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Place-based interventions and the epidemiology of violence prevention

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Abstract

Purpose of review: Violence is a leading cause of death, disability, and health inequity in the United States. This review summarizes the scientific literature on place-based interventions and violence, describes study design challenges, and suggests future directions for this group of interventions.

Recent findings: Violence prevention strategies commonly target high-risk individuals, but recent research has found that place-based interventions are practical, sustainable, and high-impact opportunities that benefit communities at large. This body of work has largely consisted of quasi-experimental studies of land and building place-based interventions and interpersonal violence.

Summary: Current epidemiological evidence suggests that place-based interventions are cost-effective solutions for violence prevention. Future work is needed using mixed methods to better understand their mechanisms of action and to inform implementation efforts. There are opportunities for the broader development of implementation science to bring promising and established place-based interventions to scale and to extend these interventions to other types of violence.

Keywords

place-based intervention; violence prevention; firearm injury

INTRODUCTION

Violence is a leading cause of death and health disparities in the United States (US). In 2020, 71,335 people died from a violence-related injury [1]. Over a third of these deaths were homicides and nearly two-thirds were suicides [1]. In addition to this very large

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Conflict of Interest

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mortality burden, nonfatal violence-related injuries are much more common. Almost 2 million violence-related emergency department visits also occurred in 2020 [1]. All these incidents have short-term and long-term consequences for those directly involved as well as the people and places around them [2]. The experience of violence ranges from people having their lives prematurely cut short, to long-term physical injuries and disability, to the trauma of witnessing or hearing about violence in communities [3–5]. These experiences are part of a larger cycle that continues to produce yet more violence and efforts to disrupt this cycle at its most fundamental, structural origins are preferable to simply reacting once violence occurs.

A growing body of literature supports the use of place-based interventions as key structural opportunities to break the cycle of violence and promote lasting public safety in communities [6–9]. The motivation for this place-based anti-violence movement has been initiated and co-produced at the community level and buoyed by findings that public health interventions focusing on individuals can have limited sustained effects on a population scale [10]. Violence prevention efforts that target individuals are important for curbing individual violence rates within small areas and among specific high-risk groups, but they typically have a small population-level impact and are difficult to sustain [11]. Conversely, interventions that change places to promote healthy behaviors not only are scalable and affect broader populations but also may be more sustainable by changing the fundamental structures of places that initially enable violence in relatively inexpensive ways [6]. Neighborhood factors that can increase violence include concentrated poverty, residential instability, and low levels of social cohesion [12]. According to social disorganization theory and the related theory of collective efficacy, low levels of social cohesion are indicative of social disruptions and a lack of community cohesion in the face of challenges such as violence. Physical environmental dilapidation such as poorly trafficked commercial corridors, abandoned buildings, or vacant lots, are key manifestations and contributors to concentrated poverty and limited social cohesion [13]. These physical and highly visible environmental manifestations signal that an area has been neglected, likely for decades, and that violence, while not necessarily tolerated, may be able to proceed with less interruption [14, 15]. Interventions that repair and maintain physical environments, indicate proximal care of community spaces and could offer unique opportunities to disrupt the cycles of violence experienced in many communities [16–18].

Inexpensive and scalable place-based interventions are favorable because they are potentially high return-on-investment solutions to violence. Straightforward structural improvements to environments, such as greening vacant lots or fixing abandoned buildings, to which individuals are routinely exposed allow residents to remain in their home neighborhoods without the need for expensive, unwanted, and, at times, unethical relocation [19, 20]. An overarching concern of place-based interventions is they may lead to gentrification [21]. Though possible, research has found economic indicators, such as property taxes, unchanged after greening interventions are implemented [22]. The most promising place-based interventions proposed for violence prevention are inexpensive, scalable, and designed to be installed near lived spaces, giving local residents access to new amenities they would not have otherwise had, as opposed to the development of luxury place-based installations that draw in nonresidents and displace long-term residents. Critics of place-

based interventions are also concerned with the displacement of violence [23] and argue acts of violence prevented in one location will simply be displaced to other, nearby locations because of an intervention. However, prior research has not found support for this assertion [12, 22, 24, 25]. Finally, while place-based interventions to prevent violence have been well-explored, there is now the added opportunity for the broader development of implementation science programs to study the processes by which effective place-based violence interventions work best.

