmon*, 952 F.3d 876, 882–84 (7th Cir. 2020) (describing a ShotSpotter alert as an anonymous tip and finding reasonable suspicion where the alert was corroborated by 911 calls, but nothing besides physical and temporal proximity pointed to Rickmon).

²⁴⁷ *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 591–94 (1993). The Supreme Court later clarified that the test also applies to “technical” and “specialized” evidence. *See Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 147 (1999).

²⁴⁸ FED. R. EVID. 702.

²⁴⁹ *See Sinha*, *supra* note 89, at 82 (listing states that have adopted Rule 702 or a “substantially similar rule”).

²⁵⁰ *See Daubert*, 509 U.S. at 591 n.9 (explaining that evidentiary reliability equates to trustworthiness and that “[i]n a case involving scientific evidence, *evidentiary reliability* will be based upon *scientific validity*”). Because it has not been applied to ShotSpotter cases, exploration of another reliability framework that has been applied at the investigative phase—albeit to a probable cause, not reasonable suspicion determination—to drug detection dog sniffs is beyond the scope of this Article. But, one point of comparison is worth highlighting here. In *Florida v. Harris*, Justice Kagan wrote that a drug dog's performance in a controlled setting, such as in a training or certification program conducted by a “bona fide organization[,]” where ground truth is known, rather than its field performance, is most relevant to the reliability of a given drug alert. 568 U.S. 237, 245–47 (2013). For the reasons discussed previously, adequate pre-deployment performance data is not available in the ShotSpotter context. Thus, even if Justice Kagan's analysis were appropriate for application

But, Rule 702 and *Daubert* only govern the admissibility of such evidence at trials, not at pretrial suppression hearings, where the question of whether ShotSpotter alerts establish reasonable suspicion is typically raised.²⁵¹ ShotSpotter alerts are primarily used in the investigative phase, to identify crime, recover evidence, and justify stops and arrests.²⁵² ShotSpotter evidence may never be admitted at a trial,²⁵³ meaning, ShotSpotter's reliability can go without scrutiny through the entirety of a prosecution.²⁵⁴ In reasonable suspicion determinations, courts frequently assume ShotSpotter is reliable²⁵⁵ or engage in ad-hoc, uncritical analyses to conclude that ShotSpotter is reliable, but with little reasoning to back up that claim.²⁵⁶ For example, the Second Circuit found ShotSpotter was not unreliable based on speculative, inexperienced officer testimony that the system is "usually" accurate.²⁵⁷ Another court asserted with minimal analysis that ShotSpotter is "the equivalent of a reliable informant" and that it is "*objectively* more reliable than an anonymous report of gunfire[.]"²⁵⁸ Its conclusion was based solely on an officer's testimony that: (1) he "was familiar with the ShotSpotter system[;]" (2) ShotSpotter "identifies and pinpoints" gunfire; and (3) he had not responded to a ShotSpotter alert "that was proven

to ShotSpotter, ShotSpotter would likely not meet it—at least for purposes of establishing probable cause. *Id.* Further examination of the applicability of that test to ShotSpotter is left for future scholarship.

²⁵¹ FED. R. EVID. 104(a); FED. R. EVID. 1101.

²⁵² See *ShotSpotter Respond*, *supra* note 25.

²⁵³ Consider a typical scenario: police respond to a crime scene after receiving a ShotSpotter alert, encounter a man in the vicinity, and conduct a stop-and-frisk. They find contraband, and arrest and charge him with its possession. He moves to suppress the evidence, arguing that his stop-and-frisk was not justified by reasonable suspicion in part because the ShotSpotter alert did not reliably indicate that a crime had occurred. The court finds that reasonable suspicion justified the stop and declines to conduct a reliability evaluation because Rule 702 does not apply at the suppression hearing. See, e.g., *State v. Carter*, 183 N.E.3d 611, 628–29 (Ohio Ct. App. 2022) (finding that there was reasonable suspicion to stop Carter and declining to reach the question of ShotSpotter's reliability). At the trial on the possession charge, the prosecution does not seek to admit evidence relating to the ShotSpotter alert because its best evidence is the contraband itself and ShotSpotter's reliability goes unexamined throughout the life of the case.

²⁵⁴ For an assessment of why Rule 702 and *Daubert*'s inapplicability to non-trial settings can be problematic, see generally *Sinha*, *supra* note 89. This is not to suggest that incorporating *Daubert*-like rules at pre-trial suppression hearings would be an adequate solution to the problems described here. *Daubert* has been rightly critiqued for being ineffective at filtering out unreliable evidence at the trial phase. See *id.* at 81.

