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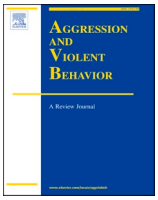

Place-based approaches to reducing violent crime hot spots: A review of the evidence on public health approaches☆

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ABSTRACT

Research from around the world shows that violent crime is spatially clustered in hot spots. A growing body of research shows that place-based changes to the built environment can help reduce violent crime. Increasingly, research summaries imply there are important public health approaches to reduce the hyper-concentration of violence. Past summaries of the effect of place-based changes on violence have focused primarily on their overall effect and have not paid adequate attention to the impact on violent crime within hot spots. Additionally, research summaries seldom delineate what place-based changes actually involve the work of public health departments versus that of housing agencies, redevelopment authorities, street departments, or community-based nonprofits. This review focuses on evidence from experimental and quasi-experimental studies of placed-based changes to the built environment that focus on violent crime hot spots. A narrative review discusses the context of each intervention and assesses their effect sizes on violent crime. Implications for this evidence for public health approaches to reduce violent crime hot spots are considered.

1. Introduction

The spatial concentration of violence and serious crime in tightly clustered hot spots has been documented for a long time (Sherman et al., 1989). The hyper-concentration of violence and serious crime has been referred to as the "law of crime concentration" (Weisburd, 2015). The relative stability in crime hot spots suggests that there are key features of places that make crime opportunities more likely within small geographic areas. The criminality of place is as important to understanding the dynamics of crime as the criminality of people (MacDonald, 2015). The hyper-concentration of violence also imposes enormous social costs on a small segment of the population in most cities. Given that crime and serious violence are concentrated in a subset of places, it is essential to identify place-based interventions that can curb these behaviors. Most violence prevention programs focus on individuals, but there is a growing body of literature that suggests place-based approaches can help reduce serious crime and violence (Kondo, Fluehr, et al., 2018). Violent crime hot spots are more likely than other places in a city to have vacant and abandoned properties, unstable housing tenure, and poorly maintained public spaces (Patterson, 1991; Spelman, 1993; Weisburd et al., 2014; Wilson & Aponte, 1985). Place-based approaches that focus on changing the environmental features of places offer some guidance for intervening in the hot spots that generate the majority of serious crime and violence in cities.

This paper systematically examines the literature on different approaches that attempt to change the built environment and reduce violence. We review evidence from experimental and quasi-experimental studies that examine how changes in the built environment impact violent crime hot spots. A narrative review discusses the context of each intervention and assesses their effect sizes on violent crime hot spots. We also discuss the internal and external validity of studies. Implications for this evidence for public health approaches to reduce violent crime hot spots are considered. Finally, we discuss whether the programs identified involve the work of public health departments versus other governmental agencies and nonprofit organizations, and suggest future areas for inquiry on how changing places could reduce the geographic concentration of violence in cities.

Place-based studies of crime invoke elements of environmental

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criminology in that they focus on how changes to the physical and social environment of places may impact criminal opportunities and offending decision-making (Wilcox & Cullen, 2018). Several environmental criminology theories connect to the idea that changing places may reduce violence in hot spots. Natural surveillance and the importance of proprietary ownership of shared public spaces in fostering informal social control are key features of environmental criminology theories, including crime prevention through environmental design (CPTED), situational crime prevention, routine activities theory, human territorial functioning, and crime pattern theory (MacDonald, 2015). All these theories suggest that the built environment makes some places more or less attractive to motivated offenders by signaling differences in the level of informal social controls of places. For example, the level of natural surveillance signals to an offender the level of guardianship and propriety ownership of shared spaces (Cozens et al., 2005). In addition to the offender perception, there is also the importance of perceptions of potential victims of crime in an area. The appearance of physical disorder is thought to engender fear and affect "the sense of mutual regard and the obligations of civility" that signal people are caring for a place (Skogan, 1990, p. 29). In essence, the physical disorder in places in the form of litter, trash on the streets, and urban decay (e.g., boarded up abandoned buildings) may lead to a cycle of disorder and further decay as residents withdraw from public spaces (Skogan, 1990, 2015). While studies of violent crime hot spots and changes in the built environment do not actually test changes in perceptions, they are thought to be one of the main channels that explain why changing the physical and social environment of hot spots can lead to a reduction in violence and serious crime.

Violence prevention has also been a public health issue for several decades now rather than a sole responsibility of the criminal justice system. Public health emphasizes preventing injuries and fatal events. By identifying the risk factors and sources of harm, it aims to develop interventions that effectively reduce violence. It moves from identifying victims of violence to preventing them from becoming one (Mair & Mair, 2003; Mercy et al., 1993). A public health perspective puts together the source of the problem with a discussion of its solution to address it. The practical and prevention approaches in public health have been embraced by criminology (Braga, 2022; Pridemore, 2003). By reviewing the evidence on public health-informed approaches relying on the role of place and environmental design, we aim to extend our understanding of effective strategies to prevent the concentration of violence.

In the following section, we review the studies that focus on changing supplementary services, property abatement, land use improvements, and visibility and surveillance in high-crime areas.

2. Methodology and summary of literature

The search strategy for this review involved a comprehensive approach to ensure the inclusion of literature that focused on studying how changes in housing and vacant land, lighting and surveillance, and supplementary services affected violent crime. First, the topics for the review were split among the authors. Then, each author independently queried electronic databases (Google Scholar, JSTOR, and Scopus) and Web search engines (Google) using specific keywords and phrases related to the central themes of the review, including "hotspot", "crime", "violent", and other topic-relevant words such as "private security", "abatement", "foreclosure", "street lighting", "abandoned housing", and "vacant lots". Additionally, we manually checked reference lists of selected articles, particularly recent reviews (Kondo, Andreyeva, et al., 2018) and articles, to identify further relevant studies. The search process was iterative, with initial findings guiding subsequent searches, and a thorough review of abstracts and full texts was conducted to ensure the inclusion of relevant studies. We focused on only including peer-reviewed publications.