In this article, we summarize the recent literature on place-based interventions and violence, describe the study designs used in assessing these interventions and violence outcomes, and suggest future directions to bring promising and established place-based interventions to scale and to extend these interventions to other types of violence. By better understanding the existing science and the impacts of place-based interventions on violence and other outcomes, we can better understand mechanisms of action for these interventions and inform future implementation efforts for large populations.

METHODS

We conducted a systematic review of the literature examining place-based interventions and violence. Articles that contained search terms in the title or abstract that were relevant to the current review were identified through the PubMed database. The terms included (“greening” OR “green space” OR “blight remediation” OR “vacant lot” OR “neighborhood intervention” OR “community garden” OR “public space” OR “remediation” OR “place-based” OR “group-randomized trial”) AND (“crime” OR “crime prevention” OR “violence” OR “violence prevention” OR “suicide” OR “self-inflicted” OR “self-directed”). We limited the search to articles published from 2000 to 2021.

Our search strategy identified 276 unique articles. All study authors designed study inclusion criteria and one study author (ANG) made specific inclusion decisions after extensive internal consultation. All abstracts were screened and the full text of 41 articles was reviewed for eligibility. To be eligible for inclusion, articles must have provided quantitative empirical data; examined violence prevention as a dependent variable; and examined a type of place-based intervention as an independent variable. We excluded reviews, commentaries, and study protocol papers. In total, 14 articles met our inclusion criteria (Table 1). Study author ANG additionally reviewed the reference lists of the included articles and added papers that were cited but not captured in the review. This resulted in the addition of 4 articles (Table 1).

After reviewing all of the studies, two main categories were identified: 1) land and 2) building interventions. Land interventions included studies that examined the impact of greening vacant lots (i.e., removing trash and debris, grading the land, planting new grass) on violence. Building interventions included remediation or demolition of abandoned buildings.

RESULTS

Land interventions

Between 2000 and 2021, ten studies examined the relationship between land interventions and violence [22, 24, 26–33**]. Of the studies included in this category, four were cluster randomized controlled trials [24, 26, 28**, 29] and six were quasi-experimental studies [22, 27, 30, 31*]. Five cities were represented across the studies: Philadelphia, PA [22, 24, 26, 28**, 29]; New Orleans, LA [32, 33**]; Milwaukee, WI [30]; Youngstown, OH [27]; and Flint, MI [31*].

The four randomized controlled trial papers represented two separate trials in Philadelphia, PA. The first was a pilot study of vacant lot greening in 2011 [26]. The study found a significant increase in perceptions of safety for residents living around vacant lots that were cleaned and greened compared with those living near vacant lots that were left untouched. A nonsignificant decrease in total crimes and firearm assaults around greened vacant lots compared with controlled lots was found; however, the study was underpowered to find actual differences due to the small number of case locations. The second trial was an expansion of the pilot to investigate the effects of standardized, reproducible interventions that restore vacant land on a larger scale. The three analyses using the trial data examined different outcomes. The first examined the effects of greening on violence, firearm violence, and the perceptions of fear and safety [28**]. The study found greening significantly reduced firearm violence and other police-reported issues, such as burglaries and nuisances. Random samples of residents living near newly renovated spaces also reported matching perceptions that crime and vandalism had been significantly reduced. Another study focused on firearm violence specifically [24]. Researchers sought to determine if greening reduced firearm shooting incidents resulting in injury or death. The study found that greening and mowing and the removal of trash significantly reduced shootings. The final study determined the impact of gender differences on perceived safety by the time of day [29]. After the intervention, women reported more fear and men less fear; however, the results and tests for effect modification were not statistically significant.