²⁵⁵ See *State v. Bellamy*, No. A–2978–16T2, 2018 N.J. Super. Unpub. LEXIS 1363, at *8–9 (2018) (per curiam) (finding ShotSpotter to be "objectively more reliable" than an anonymous tipster).

²⁵⁶ *Id.*

²⁵⁷ *United States v. Hawkins*, 37 F.4th 854, 858 (2d Cir. 2022).

²⁵⁸ *Bellamy*, 2018 N.J. Super. Unpub. LEXIS 1363, at *8–9 (emphasis added).

inaccurate.”²⁵⁹ As described earlier, such testimony cannot establish ShotSpotter’s accuracy.²⁶⁰ Such uncritical approaches for assessing reliability of ShotSpotter in reasonable suspicion determinations fail to protect citizens from searches and seizures based on untrustworthy information.²⁶¹

B. *Expanded Suspicion and Its Consequences*

ShotSpotter alerts expand the reach of *Terry* suspicion in additional distinct ways. This has troubling secondary consequences, particularly for Black, Brown, and other marginalized populations most impacted by stop-and-frisk policing.

1. Expanded Suspicion

Because courts have assumed ShotSpotter to be accurate and indicative of dangerous activity,²⁶² they frequently treat alerts as justifying intrusions beyond what is consistent with the Fourth Amendment, even without particularized suspicion that a specific person is engaged in criminal activity. Indeed, that is precisely what then-Chief Judge Diane Wood of the Seventh Circuit accused her colleagues in the majority of doing in *Rickmon*.²⁶³

Because the system’s validity is unknown, ShotSpotter alerts also dilute the requirement that reasonable suspicion be premised on suspicion of actual criminal activity. ShotSpotter can misclassify non-gunfire as gunfire, meaning, a ShotSpotter alert does not always equate to criminal activity. But courts are likely to treat it as doing so nonetheless. The continued crediting of alerts that may not signal crime has two consequences. By permitting police to conduct stop-and-frisks under circumstances in which crime may

²⁵⁹ *Id.* It is unlikely that the officer actually knew whether previous alerts he had responded to were accurate or not because of the ground truth problem. *See supra* note 96 and accompanying text.

²⁶⁰ *See supra* notes 90–96 and accompanying text.

²⁶¹ *United States v. Jones*, 1 F.4th 50, 52–54 (D.C. Cir. 2021) (finding a ShotSpotter alert contributed to reasonable suspicion without analyzing reliability). Some courts have at least acknowledged that ShotSpotter’s reliability is an open question. *United States v. Rickmon*, 952 F.3d 876, 880 n.2 (7th Cir. 2020) (declining to reach the question of ShotSpotter’s reliability); *State v. Carter*, 183 N.E.3d 611, 628 (Ohio Ct. App. 2022) (declining to reach the question of ShotSpotter’s reliability).

²⁶² *E.g.*, *Carter*, 183 N.E.3d at 628–29; *Rickmon*, 952 F.3d at 883.

²⁶³ *See Rickmon*, 952 F.3d at 886 (Wood, C.J., dissenting) (arguing that police had insufficient individualized suspicion of the appellant to justify a stop); *see also id.* at 887 (Wood, C.J., dissenting) (complaining that Seventh Circuit’s finding of reasonable suspicion was based on the belief that “compliance with the Fourth Amendment here might have allowed a culpable person to avoid being arrested”).

not be occurring, courts entrench and normalize a watered-down application of the reasonable suspicion standard that permits police to stop nearly anyone proximate to an alert.²⁶⁴ On top of that, by uncritically treating ShotSpotter alerts as reliable, they add to the veil of certainty that already cloaks high-tech evidence.²⁶⁵

Second, ShotSpotter further unmoors the reasonable suspicion standard from the individualized suspicion requirement. Again, in high crime areas, this requirement is already less rigid than in non-high crime areas.²⁶⁶ Even assuming it is accurate, a ShotSpotter alert only indicates potential criminal activity and where that activity may have taken place. It does not indicate who is responsible for the alert, nor who was present at the time of the alert, as opposed to who is present when police arrive in response.²⁶⁷ Consequently, police have considerable leeway to stop anyone around the site of an alert. Proximity to an alert—both temporal and physical—takes the place of true individualized suspicion,²⁶⁸ cementing treatment of the individualized suspicion prong as a less-than-mandatory component of the standard.