We set several criteria for the studies to be included in this review. First, we focused on studies with experimental and quasi-experimental designs that estimate how changes to the built environment impact violent crime hot spots, particularly with a pre-post change and a control group. We did not examine cross-sectional studies on the built environment and violent crime hot spots because they do not permit one to estimate causal relationships. Second, we only considered studies measuring changes in either aggregate or specific types of violent crime. However, if a study modeled both violent and property crime it was still included in our search and review process. Third, we narrowed our review to studies that typically examine violent crime at a neighborhood or lower level of spatial aggregation. We use the lower level of geography as a proxy for a violent crime hot spot. There is no specific geographic designation of a hot spot. Still, research generally defines a hot spot based on a micro-geography containing a collection of street segments, census blocks, or grids. In a few instances, we focused on studies using a more extensive geography, such as a neighborhood, zip code, or police district. We do not include studies where the units of analysis have higher levels of geographic aggregation, such as cities, counties, and states. Our focus on places as the primary unit of analysis means that studies with only individuals as the unit of analysis were omitted from inclusion in our narrative review.

This search strategy has clear limitations. Reliance on electronic databases may exclude relevant studies not indexed in these sources, particularly those in non-English languages. The focus on peer-reviewed articles might overlook relevant evidence from non-peer-reviewed sources, such as unpublished theses and manuscripts. The iterative nature of the search could lead to subjective decisions in study selection. Lastly, the narrative review format means that another search strategy may produce additional studies.

The review focuses on interventions that modify or change housing and vacant land, lighting and surveillance, and supplementary services in ways that shape the built environment. Table 1 at the end of this paper provides a brief review of studies. Several high-quality studies show that changes to the built environment lead to small but meaningful reductions in violent crimes. There are some examples where place-based interventions focused on blocks in a given city with the highest violent crime rates. Few place-based studies, however, are explicitly designed to examine changes in violent crime hot spots. More research needs to evaluate place-based interventions in violent crime hot spots. A specific focus on violent crime hot spots will generate greater insight into whether place-based interventions that show efficacy in areas with higher-than-average rates of violent crime will also reduce violence in the worst city blocks. Many studies do not report the effect size of results in a meaningful way, such as the expected percentage change or the elasticity of violent crime with respect to a place-based change to the built environment. The research would be more informative if studies explicitly indicated the expected percentage changes in violent crime due to a place-based intervention. Studies do not generally measure displacement. Ideally, studies in the future will provide both effect size and displacement estimates to provide clearer evidence on how changes to the built environment in hot spots can lead to overall population-level effects on violent crime.

2.1. Supplementary services

One area of growing inquiry is the role of supplemental services in reducing serious crime and violence within confined micro-geographies. Several studies examine what happens when some form of civilian private security or street outreach worker is provided to a given area to reduce the hot spots for violence generated by youth and young adults. The logic of providing supplemental services to an area connects to insights from environmental criminology. For example, private security or street outreach workers may provide an area with an extra set of "eyes upon the street" (Jacobs, 1961) and place-based management that can act as guardians to deter violence from occurring in a given location.

Table 1
Summaries of reviewed literature.