Five of the six quasi-experimental studies used a difference-in-differences approach to assess the impact of greening on various outcomes. One study evaluated changes in violence and health outcomes near 4,436 vacant lots that had been greened between 1999 and 2008 compared to 12,308 control lots [22]. Researchers found vacant lot greening was associated with a reduction in firearm assaults. A second study examined the association between changes in crime around both 166 contractor-greened lots and 78 community reuse lots compared with 959 control lots between 2011 and 2014 [27]. A significant reduction in property crimes was found around contractor-greened lots and a decrease in violent crimes was found around community reuse lots. Another study determined whether the conversion of vacant lots into community gardens reduced reported theft and violent and nuisance crime [30**]. The authors found community gardens are associated with a slight decrease in crime, primarily driven by reductions in violent crime.

The two quasi-experimental studies in New Orleans used a difference-in-differences approach to evaluate the effect of the Chapter 66 Vacant-Lot Maintenance Program. This

land intervention involved the removal of debris and mowing of vegetation. The first study examined changes in crime rates near lots that were remediated [32]. The authors did not find significant differences between remediated and control lots in levels of violent, property, and domestic crimes from pre-remediation to post-remediation. However, the number of drug crimes per square mile decreased significantly near all remediated lots compared with control lots. The second study assessed the impact of land remediation on the incidence of domestic crime [33**]. The authors additionally assessed if alcohol outlet density modified the relationship between vacant property remediation and domestic crime. They found remediation interventions reduce domestic crime incidents in areas with more bars and taverns.

The remaining quasi-experimental study fit a series of hierarchical generalized linear models to examine whether routine maintenance of vacant lots by local community members was associated with a reduction in crime [31*]. Researchers found that community-engaged greening of vacant lots was associated with a 40% reduction in assaults and total violent crime compared to vacant lots not maintained by these groups. The results from this study support previous findings that violent crime decreases near greened lots; however, the results differ from other studies in that the results show greening does not require much more than trash removal and community engagement as compared to the grading of soil or installation of fences. Community-engaged greening programs provide a lower-cost alternative to city-directed implemented programs and have the added benefit of neighborhood collaboration and community ownership.

Building interventions

Beyond land interventions, studies have considered the association between building interventions and violence (n = 8). The vast majority of articles in this category (n = 6) were quasi-experimental [25, 33**, 34*, 38–40]. Two were cross-sectional [35, 37]. All the quasi-experimental studies used a difference-in-differences approach to analyze the association between building interventions and violence. Studies examining remediation occurred in Philadelphia, PA [34*, 36*, 37], and demolition studies occurred in five cities: Buffalo, NY [35, 40]; Detroit, MI [25]; Saginaw, MI [39]; Cleveland, OH [38]; Chicago, IL [38]; and Denver CO [38].

Remediation—The studies in Philadelphia focused on interventions around structural repairs. Two of the three studies there were quasi-experimental and examined the impact of Philadelphia’s Doors and Windows Ordinance [34*, 36*]. Passed in 2010, the ordinance required owners of abandoned buildings to install working doors and windows in all structural openings and clean the facades of their buildings. One study examined the impact of compliance with the ordinance on violence outcomes [36*]. Researchers compared the change in density of violence between 2011 and 2014 with around 676 properties that were remediated to comply with the ordinance with control properties that were not remediated. Housing remediations were found to be significantly associated with up to a 4% relative reduction in total crimes, assaults, and firearm assaults. The second study sought to determine if the remediation was a cost-beneficial solution to firearm violence [34*]. The authors examined both building and land interventions and found that abandoned buildings

and vacant lot remediation both were high-value and high-return strategies for reducing firearm violence, but not so much for non-firearm violence. This study has been classified under building interventions because there was a greater reduction in firearm violence from the remediation of abandoned buildings (39%) compared to the remediation of vacant lots (5%).