The fact that courts treat proximity to an alert as a proxy for individualized suspicion tacitly enables police conduct that veers towards dragnet sweeps plainly inconsistent with the Fourth Amendment.²⁶⁹ Courts thus effectively give police a free pass to stop nearly anyone in the area of an alert, for nearly any purpose.²⁷⁰ Thus, for anyone in the area of a ShotSpotter alert, *Terry*'s original protections, lessened as they were, barely exist. As described in the opening vignettes to this Article,²⁷¹ the consequences are often suffered by those who have nothing to do with the ShotSpotter alert that prompted the police response.²⁷²

²⁶⁴ Cf. Andrew Guthrie Ferguson, *Crime Mapping and the Fourth Amendment: Redrawing "High-Crime Areas,"* 63 HASTINGS L.J. 179, 198 (2011) (arguing that a high crime area designation is often dispositive in finding reasonable suspicion); L. Song Richardson, *Race & Immigration Symposium: Cognitive Bias, Police Character, and the Fourth Amendment*, 44 ARIZ. ST. L.J. 267, 279 (2012) (arguing that designating an area as "high crime" is almost always dispositive of reasonable suspicion and rarely requires empirical evidence). See also *supra* notes 227–230 and accompanying text.

²⁶⁵ See *supra* note 89.

²⁶⁶ *Illinois v. Wardlow*, 528 U.S. 119, 124 (2000); Katz, *supra* note 194, at 493.

²⁶⁷ See *ShotSpotter's Response to Associated Press Article*, *supra* note 120.

²⁶⁸ See *Rickmon*, 952 F.3d at 886 (Wood, C.J., dissenting) (disagreeing with majority's finding of reasonable suspicion based in part on a ShotSpotter alert because "[t]he only thing that distinguished the car [the officer] chose to stop was that it existed, and it was the only car on the street at that early hour of the morning. None of the information he had received even hinted at the shooter's car's make, color, age, style, or anything else.>").

²⁶⁹ *Ybarra v. Illinois*, 444 U.S. 85, 91 (1979).

²⁷⁰ See *Rickmon*, 952 F.3d at 886 (Wood, C.J., dissenting).

²⁷¹ *Supra* notes 1–16; CHICAGO OIG REPORT, *supra* note 1, at 18–19.

²⁷² See *supra* notes 1–16 and accompanying text; MACARTHUR JUST. CTR., *supra* note

These problems are amplified in the context of alleged high crime areas. As courts have effectively declared, mere presence in such areas, even absent particularized suspicion of any specific criminal activity, with very little more information will nearly always be found to constitute reasonable suspicion.²⁷³ ShotSpotter compounds this problem. ShotSpotter is allegedly installed based on the volume of gun crime known to occur in the area,²⁷⁴ i.e., in areas where (1) citizens already enjoy lesser privacy protections under the Fourth Amendment based on their location and (2) location, on its own, will get police almost the entire way to reasonable suspicion.²⁷⁵ Adding a ShotSpotter alert to that baseline will almost certainly provide police with the thin addition of evidence needed to establish reasonable suspicion for stop-and-frisks in high crime areas.²⁷⁶

ShotSpotter also moves reasonable suspicion doctrine away from its alleged mooring in deference to police officer judgment and ability to test that judgment in later proceedings²⁷⁷ because ShotSpotter makes the threshold determination of whether criminal activity is occurring for the officer. Even though blind deference to police officer judgment is much criticized,²⁷⁸ this is a step in the wrong direction. ShotSpotter alerts cannot be tested through cross-examination or other traditional means.²⁷⁹ And, because an officer cannot know if any particular alert is accurate,²⁸⁰ ShotSpotter effectively becomes a black box that is presumed reliable.²⁸¹ Certainly, the critics of *Terry*'s over-deference to police judgment do not seek a substitute that is worse at judging crime than an officer or that cannot be evaluated meaningfully.

²⁷³ See *supra* note 264.

²⁷⁴ *ShotSpotter Responds to False Claims*, *supra* note 73.

²⁷⁵ See Ferguson & Bernache, *supra* note 227, at 1589; Ferguson, *supra* note 264, at 198.

²⁷⁶ Indeed, courts have found reasonable suspicion to exist in so-called high crime areas where ShotSpotter is cited as a justification. *United States v. Rickmon*, 952 F.3d 876, 884 (7th Cir. 2020) (finding reasonable suspicion in part because of “officer’s experience with gun violence in the area”); *State v. Bellamy*, 2018 N.J. Super. Unpub. LEXIS 1363, *6–7 (2018).

²⁷⁷ *Terry v. Ohio*, 392 U.S. 1, 21–22 (1968).

²⁷⁸ L. Song Richardson, *Police Efficiency and the Fourth Amendment*, 87 IND. L.J. 1143, 1157 (2012) (arguing that courts give too much deference to police in assessing reasonable suspicion); Harris, *Frisking*, *supra* note 180, at 5; see also I. Bennett Capers, *Crime, Legitimacy, and Testilying*, 83 IND. L.J. 835, 866 (2008) (“[O]fficers know they can misrepresent their motives for conducting stops without consequences.”).