Citation	Location	Period	Study design	Intervention	Control	Findings
A. Supplementary services						
Buggs et al. (2022)	Baltimore, MD, USA	2003–2017	Quasi-experimental (DiD)	Violence interrupters in 7 neighborhoods (police posts)	136 neighborhoods	Non-significant effects for homicides and nonfatal shootings overall
Cook and MacDonald (2011)	Los Angeles, CA, USA	1994–2005	Quasi-experimental (DiD)	BIDs and level of private security spending in 179 police districts	893 districts without a BID	Decrease in total crime (−11 %), assaults (−8 %), robberies (−18 %), and no evidence of displacement
Fox et al. (2015)	Phoenix, AZ, USA	2007–2011	Quasi-experimental (Did)	1 area with Project Truce violent interruption program	3 comparison areas	Increase in shootings (55 %), but reduction in assaults (−45 %) and overall violent crime (−35 %)
MacDonald et al. (2013)	Los Angeles, CA, USA	2006–2007	Observational matched	672 households with adolescent individuals living within areas with BIDs	700 households with adolescent individuals living in areas without BIDs	Null effect on self-reported violent victimization
McMillen et al. (2019)	Chicago, IL, USA	2001–2016	Quasi-experimental (DiD)	Civilian guards on 660x660ft grid cells within 124 school routes	Adjacent contiguous grid cells	Decrease in violent crime (−14 %), no crime displacement
Piza et al. (2020)	Newark, NJ, USA	2009–2018	Quasi-experimental (SCM)	314 street segments in downtown BID area	314 weighted street segments and intersections from 10,247 outside BID area	Significant reduction in burglaries and motor vehicle thefts, but spatial displacement of robberies and thefts from cars
Sanfelice (2019)	Chicago, IL, USA	2005–2016	Quasi-experimental (DiD)	Civilian guards on school routes across 1642 street segments	50,656 street segments	Decrease in simple assaults with batteries (−28 %) and aggravated assaults with batteries (−32 %), and no evidence of displacement
Webster et al. (2013)	Baltimore, MD, USA	2003–2010	Quasi-experimental (DiD)	Violence interruption program Safe Streets in 4 high-crime neighborhoods	35 high-crime and adjacent neighborhoods	Significant decrease in homicide (−22 %–66 %) in 2 out of 4 sites, and no consistent impact on nonfatal shootings
Wilson and Chermak (2011)	Pittsburgh, PA, USA	1997–2007	Quasi-experimental (DiD)	Violence interruption program in 3 intervention areas across 32 neighborhoods	57 neighborhoods with no program	No impact on overall violence, but a significant increase in aggravated assaults in intervention areas
B. Property abatement						
Aliprantis and Hartley (2015)	Chicago, IL, USA	1999–2011	Quasi-experimental (DiD)	161 public housing building demolitions	Exogenous timing of demolitions	Decrease in homicides (−63 %), and decrease in homicides within a half-mile bandwidth (spillover effects)
Branas et al. (2016)	Philadelphia, PA, USA	2010–2013	Quasi-experimental (DiD)	676 properties compliant with a local ordinance on installing working doors and windows	676 properties that had received a citation but had not yet made any physical reparations	Decrease in aggravated assaults with (−39 %) and without firearms (−13 %)
Cui and Walsh (2015)	Pittsburgh, PA, USA	2005–2009	Quasi-experimental (DiD)	3282 census blocks within 250 ft of a foreclosed property	Surrounding ring of the same size of the intervention area	Increase in violent crime (2.6 %), and no change in property crime
Ellen et al. (2013)	New York City, NY, USA	2003–2011	Quasi-experimental (DiD)	Over 18,000 blockfaces experiencing foreclosures	Over 45,000 blockfaces not experiencing foreclosures located in the same neighborhood	Violent crime increase (2.6 %). No geographical displacement, nor a change in property crime
Han and Helm (2023)	Kansas City, MO, USA	2012–2016	Quasi-experimental (DiD)	559 demolished buildings	Surrounding ring within 354 ft of the intervention area	No significant changes on violent or property crime
Jay et al. (2019)	Detroit, MI, USA	2009–2016	Quasi-experimental (DiD)	343 census blocks groups experiencing more than five demolitions per quarter	343 matched census blocks experiencing less than five demolitions per quarter	Violent crime increase (11 %), and no evidence of spatial crime displacement
Kondo et al. (2015)	Philadelphia, PA, USA	2010–2013	Quasi-experimental (DiD)	676 properties compliant with a local ordinance on installing working doors and windows	676 properties that had received a citation but had not yet made any physical reparations	Decreases in gun assaults (−4 %), all assaults (−2 %), but mixed findings on robberies, narcotics, and property crimes
Kondo et al. (2022)	Columbus, Ohio, USA	2008–2019	Quasi-experimental (SCM)	Healthy Homes housing interventions in 1 zip code	Weighted comparison of 29 zip codes not experiencing intervention	Null effects on violent crime and total crime
Lacoe and Ellen (2015)	Chicago, IL, USA	2007–2011	Quasi-experimental (DiD)	Block faces experiencing foreclosures	Blockfaces not experiencing foreclosures	Violent crime increase (0.9 %) and total crime increase (1.1 %) per foreclosure on a block
Locke et al. (2023)	Baltimore, MD, USA	2014–2019	Quasi-experimental (DiD)	775 block faces experiencing building removals	524 matched block faces with vacant buildings and no removal	Decreases in violent crime (−3.0 %), burglary (−1.9 %), and simple assault (−4.8 %)
MacDonald et al. (2023)	Philadelphia, PA, USA	2017–2020	RCT (cluster)	58 full housing remediation and recurrent trash/weeds cleaning	107 vacant buildings with no intervention	Decreases in disrepair (−27 %), and improvement in disrepair predicted a reduction in weapons violations, gun assaults, and shootings.

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Table 1 (*continued*)