The remaining study in Philadelphia was cross-sectional and examined the impact of a different intervention in the city, the Basic System Repair Program (BSRP) [37]. The BSRP intervention includes a grant of up to \$20,000 provided to low-income owners for structural repairs to electrical, plumbing, heating, and roofing damage. The study found that the BSRP intervention was associated with a modest but significant reduction in crime.

Demolition—Quasi-experimental studies examining demolition all found the intervention associated with a reduction in crime [25, 38–40]. One paper analyzed the impact of demolition in three cities: Cleveland, Chicago, and Denver. Researchers tested the effect of the federal Neighborhood Stabilization Program on rehabilitating or demolishing foreclosed vacant properties [38]. The authors found that property demolition resulted in statistically significant decreases in property crime, but no significant changes were found in violent crimes. These findings were limited by a small sample of properties. Another study in Detroit, MI found that census block groups that received over 5 demolitions were associated with an 11% reduction in firearm assaults, relative to comparable control locations [25]. The study in Saginaw, MI estimated the effect of vacant building demolitions of single-family homes on crime [39]. The author found that demolitions reduce crime by approximately 8% in the block group in question and 5% in nearby block groups. The study in Buffalo, NY examined whether demolitions of residences at the micro place level and the census tract level resulted in crime reductions [40]. At the micro place level, demolitions caused a steep drop in reported crime. At the census tract level, demolitions reduced crime, but the effect was not statistically significant across different models.

The final demolition study was cross-sectional and estimated the association between demolitions and criminal activity in Buffalo, NY through comparative statistical analysis [35]. Researchers conducted a cluster analysis to identify high and low hot spots of demolition and crime activity. Specific crime categories included assault, drug arrests, and prostitution. The authors found an association between areas targeted for significant demolition and the migration of spatial patterns of certain crimes. Crime largely moved toward the edges of the city limits and in the direction of the first ring of suburbs.

STUDY DESIGN METHODS TO ASSESS THE RELATIONSHIP BETWEEN PLACE-BASED INTERVENTIONS AND VIOLENCE

As summarized in the prior section, the literature on place-based interventions and violence has largely focused on quasi-experimental studies of interpersonal violence. While these articles have made an important step forward, more studies using innovative design methods exploring different types of violence are needed. In this section, we describe key challenges with the various study design methods—cross-sectional, quasi-experimental, and experimental.

Cross-Sectional

Early studies examining the relationship between the built environment with violence prevention were cross-sectional in that exposure and outcome were ascertained at the same time [41]. The implications of these studies remain limited as they do not allow the examination of the change in violence because of change in the built environment due to the challenges in the establishment of any temporality in cross-sectional studies. Instead, cross-sectional studies examine average differences between treatment and comparison groups while assuming, conditional on covariates, the two would have similar outcomes. Despite these limitations, it is important to note that the results from the two cross-sectional studies in the review concord with the results from the quasi-experimental and experimental studies.

Quasi-Experimental

Quasi-experimental methods or natural experiments are the most common study design noted in our review of place-based violence interventions. This is likely because these methods can take advantage of changes in policies or procedures that may be randomly assigned, although not by the investigator themselves. In quasi-experimental studies, there is a “clear before/after temporal measures” to examine the relationship between exposure and outcomes [33**]. Furthermore, the cost and logistical difficulties of randomly assigning environmental interventions are avoided by taking advantage of natural experiments. One example of the quasi-experimental study design, which dominated this review, is the difference-in-differences approach. In difference-in-differences analyses, researchers quantify the effect of some sort of intervention by comparing the outcomes of a group that received the intervention and the outcomes of a group that did not.