²⁷⁹ See Roth, *supra* note 242, at 1978.

²⁸⁰ See Maye, *supra* note 95; Carr & Doleac, *supra* note 96, at 5.

²⁸¹ Roth, *supra* note 242, at 1977–78 (describing “black box dangers that could lead a fact-finder to draw the wrong inference from information conveyed by a machine source” and the ways in which built-in flaws can cause a machine to “utter a falsehood by design”) (internal quotations omitted).

2. Secondary Consequences

ShotSpotter has potential to extend *Terry*'s legacy in troubling secondary ways too. *Terry* is often credited with opening the door to over-policing in Black and Brown neighborhoods and the harassment and violence that frequently comes with it.²⁸² ShotSpotter adds to the problem in two ways. One, ShotSpotter alerts occur primarily or exclusively in the very neighborhoods that already experience over-policing.²⁸³ ShotSpotter alerts bring still more police to such neighborhoods, adding to existing tensions and fueling the cycle of over-policing.²⁸⁴

In addition, police use the fact that ShotSpotter alerts generally occur in certain areas (or their belief that alerts generally occur in such areas) to justify stop-and-frisks, even when they are not responding to an alert in the moment.²⁸⁵ This reliance on ShotSpotter alerts stretches the original contours of reasonable suspicion even further than they have been stretched already. It arms police with a justification not only to stop people proximate to a *recent alert*, but also to stop those proximate to an *aggregate set of alerts* covering a larger geography than a single alert that occurred at a precise time and location.²⁸⁶ More simply, police use the occurrence of ShotSpotter alerts in a particular area in the past to justify stop-and-frisk policing in the present. In areas where ShotSpotter is deployed, this can lead to even more stops and frisks—whether or not related to gun crime—that courts are likely to deem lawful.²⁸⁷

²⁸² See, e.g., Harris, *Factors*, *supra* note 143, at 677 (arguing that *Terry* allowed increased use of stop-and-frisk practices disproportionately against minorities who often live in areas that may easily be designated as high crime); U.S. DEP'T OF JUST., CIV. RTS. DIV., *supra* note 184, at 25–29.

²⁸³ See *supra* notes 144–149.

²⁸⁴ See Maye, *supra* note 95 (presenting the MacArthur Justice Center's view that "when ShotSpotter is deployed in [Black and Brown] neighborhoods, it's generating statistics about supposed gunfire only in those neighborhoods. And because there's no reason to believe that ShotSpotter's false positive rate is particularly good, the system is inflating the number of gunshots detected in those districts as opposed to elsewhere. That can skew the way that police deploy their resources: police have stats about the supposed number of gunshots in ShotSpotter neighborhoods that look much higher than other neighborhoods, but that's just because ShotSpotter is installed there."); MAMMINO, *supra* note 103, at 3 ("[ShotSpotter] can also create a circular justification for the continued policing of [Black and Brown] communities, as alerts from ShotSpotter produce (false) data that reinforces the decision to conduct surveillance in the locations where cities place ShotSpotter.").

²⁸⁵ CHICAGO OIG REPORT *supra* note 1, at 19–22.

²⁸⁶ See *id.*

²⁸⁷ See Joh, *supra* note 62, at 531 (suggesting that police use of aggregate ShotSpotter alerts to justify stops is likely to be deemed by courts as supporting reasonable suspicion even without empirical support).

IV. PRELIMINARY SOLUTIONS

There are no simple solutions to the problems outlined here. This Article lays out concrete reasons to believe that use of ShotSpotter, like other carceral technologies, does more harm to communities than good²⁸⁸ and thus, as I have argued elsewhere, should be abandoned entirely.²⁸⁹ But given its widespread use, complete abandonment of ShotSpotter seems unattainable in the near future.²⁹⁰ Accordingly, the ideas presented here, both doctrinal and non-doctrinal legal strategies, seek to alleviate those harms and empower the communities affected by ShotSpotter to have substantive input on the technology, while limiting its use.²⁹¹ I recognize that legal reforms have potential to entrench carceral harm by legitimizing it,²⁹² but I adopt the position that legal interventions can support more radical goals.²⁹³ This Part, thus, offers potential non-reformist pathways for achieving those goals until use of ShotSpotter can be eliminated altogether. The ideas are not meant to be comprehensive or exhaustive; rather, they are intended as a starting point for minimizing harms resulting from police reliance on ShotSpotter, elevating the input of communities impacted by the technology, and slowing the erosion of Fourth Amendment search and seizure protections caused by the system.

A. *Correcting What Current Reasonable Suspicion Doctrine Cannot*

In response to the erosion of search and seizure protections and the consistent harassment and violence suffered by marginalized communities at

²⁸⁸ See *supra* Parts I.B., III.