Citation	Location	Period	Study design	Intervention	Control	Findings
Sandler (2017)	Chicago, IL, USA	1999–2010	Quasi-experimental (DiD)	City-blocks surrounding 276 public housing demolitions	City-blocks within a 3-mile radius from the demolitions	Decreases in murder (−31.4 %), assaults (−32.4 %), robberies (−16.9 %), and spillover effects at greater distances
South et al. (2021)	Philadelphia, PA, USA	2006–2013	Quasi-experimental (DiD)	6732 block faces experiencing property renovations via the Basic Systems Repair Program	Blocks with properties wait-listed to receive the program	Decreases in overall crime (−21.9 %), burglary (−18 %), theft (−25 %), aggravated assault (−19 %), robbery (−22.6 %), and homicides (−21.9 %).
South et al. (2023)	Philadelphia, PA, USA	2017–2020	RCT (cluster)	58 full housing remediation and recurrent trash/weed cleaning, 93 recurrent trash/weed cleaning	107 vacant buildings with no treatment	Decreases in weapons violations (−8.4 %), gun assaults (−13.1 %), and shootings (−6.9 %) from full housing remediation, null effects for trash cleanup, and no evidence of crime displacement
Spader et al. (2016)	Cleveland, OH, USA; Chicago, IL, USA; Denver, CO, USA	2008–2013	Quasi-experimental (DiD)	Neighborhood Stabilization Program (mostly demolition or rehabilitation) 0–250 ft distance from 1420 properties	Surrounding ring of 250–354 from 1420 properties	Increases in property crime (6.9 %) in Cleveland. No effects on other cities, nor violent crime
Stacy (2018)	Saginaw, MI, USA	2008–2009	Pre-post comparison	254 single-family property demolitions in 72 block groups	None	Decreases in violent crime (−6.7 %), property crime (−9.7 %), and some evidence of crime reductions in adjacent areas
C. Vacant land remediation						
Beam et al. (2021)	Milwaukee, WI, US	2005–2017	Quasi-experimental (DiD)	53 community gardens	159 matched vacant lots	Community gardens reduced violent crime (−4 %), but no overall change in total crime
Branas et al. (2011)	Philadelphia, PA, USA	1999–2008	Quasi-experimental (DiD)	4436 vacant lots cleaned and greened via PHS	13,308 vacant lots in violation of city ordinance	Decreases in robberies (−3.6 %) and felony assaults (−4.5 %)
Branas et al. (2018)	Philadelphia, PA, USA	2011–2014	RCT (cluster)	206 vacant lots cleaned and greened or 174 mowed and maintained via PHS	161 no treatment vacant lots	Reduced gun assaults (−2.7 %) from greening, any intervention (−4.5 %), and no displacement
Kondo et al. (2016)	Youngstown, OH, USA	2010–2014	Quasi-experimental (DiD)	244 greened and maintained vacant lots	959 vacant lots that were not cleaned and greened	Bimonthly reduction of in robberies (−3.6 %) and felony assaults (−4.5 %), and no evidence of displacement
Kondo, Morrison, et al. (2018)	New Orleans, LA, USA	2013–2016	Quasi-experimental (DiD)	204 vacant lots cleaned by the Fight the Blight program.	506 untreated vacant lots more than 250 ft away intervention lots	No change in 911 calls for violent, but small increase in drug-related 911 calls (6 %)
Heinze et al. (2018)	Flint, MI, USA	2009–2013	Quasi-experimental (DiD)	216 residential streets segments that contained vacant lots maintained by community groups	446 street with unmaintained vacant lots	Decreases in aggravated assaults (−38.1 %) and overall violent crime (−34.9 %)
MacDonald, Nguyen, Jensen, Branas (2021a, 2021b)	Philadelphia, PA, USA	2006–2018	Quasi-experimental (DiD)	4046 vacant lots cleaned and greened via PHS	8742 vacant lots in violation ordinance	Decreases in robberies (−20.8 %), with no evidence of displacement
Moyer et al. (2019)	Philadelphia, PA, USA	2011–2015	RCT (cluster)	206 vacant lots cleaned and greened or 174 mowed and maintained via PHS	161 no treatment vacant lots	Decreases in shootings (−6.8 % greening and − 9.2 % cleaned lots), with no evidence of displacement
Stern and Lester (2021)	Chicago, IL, USA	2010–2019	Quasi-experimental (DiD)	1332 blockfaces selling a property via the Large Lots Program	Blocks yet to be enrolled in Large Lot Program	Decreases in overall crime (-3.5 %). The effect increased to -6.8 % when the property was sold to an owner living in the same neighborhood
D. Lighting and Cameras						
Chalfin, Kaplan, et al. (2022)	Chicago, IL, USA	2010–2018	Quasi-experimental (DiD)	300,000 street light outages	Street segments with no light outages	Null effect on immediate block but increases robberies (6 %) and assaults (2.1 %) in nearby blocks
Chalfin, Hansen, et al. (2022)	New York, NY, USA	2016	RCT (paired)	40 public housing developments	40 public housing developments	Decrease in nighttime outdoor index crimes (−35 %)
Circo et al. (2023)	Detroit, MI, USA	2017–2019	Quasi-experimental (DiD)	560 Project Green Light addresses	Matched comparison of 1136 other addresses	No impact on violent crime
Davies and Farrington (2020)	Maldon, Essex, England	2004–2006	Quasi-experimental (DiD)	Lights switching off	Wards without lights switching off in adjacent districts	Decrease in violent crime (−15 %)
Gómez et al. (2021)	Medellín, Colombia	2013–2015	Quasi-experimental (DiD)	70x70m grid cells around 587 locations with CCTV	Grid cells around 587 locations more than 300 m from CCTV	Decrease in violent crime (−26 %) and property crime (−17 %)

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Table 1 (*continued*)

Citation	Location	Period	Study design	Intervention	Control	Findings
Piza et al. (2015)	Newark, NJ, USA	2011	RCT (paired)	19 CCTV with additional camera operator and two dedicated patrol cars	19 CCTV with usual police response	Decrease in violent crime (−40–48 %)
Priks (2015)	Stockholm, Sweden	2004–2009	Quasi-experimental (DiD)	100 subway stations with CCTV installed eventually during the study period	Exogenous timing of CCTV installation	Decrease in robberies (−60 %), null effects on assaults
Tompson et al. (2023)	Thames Valley, England	2004–2013	Quasi-experimental (ITS)	815 lights switching off after midnight	30,716 street segments without lights switching off	Decrease in thefts (44 %). Decrease in violent crime (−25 %)

2.1.1. Private security: safe passage program

A Safe Passage program is a community-based initiative designed to enhance public safety by providing designated, secure routes for school-aged youth to travel through areas with potential safety concerns, such as high-crime neighborhoods. The program is implemented in collaboration with local law enforcement, schools, and community organizations and aims to create a visible and protective presence along these routes to deter criminal activity. Instead of sworn police officers, unarmed civilians wearing some form of uniform or insignia act as guardians along the safe passage routes. Two studies have examined the effects of the Safe Passage program on local crime.

McMillen et al. (2019) examined the effect of the Safe Passage program in Chicago, IL, on local violent and property crime. Hiring civilians to be guards on the routes to Chicago schools began in 2009 and, by 2016, was expanded to 140 schools in the city. The study compared the change in crime incidents within 660 ft of the Safe Passage routes compared to similarly sized adjacent areas. The staggered implementation of the program allowed the study to investigate changes in serious crime around Safe Passage routes relative to adjacent areas at different points in crime, controlling for some area-level demographic characteristics. The Safe Passage program was estimated to have led to a decrease in violent crime by −14 %, driven by fewer robberies and aggravated assaults committed by juveniles. Because of the relatively inexpensive cost of hiring the guards, the intervention might be an efficient place-based strategy to decrease violent crimes youth commit in high-crime areas around schools.

Sanfelice (2019) also examined the crime reduction benefits of the Safe Passage program in Chicago, IL. This study focused on street segments as their unit of analysis and closely assessed the temporal and spatial spillover effects of the intervention. The study found Safe Passage was associated with a decrease in simple assaults with batteries (−28 %, or 0.83 incidents per 1000 ft per school year) and aggravated assaults (−32 %, or 0.58 incidents per 1000 ft per school year). The study found no temporal displacement but some evidence of spatial spillover. Street segments adjacent to the Safe Passage routes also showed a decrease in violent crime relative to street segments further away. The study found some evidence of displacement in property crime, showing a slight increase in thefts and criminal damage outside the immediate Safe Passage routes and their adjacent street segments.