A major limitation of the difference-in-differences method is it assumes that the indicators of interest follow the same trajectory over time in treatment as comparison groups [42]. This assumption is otherwise known as the parallel trends assumption. When this assumption holds, the estimate made using this method would be unbiased. If, however, the differences between the groups change over time, then this method will not help to eliminate these differences. One way around this using matching methods. Matching on variables that predicted treatment assignment strengthens the assumption that common trends would hold between treated and control units throughout the study period [43]. It is no surprise then that all the quasi-experimental studies in this review that used a difference-in-differences approach utilized some matching procedure to select controls.

Despite the benefits of matching, a common threat to quasi-experimental studies remains: unmeasured confounding. This phenomenon results from a variable associated with both the exposure and outcome that is not measured and may differentially affect units that are in the treatment group versus units that are in the control group. Without the randomization common in experimental study designs, the threat of unmeasured confounding persists [27, 34*].

Experimental

As detailed in the above review of the literature, there is a lack of experimental studies testing the effects of place-based violence interventions that change the neighborhood

environment. Four of the 18 articles identified in our review were experimental studies; however, the four papers represent only two randomized controlled trials. The first was a preliminary study for the second. This is likely because of ethical, practical, and logistical challenges associated with conducting them [44]. Bureaucratic and financial challenges exist in obtaining permissions to perform interventions on neglected public or private land. Developing relationships with local community-based organizations and municipal governments is critical to anticipating and overcoming challenges related to environmental modification studies. For example, community members may be concerned about being randomized to the non-intervention control arm and government officials may be uncomfortable withholding a potentially valuable intervention from community members. Taking the time to explain the importance of randomization to obtain the highest level of evidence is essential to making evidence-based policy decisions. Due to the high initial cost of these sorts of interventions, feasibility can be challenging, leading to smaller sample sizes in the study, lower power, and of course, limited generalizability of study findings [26].

Despite these challenges, the two randomized controlled trials in this review have some notable features worth highlighting. Both used a clustered randomized controlled trial design, otherwise known as group randomized trials, as a means of implementing an experimental design given the challenging conditions in conducting a place-based intervention. In contrast to the individual randomized controlled trial, in which individuals are randomized to intervention groups, cluster trials randomly assign interventions to a whole group or cluster [45]. Cluster trials are a particularly useful tool for place-based interventions. Given that the treatment is for a place and not an individual, a cluster trial allows for some efficiencies, thereby compensating for some of the feasibility challenges discussed above. Additionally, cluster randomization can reduce treatment contamination between intervention and control groups, something of concern when dealing with an intervention on places [46–48]. In addition to the cluster trial design, these two studies utilized a mixed-methods approach. Ethnographers conducted conversational style semi-structured interviews, collected detailed observational field notes, and assembled archival materials (i.e., social media data, longitudinal geographic maps, and satellite photographs). This qualitative component allowed researchers to identify potentially unexpected or unwanted effects and document potential causal mechanisms that might explain differential microneighborhood responses to interventions.

CONCLUSIONS

The recent literature illustrates manipulating elements of crime opportunity through place-based interventions can impact key violence outcomes and be cost-effective [34*, 49]. Interventions that are structural, scalable, and sustainable are proven to reduce violence and are economically viable. Increasing green space and improving the quality of neighborhood buildings can be cost-effective ways of decreasing violence. For these violence prevention strategies to be effective, it is important to understand the specific context of any environment before choosing an appropriate place-based intervention. All the evidence thus far has focused on specific interventions in single study cities as preventive measures of interpersonal violence. A range of relevant violence outcomes associated with place-based interventions is needed. As seen by the studies presented in this review, coarse crime

measures derived from police and other administrative records, such as total crimes, violent, and property crimes are used. However, not all crimes are reported to the police, and police-reported crime data have known limitations. Creative, ethical ways to directly observe the incidence of violence around place-based interventions with infrared cameras, for example, could allow discrete observation while preserving anonymity for users of the public spaces. Additionally, more research would benefit from direct measurements of perceptions of safety and possible mediators such as social and built environment characteristics and mental health.