²⁸⁹ Maneka Sinha, *Radically Reimagining Forensic Evidence*, 73 ALA. L. REV. 879, 940 (2022). See generally *id.* for an analysis of how policing technologies entrench and exacerbate carceral harms and a framework for non-reformist reform that acknowledges this.

²⁹⁰ Cf. LEE, MUSA & PINARD, *supra* note 89, at 63 (making recommendations for governance of policing technologies because “it is clear that these technologies are being considered or have been implemented in cities and towns across the country”).

²⁹¹ See Sinha, *supra* note 289, at 939 (“[N]on-reformist forensic reform efforts should seek the elimination, or, at minimum, alleviation of the harms caused by the use of forensics to facilitate carceral functions.”).

²⁹² *Id.* at 889.

²⁹³ See MARIAME KABA & ANDREA J. RITCHIE, NO MORE POLICE: A CASE FOR ABOLITION 138 (2022) (emphasizing that traditional legal strategies can be a part of radical solutions); Southerland, *supra* note 40, at 69 (explaining that applying an abolitionist ethos to non-abolitionist laws can “allow[] advocates to make use of the things the law provides—like transparency and an avenue for narrowing or stopping technologies—in conjunction with broader efforts outside the law to shrink the role of police technologies and law enforcement’s access to them”). For a thoughtful case study on how ostensibly reformist legal interventions can be applied towards abolitionist goals, see *supra* notes 66–80.

the hands of police, often in the aftermath of street encounters that implicate the Fourth Amendment, many have advocated for abandonment of the reasonable suspicion standard altogether.²⁹⁴ Given the dilution of Fourth Amendment doctrine before and after *Terry*, however, this seems unlikely to be achieved through a jurisprudential shift.²⁹⁵

Courts can, however, begin to account for the broader context that Black and Brown people are disproportionately impacted by policing that pushes the limits of the Fourth Amendment. Courts can decline to give weight to facts likely to disproportionately impose suspicion on members of those communities – for example, claims that an area is “high crime,” a person’s supposed flight, or the existence of an open traffic warrant unknown to police before a stop.²⁹⁶ Indeed, given widespread abuse by police of the doctrine, courts might also treat such facts as affirmatively exculpatory in assessing the totality of circumstances.²⁹⁷ But the reasonable suspicion doctrine has thus far survived such criticisms, making such a solution appear equally unrealistic any time soon.

A third option is to shift the inquiry of the existing doctrinal framework. The totality of circumstances approach to evaluating reasonable suspicion traditionally focuses on the facts as observed and perceived by the officer.²⁹⁸ L. Song Richardson has encouraged a shift away from away from a “fact-centered” approach towards an “officer-centric” approach.²⁹⁹ Richardson suggests that, in addition to the facts articulated by an officer as grounds for a stop, an officer’s efficiency in judging criminality should also be considered in the evaluation.³⁰⁰ She argues that whether an officer is actually effective in identifying crime is relevant to determining whether reasonable suspicion exists. If an officer routinely turns up no evidence of a crime following a stop, that is relevant to whether any given stop by the same officer should be deemed justified.³⁰¹

²⁹⁴ See, e.g., Harris, *Factors*, *supra* note 143, at 682 (asserting that a “return to pre-*Terry* law for all searches and seizures” would be “the cleanest solution” to such problems).

²⁹⁵ *Id.* at 683–84.

²⁹⁶ *Utah v. Strieff*, 579 U.S. 232, 254 (2016) (Sotomayor, J., dissenting) (arguing that people of color are disproportionately subjected to unjustified “suspicionless stop[s]” and including in this category the stop at issue).

²⁹⁷ See, e.g., FERGUSON, *supra* note 58 at 392 (arguing that exculpatory information should be given equal weight in reasonable suspicion analysis); *Wilder v. Turner*, 490 F.3d 810, 814 (10th Cir. 2007) (explaining that exculpatory evidence must be considered in the totality of circumstances analysis used to determine probable cause).

²⁹⁸ *Terry v. Ohio*, 392 U.S. 1, 27 (1968); Richardson, *supra* note 278, at 1146.

²⁹⁹ Richardson, *supra* note 278, at 1146.

³⁰⁰ *Id.* (arguing for a “judicial refocus of the reasonable suspicion standard” away from an assessment of whether a suspect is acting suspiciously to how well an officer is known to judge criminality in the stop-and-frisk context).