2.1.2. Private security: business improvement districts

A business improvement district (BID) is a geographically defined area in a city within which businesses collaborate to fund, manage, and implement projects and services to enhance the local environment and promote economic development. BIDs are often funded through special assessments on property owners within the district. A BID can increase safety by implementing various measures such as enhanced lighting, security patrols, surveillance systems, and collaboration with law enforcement agencies. There have been several studies on the effects of BIDs on crime, which we summarize below. BIDs have often formed in business districts with higher-than-average rates of violent crime in cities.

Cook and MacDonald (2011) assess the effect of business improvement districts in Los Angeles, CA, on crime. During 1994–2005, 30 BIDs emerged within 179 out of 1072 Los Angeles police reporting districts. The study leveraged the differential adoption of BIDs across districts, comparing the relative change in crime to adjacent non-BID areas. The study also examined the effects after considering temporal lags and leads and spatial spillovers. Adopting a BID consistently decreases all types of crime, with increasing reductions each year after the emergence of BID. The study found BID formation was associated with a yearly decrease in robberies of −18 %. Acknowledging the geographical and financial heterogeneity among BIDs, the study examined a dose-response effect of private security expenditures on crime: each additional $10,000 per BID leads to -0.59 incidents of robbery, -0.43 incidents of assault, and -.53 of burglary per year. At the same time, there was no evidence of crime displacement in adjacent districts.

MacDonald et al. (2013) examined the association between self-reported violent victimization of juveniles inside or outside BID-affected areas of Los Angeles, CA, during 2006–2007. Using a telephone survey sample of 1372 households, the study estimated models that control for individual, household, and neighborhood attributes. The cross-sectional study found that youth living near BIDs, compared to those living in areas with similar demographic characteristics, do not report significant differences in violent victimization. Because the research design is cross-sectional and the survey sample is modest, their null findings likely result from statistically under-powered design and suggest that the effect of BIDs on self-reported violent victimization of youth is small or nonexistent.

Piza et al. (2020) focus on a particular dimension of BIDs: a BID-associated police substation in downtown Newark, NJ. Drawing from official crime data from 2009 to 2018, they compare crimes across 314 street segments and intersections within the area affected by the police substation with crimes outside the area across 10,247 street segments and intersections using the micro-synthetic control method. The synthetic control method takes a weighted combination of street segments outside the BID area comparable to pre-existing crime trends. They find mixed evidence of crime reduction effects of this intervention on crime. Burglaries and motor vehicle thefts exhibit a significant decrease compared to synthetic control street segments, with some evidence of the diffusion of benefits. However, robberies and thefts from cars appear to be displaced to nearby control zones.

2.1.3. Safety ambassadors and violence interruption

Violence interruption programs are community-based initiatives designed to curb and prevent interpersonal violence by deploying trained individuals, often known as violence interrupters, to mediate conflicts and disrupt the cycle of retaliation. These programs attempt to connect at-risk individuals to support services in the hopes that they can address some of the underlying causes of their violence (e.g., lack of jobs

and low educational achievement). Violence interrupters, typically individuals with credible backgrounds and personal experiences related to violence, work to build trust within their communities and intervene in potentially violent situations before they escalate.

Webster et al. (2013) study the effects of the Safe Streets program in Baltimore, MD. The program was implemented in four high-crime neighborhoods in 2006–2010. The study compared the incidence of homicides and nonfatal shootings in areas that received the violence interrupters to adjacent areas and other high-crime areas in Baltimore that did not receive the intervention. The study also controlled for known confounding factors, such as drug and weapon arrests, other interventions, and yearly changes. The study found the program significantly decreased gun violence in only one of the four treated neighborhoods.

Fox et al. (2015) assessed the effects of Project TRUCE, a replication of the Chicago CeaseFire program in Phoenix, AZ. The study compared the rate of shootings, assaults, and violent crime in the 19 months before and after the implementation of the program during 2007–2011 relative to three comparison areas. The study found a significant rise in monthly shootings (54 %) but a significant reduction in overall violent crime by −35 % driven by the large decrease in reported assaults.

Wilson and Chermak (2011) analyze the effects of the One Vision One Life violence interruption program in Pittsburgh, PA. The intervention occurred in three target areas spanning 32 city neighborhoods in 2004–2005. Using crime data on aggravated assaults and aggravated assaults with a gun from 1997 to 2007, the authors used propensity score matching to create a comparison group from 57 unaffected city neighborhoods and control for neighborhood attributes, seasonal effects, and time trends. The study found no evidence of violence reduction. Instead, the study found aggravated assaults increased in the intervention areas. However, the study did not match the crime trends before the intervention. Also, it is difficult to know the size of the effects since the study does not report the mean rate during the intervention period in the target areas.

Buggs et al. (2022) use a difference-in-differences design with a synthetic control method to assess the long-term impact of the Safe Street program that started in Baltimore, MD, in 2007. The study compared city neighborhoods (police post areas) containing seven intervention sites with synthetic control groups consisting of 136 neighborhoods and assessed the effect on homicides and nonfatal shootings, with the data spanning 2003–2017. The study found no consistent effect of the intervention, and even the suggestive effects show evidence of attenuation over time after implementation. Some locations, such as Cherry Hill and Sandtown-Winchester sites, had reductions in homicides (−21 % and − 9 %, respectively) but increases in shootings (11 % and 15 %, respectively), whereas other locations had either increase or no change in homicides and nonfatal shootings.

In general, the literature on the effect of supplemental services on violent crime hot spots suggests potential benefits. Hiring private security to work in high-crime commercial or school corridors appears to help thwart violent crime. Still, it is unclear whether these effects are reproducible in other contexts, such as a violent crime hot spot in a residential area. The evidence for supplemental services provided by street outreach workers (e.g., safety ambassadors and violence interrupters) in violent crime hot spots is not very compelling. The evidence suggests these programs overall do not significantly reduce serious violence in the most violent crime hot spots. Taken together, the evidence suggests that the dynamics of controlling violence may be more difficult in contexts that safety ambassadors or other street outreach worker groups are dealing with than private security working in a commercial or school corridor.