In addition, few studies focused specifically on health disparities or the impact of place-based interventions on vulnerable populations. Moving forward, research will need to be intentional in assessing the impact of place-based interventions in high-need communities to assess the impact on a complex set of structural inequalities. This research could reveal cost-effective solutions to underlying public health issues at the individual and community levels. Doing so would allow policymakers to determine how best to distribute limited resources and maximally scale place-based interventions. If high-need and high-reward locations or groups can be identified, it would be imperative to target those areas first.

With a few exceptions, studies have not applied experimental approaches to test whether place-based interventions affect violence resulting in limited ability to establish causal mechanisms. Despite the noted implementation challenges and longer study periods, new studies should aim to achieve the highest level of evidence through randomized controlled trials [50]. Future trials could consider a multitude of questions. What is the longitudinal impact of interventions? There are potential seasonal effects that could influence violence prevention. Additionally, to what extent do the benefits persist from a cost-savings perspective? If the interventions proposed have initial implementation costs but require relatively low maintenance, are the costs justifiable?

When randomized controlled trials are not possible given the various challenges, quasi-experimental studies could be secondarily prioritized [50]. Mixed methods will also be increasingly important to fully understand the statistical findings of quantitative studies. Thus, in addition to quantitative studies, equally rigorous qualitative studies drawing on the skills of qualitative researchers are needed to better understand the mechanisms through which place-based interventions affect violence and inform implementation efforts. This mixed-methods approach can uncover community members' perceptions of place-based interventions and inform successful strategies for implementation.

Our study is subject to several limitations. All the studies included in our review were conducted in the US, thus potentially limiting the global generalizability of our results. Our search may also have omitted relevant studies not included in PubMed. For example, there are several place-based violence prevention interventions in Latin American countries that have not been published in PubMed [51]. Additionally, even among studies in the US, not all papers related to place-based interventions for violence prevention are referenced in PubMed [52–54]. Finally, we did not assess the studies for bias, and only included studies written in English. Despite these limitations, this review provides the basis for opportunities for the

broader development of implementation science to bring promising and established place-based interventions to scale and to extend these interventions to other types of violence.

Place-based interventions could have a large population-level impact that is less dependent on the actions of individuals. A concentrated effort and collaboration across multiple fields such as environmental science, public health, epidemiology, anthropology, psychology, economics, and criminology will be needed as research develops. Prioritizing place-based interventions as part of a larger co-production process that includes community initiation and ongoing, bilateral community-researcher engagement could significantly reduce violence and health disparities.

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Table 1. Summary of studies between place-based interventions and violence from 2000–2021