³⁰¹ *Id.* at 1145 (defining “arrest efficiency” as the “rate[] at which the police find

Such an approach could be adapted to scenarios in which ShotSpotter replaces, even in part, police officer judgment. Just as officer efficiency is relevant in the traditional policing context, analogously, ShotSpotter's efficiency should be considered where it provides the justification for reasonable suspicion. In the ShotSpotter context, efficiency corresponds directly with the system's validity. Thus, an approach in which courts consider ShotSpotter's efficiency in the totality of circumstances analysis means two things. First, courts must conduct a meaningful reliability assessment by examining validation test data, error rates, research, and other data that informs validity rather than relying on a testifying officer's, police department's, or SSTI's word on accuracy.

Second, courts should evaluate how frequently ShotSpotter alerts lead to a stop or arrest of persons responsible for the gunfire that produced the alert.³⁰² While ShotSpotter alerts regularly lead to seizures, those are frequently of individuals with no connection to those alerts.³⁰³ This is critical; if a stop is premised on an alert, whether the person stopped can be tied to the alert is relevant to its reasonableness. This is also true in the aggregate. If police regularly stop people in response to ShotSpotter alerts without turning up evidence connecting them to those alerts, subsequent stops in response to alerts are increasingly less justifiable. Consider the alternative: If efficiency is construed as referring only to how frequently ShotSpotter alerts lead to stops or arrests for *any* crimes, ShotSpotter will become the type of talismanic magic word that will replicate the high crime area problem by excusing nearly any stop.³⁰⁴

Legislation may also be an effective alternative to limit erosion of reasonable suspicion doctrine and reckon with the racialized context of ShotSpotter-driven police-civilian encounters. Community activists have long advocated for legislative bans of stop-and-frisk policing.³⁰⁵ A legislative approach can be tailored to prevent overreliance on ShotSpotter alerts to justify stop-and-frisks and limit abuses in the aftermath of an alert. For

evidence of criminal activity when conducting a stop and frisk”).

³⁰² *Cf. id.* at 1146 (encouraging that the reasonable suspicion standard shift to account for how well an officer is known to judge criminality in the stop-and-frisk context).

³⁰³ *See supra* notes 1–17; *United States v. Rickmon*, 952 F.3d 876, 887 (7th Cir. 2020) (Wood, C.J., dissenting) (“To this day, no one has suggested that [Rickmon] was the shooter.”).

³⁰⁴ *See supra* note 230 and accompanying text.

³⁰⁵ *See, e.g., No More Stop & Frisk*, STOP POLICE TERROR PROJECT-D.C., <https://www.sptdc.com/nomorestopandfrisk> [<https://perma.cc/TUG8-KCTP>] (calling for a legislative ban on stop-and-frisk practices in Washington, D.C.); Brianne K. Nadeau, Opinion, *End Stop and Frisk in D.C.*, WASH. POST (Feb. 15, 2019), https://www.washingtonpost.com/opinions/localopinions/end-stop-and-frisk-in-dc/2019/02/14/cdd59c2c-2fab-11e9-8ad3-9a5b113ecd3c_story.html [<https://perma.cc/PZ3D-BB8X>].

example, legislation can be used to disallow stops based on ShotSpotter alerts without corroboration, stops for suspicious activity unconnected to an alert (like drug possession), or stops based on alerts in jurisdictions where validity of the system has not been established through independent testing and review.³⁰⁶

B. Mitigating ShotSpotter's Other Harms

Legislative solutions can also constrain ShotSpotter's use, protect against abuses, improve transparency, and promote the system's validity prior to purchase and deployment.

1. Pre-Deployment Approaches

At a minimum, legislation should require police departments to submit—and then adhere to—proposals that explain how they will use the technology, avoid abuses, and prevent and remedy privacy intrusions for local government approval. Scholars including Mailyn Fidler and Elizabeth Joh and advocates have already recommended this or similar approaches for surveillance technologies generally.³⁰⁷

Legislation may also be able to remedy failures to notify communities and solicit their input before acquiring ShotSpotter. For example, a legislatively-mandated notice and comment period can be used to obtain community input.³⁰⁸ The ACLU also recommends that local governments appoint a community advisory body to advise legislators on the use of surveillance technologies.³⁰⁹ Because government actors can disregard

³⁰⁶ Scholars and advocates have mapped out a set of recommendations for ending post-*Batson* race-based peremptory juror strikes which may serve as a model. ELISABETH SEMEL, DAGEN DOWNARD, EMMA TOLMAN, ANNE WEIS, DANIELLE CRAIG & CHELSEA HANLOCK, *WHITEWASHING THE JURY BOX: HOW CALIFORNIA PERPETUATES THE DISCRIMINATORY EXCLUSION OF BLACK AND LATINO JURORS* ix-xi (2020), <https://www.law.berkeley.edu/wp-content/uploads/2020/06/Whitewashing-the-Jury-Box.pdf> [<https://perma.cc/4F8Z-JCST>]. Several states have since passed legislation or court rules substantially adopting those recommendations. See *Batson Reform: State by State*, Berkeley Law, <https://www.law.berkeley.edu/experiential/clinics/death-penalty-clinic/projects-and-cases/whitewashing-the-jury-box-how-california-perpetuates-the-discriminatory-exclusion-of-black-and-latinx-jurors/batson-reform-state-by-state/> [<https://perma.cc/9VWL-M4CE>].