2.2. Property abatement

The strong correlation between urban abandonment and violent crime hot spots raises the question of whether dilapidated properties attract crime. One causal pathway between crime and impoverished communities is when a sudden, steady rise in crime decreases property values, leads residents to move out of communities, and increases foreclosures. An increase in foreclosures caused by economic shocks to the property market could also lead to the deterioration of neighborhoods.[1]

2.2.1. Vacancies and foreclosures

Several studies have examined the relationship between abandoned properties, foreclosures, and crime. Cui and Walsh (2015) leveraged the timing and location of foreclosures in Pittsburgh, PA. They compared the region within 250 ft of a property to its surrounding ring of the same size before and after the foreclosure. A vacant home increased violent crime by 19 % (0.1 standard deviations). The impact was positively related to the vacancy duration, plateauing between 12 and 18 months after the vacancy. The effect attenuated once the property was reoccupied. There were no significant property crime changes. The study's use of smaller areas of analysis came at the cost of not ruling out the presence of spatial spillovers or other factors affecting the overlapping treatment and control areas.

Ellen et al. (2013) compared crime changes on block faces experiencing foreclosures to changes on nearby block faces not experiencing foreclosures but located within the same neighborhood in New York City (e.g., a police precinct or census tract). The study assessed foreclosures based on properties on the way to an auction or reverted to bank ownership as being more likely to be vacant. An additional foreclosure led to an increase in violent crime of 3 %. The changes did not reflect a spatial displacement from neighboring block faces. The study found that clustering three foreclosures within the same block face had larger crime increases.

Lacoe and Ellen (2015) contrasted crime on a block face in Chicago experiencing an increase in foreclosures relative to crime changes on other block faces without foreclosure activity, finding an additional foreclosure on a block was associated with an increase in violent crime of 1 %. The relative increase in violent crime occurred in indoor and outdoor locations, suggesting a net increase was not caused by a reallocation of crimes from outside to indoors.

The evidence on the effect of vacant properties caused by foreclosures on small geographic areas (e.g., block faces) is in the spirit of concerns about the hyper-concentration of violence by place. However, these studies focus on the 2008 financial crisis and the surge of foreclosures during this period, making it difficult to generalize to other contexts and whether the magnitude of the effects translates to periods when foreclosures are less common.

2.2.2. Demolitions of public housing

The slowly degraded conditions of high-rise public housing in many US cities have prompted several policy reforms, including federal support for demolition and reallocation to scattered site low-rise public housing or subsidized private rental properties. High-rise public housing projects have been noted for their disproportionate share of violent crime hot spots (Roncek, 1981). The massive demolitions in US cities provided an opportunity to study the impact of concentrated public housing on crime in communities.

Aliprantis and Hartley (2015) estimated the effect of closing and demolishing nearly 20,000 units of high-rise public housing in Chicago. The variation in the timing and number of building closures before the demolition of high-rise public housing was used to estimate the relative change in serious crime around these locations. Closing 1000 high-rise public housing units was associated with 0.15 fewer homicides per

[1] To the best of our understanding, there is not yet a literature review on the effects of actual or perceived crime on property prices or urban development, but readers can consult some exemplary studies on the topic: Dealy et al. (2017) and Linden and Rockoff (2008).

year, or about a − 63 % decline in the city-block homicides. There was a positive spillover effect measured through a − 39 % reduction in the annual homicides occurring within a half mile from the demolition. The public housing demolition accounted for 9 % of all crime reduction in the city.

Sandler (2017) also assessed the crime impacts of public housing demolitions in Chicago using a difference-in-differences design. The control group included the city blocks within a 3-mile radius of the city block experiencing a public housing demolition. Most of the effect happened within 0.25 miles, so a typical demolition decreased murders by −32 %, assaults by −32 %, and robberies by −17 %. The crime changes declined in the adjacent buffer, suggesting some spillover benefits. Demolitions of poorly maintained units in low-income, high-poverty areas were responsible for most of the crime decline.

One mechanical effect of the demolitions could be having fewer residents in the area. Fewer residents translate into fewer potential victims and offenders, hence, less criminal activity. However, the demolition of public housing also decreased crime in neighboring areas not exposed to housing changes and where the number of residents likely was unaffected. Accordingly, other mechanisms, such as alterations to the built environment, concentrated disadvantage, and neighborhood networks, may have caused the changes in crime. For example, demolishing public housing could decrease crime by dispersing the pockets of poverty and changing the opportunities for crime.

2.2.3. Demolitions of single-family homes

Several studies have also looked at the impact of vacant single-family and small multifamily properties on crime, which descriptive research suggests are hot spots for serious crime and violence (Spelman, 1993).

Stacy (2018) evaluated the impacts of single-family home demolitions on crime in Saginaw, MI. Block groups that experienced a demolition were assessed over time (a within-estimator). The study found a − 7 % decrease in violent crime was associated with an additional demolition (around two crimes per block year or 0.72 standard deviations). Property crime decreased by −10 % (five crimes per block year or 1.1 standard deviations). After four months, violent crime seems to have bounced back to pre-intervention levels but led to crime reductions in the contiguous block groups (one crime per block year or 0.38 standard deviations), suggesting limitations to the crime effects of property demolitions.

Jay et al. (2019) examined a large-scale demolition program in Detroit, MI, with nearly 10,000 demolished buildings. The intervention was block groups with more than five demolitions in a quarter, while the control group was areas with less than five demolitions. Accordingly, the comparison is relative to an area that received a smaller dosage rather than no dosage. The motivation for this design was that demolishing a single property may not influence the neighborhood, given the widespread prevalence of vacant properties in the city (around 78,000). Moreover, using block groups which are considerably larger geographical units than block faces, would allow for measuring visible neighborhood transformations. Using a difference-in-differences design with a matching process, the research found a -11 % reduction in firearm assaults. Areas experiencing more than 13 demolitions per quarter block group did not experience larger crime declines, suggesting that crime changes eventually plateau due to decreasing marginal returns.