Reference	Location	Study Period	Study design	Sample size	Intervention Type	Main findings
Beam et al. [30**]	Milwaukee, WI	2006–2016	Quasi-experimental	212 lots	Land	Community gardens are associated with a slight net decrease in crime, primarily driven by reductions in violent crime (3.7% to 4.6% reduction).
Branas et al. [22]	Philadelphia, PA	1999–2008	Quasi-experimental	17,744 lots	Land	Greening of vacant lots was associated with a citywide reduction in firearm assaults ($P < 0.001$). Vandalism and criminal mischief were also significantly reduced after greening in at least one section of Philadelphia ($P < 0.001$).
Branas et al. [34*]	Philadelphia, PA	1999–2013	Quasi-experimental	1,352 buildings 17,744 lots	Building & Land	Both blight remediation programs were high-value and high-return strategies for reducing firearm violence but not so much for non-firearm violence. Respectively, for taxpayers and societal returns on investment for firearm violence prevention were \$5 and \$79 return for every dollar spent on abandoned building remediation and \$26 and \$333 for every dollar spent on vacant lot remediation.
Branas et al. [28**]	Philadelphia, PA	2011–2014	Randomized Controlled Trial	541 lots	Land	Greening significantly reduced crime overall (−13.3%, $P < 0.01$), firearm violence (−29.1%, $P < 0.0001$), burglary (−21.9%, $P < 0.0001$), and nuisances (−30.3%, $P < 0.05$)
Frazier et al. [35]	Buffalo, NY	2007–2012	Cross-sectional	290 census block groups	Building	There is an association between areas targeted for significant demolition and the migration of spatial patterns of certain crimes.
Garvin et al. [26]	Philadelphia, PA	2011	Randomized Control Trial	50 lots	Land	Greening was non-significantly associated with a net reduction in total crime and aggravated assaults with firearms. A significant net increase in residents' perceptions of safety around greened vacant lots compared to non-greened vacant lots was observed.
Heinze et al. [31*]	Flint, MI	2009–2013	Quasi-experimental	662 street segments	Land	Community-engaged greening of vacant lots was associated with nearly a 40% reduction in assaults and total violent crime compared to vacant lots not maintained by these groups.
Jay et al. [25]	Detroit, MI	2009–2016	Quasi-experimental	686 census block groups	Building	Receiving over 5 demolitions was associated with an 11% reduction in firearm assaults, relative to control locations (95% CI: 7%, 15%).
Kajeepeeta et al. [33**]	New Orleans, LA	2011–2017	Quasi-experimental	816 lots	Land	In difference-in-difference analyses, remediation was associated with an increase of 0.311 domestic crime calls per square mile (0.311, 95% CI: 0.016, 0.605). In triple-difference analyses, on-premise bar density modified this association.
Kondo et al. [36*]	Philadelphia, PA	2011–2013	Quasi-experimental	2,557 buildings	Building	Renovation permits were consistently associated with crime declines around building sites ($P < 0.001$).
Kondo et al. [27]	Youngstown, OH	2011–2014	Quasi-experimental	1,203 lots	Land	Vacant lot greening was statistically significantly associated with reductions in felony assaults, burglaries, and robberies.
Kondo et al. [32]	New Orleans, LA	2014–2016	Quasi-experimental	816 lots	Land	No significant differences between remediated and control lots in violent, property, and domestic crimes from pre-remediation to post-remediation. But, the number of drug crimes per square mile decreased significantly near all remediated lots compared to control lots (5.7% lower, $P < 0.0001$).
Kondo et al. [29]	Philadelphia, PA	2011–2014	Randomized Controlled Trial	442 participants	Land	Though not statistically significant, after the intervention, women reported more fear and men less fear.

Reference	Location	Study Period	Study design	Sample size	Intervention Type	Main findings
Moyer et al. [24]	Philadelphia, PA	2013–2015	Randomized Controlled Trial	541 lots	Land	Both the greening and the mowing and trash cleanup interventions significantly reduced shootings (–6.8%, 95% CI: –10.6% and –9.2%, 95% CI: –13.2%, –4.8% respectively).
South et al. [37]	Philadelphia, PA	2006–2013	Cross-sectional	13,632 block faces	Building	Housing repair was associated with a 21.9% reduction in total crime (IRR = 0.78, 95% CI: 0.76, 0.80). Increasing the number of houses that received repair was associated with a dose-dependent decrease in crime.
Spader et al. [38]	Cleveland, OH; Chicago, IL; Denver, CO	2008–2013	Quasi-experimental	1,468 census tracts	Building	Demolition in Cleveland decreased burglary and theft, but no measurable impacts of property rehabilitation investments were found.
Stacy [39]	Saginaw, MI	2008–2009	Quasi-experimental	73 census block groups	Building	Demolitions reduce crime by about 8% on the block group in question and 5% on nearby block groups.
Wheeler et al. [40]	Buffalo, NY	2010–2015	Quasi-experimental	26,458 parcels and 79 census tracts	Building	At the parcel level, demolitions were associated with a reduction in crime at the exact parcel. At the census tract level, demolitions were non-statistically significantly associated with a reduction in Part I crimes.