³⁰⁷ See, e.g., Fidler, *supra* note 61, at 521; Elizabeth Joh, *The New Surveillance Discretion: Automated Suspicion, Big Data, and Policing*, 10 HARV. L. & POL'Y REV. 15, 40 (2016); *An Act to Promote Transparency and Protect Civil Rights and Civil Liberties With Respect to Surveillance Technology*, ACLU (Apr. 2021), https://www.aclu.org/sites/default/files/field_document/aclu_ccops_model_bill_april_2021.pdf [<https://perma.cc/Q9BH-HLDQ>]; see also LEE, MUSA & PINARD, *supra* note 89, at 63.

³⁰⁸ Cf. LEE, MUSA & PINARD, *supra* note 89, at 63–64.

³⁰⁹ ACLU, *supra* note 307, at section 8.

community input, whether obtained through a notice and comment period, from an advisory board, or otherwise, it is important that legislation build in protections to ensure that such input is addressed substantively, rather than treated as a box to check.³¹⁰ Vincent Southerland makes a number of suggestions to give community bodies “substantive, rather than advisory authority” that include investigative and veto powers.³¹¹

Next, legislation can be designed to address ShotSpotter’s validity. It can mandate that, prior to purchase and installation, ShotSpotter be independently tested to ensure validity.³¹² Elected lawmakers can also require independent review of ShotSpotter’s validity prior to use. To remedy the lack of transparency of ShotSpotter’s data, legislation should require that data be released publicly for review. In jurisdictions in which ShotSpotter is already active, legislation can impose a moratorium on its use until each of these requirements are met.³¹³

2. Ensuring Accountability

In jurisdictions which choose to implement ShotSpotter or continue its use over the concerns raised in this Article and elsewhere, it will be necessary to continually reevaluate ShotSpotter’s impact on communities, validity, policing effectiveness, and use in justifying police stops.³¹⁴ To do this, legislation can require mandatory data collection and publication related to the system’s use and regular independent audits of ShotSpotter, which should trigger reexamination by elected bodies of ShotSpotter’s continued desirability.³¹⁵

At a minimum, data collection must address several areas. First, to better understand ShotSpotter’s influence on reasonable suspicion determinations, police must be required to report when the system is cited to justify a stop and include what, if any, additional information besides an alert justified the intrusion. Second, to address concerns related to ShotSpotter’s deployment

³¹⁰ See Southerland, *supra* note 40, at 66.

³¹¹ See *id.* at 75.

³¹² Cf. LEE, MUSA & PINARD, *supra* note 89, at 63.

³¹³ See ACLU, *supra* note 307, at section 3.

³¹⁴ Cf. LEE, MUSA & PINARD, *supra* note 89, at 63; see also KABA & RITCHIE, *supra* note 293, at 138 (“[W]e need to carefully and closely monitor the implementation of our wins to ensure that they are not gutted or coopted in the process, or inadvertently producing further harm.”).

³¹⁵ See ACLU, *supra* note 307, at section 8B (mandating an annual report to city councils by the community advisory body that encompasses some, but not all, of the suggestions made here). To avoid entrenching existing inequities, it is critical that data collection include “community knowledge sources” like individuals impacted by ShotSpotter. See Ngozi Okidegbe, *Discredited Data 5–6* (Feb. 18, 2021) (unpublished manuscript) (on file with Cornell Law Review).

in communities of color, data must include all geographic locations not only of where alerts occur,³¹⁶ but also where the system is deployed. Additionally, to address the potential for harassment and violence in police encounters that follow a ShotSpotter alert, legislation should require that every instance in which a response to a ShotSpotter alert is connected to (1) a use of force, harassment, or other abuse by officers or (2) a complaint against an officer be documented.³¹⁷

Audits should also: address validity and policing efficiency; measure ShotSpotter's impact on Fourth Amendment rights; and evaluate its influence on policing practices and harms flowing from its use. Crucially, audits must collect community input³¹⁸ and all data and findings must be made available to the public for additional comment and input and local government review.