Han and Helm (2023) inspected the relationship between demolitions and crime in Kansas City, MO. Comparing changes between areas demolishing a dangerous property to the adjacent concentric area within 353 ft, the study found no statistical changes in violent or property crime. The conclusion did not change after removing overlapping areas to address the potential contamination of control units. However, one major limitation of this study is the low base crime rate around the demolished building (0.48 violent and 1.7 property crimes per year) and large standard errors (approximately 29 %), which means that the study did not have sufficient statistical power to detect small effect sizes.

Locke et al. (2023) studied demolitions in Baltimore, MD, a city long affected by high crime and vacancy levels. The Project Creating Opportunities for Renewal and Enterprises aimed to demolish and deconstruct (e.g., materials were salvaged for reuse) vacant properties. The blocks experiencing demolitions were compared to areas without any demolitions. The control group was at least 100 ft away to prevent spatial spillover contamination. The outcome of interest was measured as crimes per square mile using a 50 m resolution kernel density estimation. The difference-in-differences design showed declines in violent crime (−3 %), burglary (−2 %), and simple assaults (−5 %). Crime displacement was not examined.

Finally, Spader et al. (2016) examined the impact of the Neighborhood Stabilization Program on crime in three US cities (Cleveland, OH, Chicago, IL, and Denver, CO). The program's resources could be spent on demolition and rehabilitating foreclosed and vacant properties. Cleveland spent 89 % of the program's budget on demolition and 8.4 % on rehabilitation and redevelopment, while Chicago and Denver spent 41 % and 92% on demolitions and 55% and 0% on rehabilitation and development, respectively. Comparing crime changes within 250 ft of the properties that received Neighborhood Stabilization Program interventions to a concentric circle of equal area just outside this area. Only Cleveland experienced a − 7 % decrease in property crime. Two limitations may have caused the null results. First, an overlap between treated and control areas could have attenuated the impacts. Second, due to the low base crime rate (e.g., Cleveland and Denver had less than one crime per year in the intervention areas), it is possible that the study was under-powered to detect the effects of the program on crime.

Overall, the evidence suggests that demolishing single-family and small multifamily properties influences reported criminal activity in high-crime places. Areas highly affected by vacancy may need a larger dosage of demolished properties to experience detectable crime effects. Still, there seems to be decreasing marginal returns of demolishing structurally dangerous properties. Tearing down another building in the same community may not produce greater crime reductions beyond some threshold. Whether single-family property demolitions will cause positive spillover effects by decreasing crime in adjacent areas is still an open research question.

2.2.4. Abandoned property

Remediation is another approach to dealing with abandoned and vacant property. Several cities have enacted ordinances that require vacant building owners to replace plywood boards and metal grate coverings with working doors and windows and to require that yards remain free of overgrown vegetation and trash. Cities also have used land banks to transfer abandoned properties owned by cities to private individuals to encourage remediation. The underlying motivation for these ordinances is to remove easy-access entry points and unauthorized entries to the premises to reduce squatting, drug dens, and the concealment of criminal activity from the public eye. Reducing the appearance of abandonment also makes it more difficult to distinguish whether a building is vacant or occupied. Engaging the private sector in neighborhood renewal may also speed up the time for redevelopment or forestall the spread of abandoned properties.

Kondo et al. (2015) studied the impacts of Philadelphia's 2011 Doors and Windows Ordinance. This local regulation made it unacceptable to secure properties with materials other than windows with frames and glazing or entry doors. Property owners not complying with the ordinance received a written notice, followed by a penalty, and, ultimately, the city would correct the conditions, charging the owner for all costs. This research compared changes around buildings that complied with the ordinance to buildings that had received citations but had not made any structural reparations. They used a matching process, removed control units within 0.25 miles of their paired treatment to avoid spillover contamination, and used a 100-ft kernel density estimation. The difference-in-differences method found that installing working doors and windows decreased all assaults (−2 % change), gun assaults (−4 %),

and all nuisance crimes (−1 %), but increased robberies (1 %), narcotics sales, and possessions (3 %), and property crimes (3 %) around the building. When using a large unit of analysis (census tract), most results became statistically insignificant, suggesting that the effect is geographically localized. Some property owners filed for city permits to make renovations beyond the ordinance requirements. Such renovations decreased violent gun crime (−10 %), assaults (−8 %), robberies (−2 %), narcotics sales and possession (−13 %), and property crimes (−13 %).

Branas et al. (2016) also examined the effects of Philadelphia's 2011 Doors and Windows Ordinance. The researchers used the same method (difference-in-differences), time frame (2010−2013), and comparison group (buildings that had received citations but had not yet made any structural reparations) but analyzed aggravated assaults with or without involving firearms. They found a decrease in firearm-related aggravated assaults of −39 % and non-firearm-related aggravated assaults of −13 % around the vacant building. The social return on investment in remediating a property was five times its costs, making it a cost-effective strategy. There was no assessment of displacement of violent crime nearby.

Kondo et al. (2022) assessed the Healthy Homes intervention, focusing on home reparations and full gut renovations. The program remediated 183 properties, concentrated in a 31-block area within a single zip code in Columbus, OH. The control group consisted of the remaining non-adjacent zip codes in Franklin County. The study estimated the program's effect using a synthetic control method, commonly used in case studies where only one unit is treated. Synthetic control builds a weighted average from a pool of control units and examines post-intervention changes relative to the treated unit. The coefficients of robberies and assaults were negative but not statistically significant (*p*-values of 0.24 and 0.17). While the authors find significant theft reductions, most of the donor pool was not considered in the p-value estimation (likely due to poor matching). Hence, one cannot conclude there were meaningful crime changes. Having a sample size of 30 units makes this study statistically under-powered to detect small differences. Zip codes are also large areas with 23,000 to 30,000 individuals, making it unlikely that the program's effect could be detectable in such a large geographic area.