3. Protecting the Accused

ShotSpotter directly harms those stopped, arrested, and charged with crimes following an alert.³¹⁹ Legislation can additionally help ensure ShotSpotter evidence is properly scrutinized in court. Robust, legislatively-mandated discovery, for example, can permit the accused to prepare to contest the legality of a stop-and-frisk, challenge ShotSpotter's reliability, and remedy the lack of transparency that shields ShotSpotter from scrutiny. Accordingly, legislators can seek to amend discovery rules to require that prosecutors notify the accused when police officers rely on ShotSpotter in a case and that comprehensive ShotSpotter-related discovery be provided prior to litigation of Fourth Amendment challenges.³²⁰

³¹⁶ Some jurisdictions collect some alert data already. *See, e.g., ShotSpotter Data, Disclaimer and Dictionary*, METRO. POLICE DEP'T (Feb. 10, 2022), <https://mpdc.dc.gov/publication/shotspotter-data-disclaimer-and-dictionary> [<https://perma.cc/CK6F-EFSK>].

³¹⁷ It is common for officers to be required to document uses of force already, but such policies may not require such documentation to include whether the use of force followed a ShotSpotter alert. *See, e.g., Policy 725: Use of Force Review and Assessment*, BALT. POLICE DEP'T (Nov. 24, 2019), <https://www.baltimorepolice.org/transparency/bpd-policies/725-use-force-review-and-assessment> [<https://perma.cc/TJA9-WMZZ>] (requiring documentation after a use of force, but not specifically instructing officers to disclose whether ShotSpotter or other policing technology prompted the initial police presence).

³¹⁸ Okidegbe, *supra* note 315.

³¹⁹ *See* Sinha, *supra* note 289, at 892–93 (explaining that forensic methods, including surveillance technologies, enable carceral harm).

³²⁰ *Cf. LEE, MUSA & PINARD, supra* note 89, at 64–65. At a minimum, discovery must require disclosure of: (1) source data relating to ShotSpotter's general validation and validation testing conducted under circumstances present in the case at issue; (2) error rate data; (3) documentation of police reliance on ShotSpotter; (4) information relating to ShotSpotter's analyst training program; (5) information relating to the training received by the specific ShotSpotter analyst in the case; (6) audio files, recordings, visualizations, and

It is important to reiterate that legislation is imperfect. While legislation enacted in several jurisdictions to regulate surveillance technologies has yielded some benefits, it also suffers from flaws. Legislative bodies ignore community input and police departments ignore enacted rules.³²¹ Bureaucratic approval processes can appear as “a rubber stamp” that entrenches the appearance of legitimacy of surveillance technologies without meaningful review.³²² In some cities, review of such technologies has been minimal, but police departments and other proponents can point to the superficially rigorous review process to argue for continued use and expansion of surveillance tools.³²³ While the precise contours of appropriate legislation are left for future scholarship, these challenges must be considered in their design.

CONCLUSION

This Article serves as a warning that, while ShotSpotter may initially appear to be an innovative solution to gun violence, upon closer examination its use raises several concerns. Police frequently point to ShotSpotter alerts to justify stop-and-frisks. Courts routinely uphold stops based on such alerts notwithstanding ShotSpotter’s unknown validity and even though the traditional reasonable suspicion framework is poorly equipped to assess the legality of seizures and searches based on alerts. Fourth Amendment jurisprudence must adapt to accommodate ShotSpotter-informed policing before its theoretical protections against police intrusions are rendered entirely meaningless. Evidence also suggests ShotSpotter has minimal impact on solving gun crimes and reducing gun violence but that its system’s skewed deployment contributes to over-policing of Black and Brown communities and creates new dangers for the residents of those communities. Non-

other materials received for review by the analyst that relate to the alert in the case; (7) documentation of all changes to sound classifications, origin locations, or other information made by analysts; (8) the geographic locations of the full sensor array in the jurisdiction at issue; and (9) information about sensor functioning including calibration data, repair, and maintenance logs. Legislation can also require that SSTI be required to waive or forsake asserting “trade secret privileges” that may thwart defense access to discovery. *Id.* at 64; *see also* Rebecca Wexler, *Life, Liberty, and Trade Secrets: Intellectual Property in the Criminal Justice System*, 70 STAN. L. REV. 1343, 1368 (2017) (noting that assertions of trade secret evidentiary privileges can limit defense access to information about policing technologies and hinder a variety of defense challenges to policing technologies, including Fourth Amendment challenges).

³²¹ LEE, MUSA & PINARD, *supra* note 89, at 56.

³²² *Id.* at 62; *see also* Sinha, *supra* note 289, at 907, 935 (describing how outwardly rigorous processes can create an appearance of legitimacy even without substantive vetting).

³²³ LEE, MUSA & PINARD, *supra* note 89, at 61–62.

doctrinal solutions must be implemented to regulate police officers' ability to justify intrusions based on ShotSpotter alerts and to remedy the harms ShotSpotter's use is already imposing.