South et al. (2023) conducted the first citywide randomized trial to assess the effects of housing remediation strategies on crime. The intervention was randomized at the cluster level among an eligible list of abandoned houses to ensure no contamination among groups. The intervention had three arms: 1) full housing remediation (install working doors and windows, remove or repair deteriorated structures from front facades, and clean trash and weeds over the post-intervention period); 2) trash cleanup (removal of debris and weeds in front of the house and sidewalk and graffiti removal); and 3) no intervention at control sites. Full housing remediated properties decreased weapons violations by −8 %, gun assaults by −13 %, and shootings by −7 %. The trash cleanup intervention had no detectable effect on gun violence outcomes. There was no significant evidence of spatial displacement of gun violence outcomes in the adjacent areas (330–660 ft away); if anything, there may have been spillover benefits. The perception of safety did not change. The intervention had 20 clusters with 93 abandoned houses. Even assuming a small intra-class correlation, the intervention was likely statistically under-powered to detect small changes. Hence, the results may be different in a large-scale intervention.

MacDonald et al. (2023) examined the same randomized control trial from Philadelphia, PA. However, they used systematic social observations from photo images taken at the properties and blocks to measure disrepair and physical disorder. Disrepair included boarded-up windows and doors and damaged stairs and walls. Physical disorder contained scattered trash and debris, overgrown plants and weeds, and graffiti. These additional measurements had two purposes. First, to confirm whether the intervention changed visual cues of disorder and disrepair above and beyond the treatment. The levels of disorder at the house level decreased by around −30 % in the trash cleanup and house remediation interventions. The levels of disrepair were only reduced in the house remediation. This result suggests that removing debris and weeds did not encourage residents to make additional property changes. Second, the disrepair and disorder measurements were used to identify their contribution to influencing crime changes. An improvement in disrepair predicted a reduction in weapons violations, gun assaults, and shootings. The evidence on disorder is mixed and imprecisely measured, making it challenging to extract conclusive evidence.

All previous interventions have focused on vacant properties. South et al. (2021) examined whether remediating resident-occupied properties also influences neighborhood safety by evaluating the Basic Systems Repair Program in Philadelphia, PA. The program provided grants of up to $20,000 to low-income property owners for electrical, plumbing, heating, and roofing reparations on owner-occupied homes. They compared changes between block faces with remediated properties and block faces with homeowners who were wait-listed to receive the intervention but have yet to receive it. Remediating an additional property decreased overall crime (−22 % or 0.09 standard deviations change), driven by decreases in all crime subcategories: burglary (−18 % or 0.06 standard deviations), theft (−25 % or 0.08 standard deviations), aggravated assault (−19 % or 0.06 standard deviations), robbery (−23 % or 0.08 standard deviations), and homicides (−22 % or 0.04 standard deviations). While remediating more homes per block face brought larger crime reductions, the effects were not different after renovating four homes, suggesting decreasing marginal returns.

2.2.5. *Vacant land remediation*

Another way to reduce urban deterioration is to encourage community groups and private individuals to remediate vacant lots that are often 'eyesores' and seen as magnates of crime and other antisocial behaviors (Garvin et al., 2013).

Branas et al. (2011) examined crime changes around 4436 cleaned and greened vacant lots in Philadelphia, PA between 1999 and 2008 compared to 13,308 vacant lots that were not remediated but were in the same sections of the city. These vacant lots are often located in the most violent crime hot spots of Philadelphia, though the study was not focused on hot spots. The study found yearly reductions of −4 % in assaults, −9 % in gun assaults, and -4 % in gun robberies around vacant lots that were cleaned and greened.

Hurricane Katrina exacerbated the problem with abandoned properties and vacant lots in New Orleans. Kondo, Morrison, et al. (2018) evaluated the city's Fight the Blight Program, which aimed to remediate and conduct maintenance on properties. For owners who failed to comply on time, the city remediated the property on their behalf, charging the costs to their tax bill. The remediation comprised mainly the removal of debris and mowing of overgrown grass. The study compared changes across time between 204 treated lots and 560 eligible properties that had not received the intervention yet. The control units were 250 ft away to reduce the contamination between groups. The study focused on 911 calls for violent and property crimes and aggregated to three-month intervals based on weighted crime counts based on distance of 100 × 100 feet grid cells. Violent crime calls for service (homicide, robbery, assault, and rape) did not change significantly around remediated lots. There was a small (−3 % to −9 %) decrease in calls for drug offenses around remediated lots. The study, however, did not test for displacement of crime.

Kondo et al. (2016) studied a vacant-lot greening program in Youngstown, OH. They examined changes in crime around 166 contractor-greened lots and 78 community reuse lots that community members maintained compared with 959 vacant lots that were not cleaned and greened between 2010 and 2014. The study found a bimonthly reduction of −4 % and − 5 % robberies and felony assaults around greened lots. The research controlled for displacment and contamination and showed slightly larger effects around community-maintained lots.

Heinze et al. (2018) examined a community-based greening of vacant lot program in Flint, MI, where the land bank transfers ownership of vacant lots to local neighborhood groups who pledge to clean, green, and maintain the vacant parcels. Some community groups also add gardens to vacant lots as part of this program. The study examined the monthly change in reported aggravated assaults and all violent crimes on 216 street segments that were part of the cleaning and greening program compared to other 446 street segments in the same census block group area with vacant lots that were not remediated. The study also controlled for neighborhood level confounding variables like poverty and population density. Vacant lot remediation was associated with a -38 % reduction in aggravated assaults and a -35 % reduction in violent crimes overall per month. The study did not directly examine displacement effects.

Branas et al. (2018) conducted the only citywide randomized experiment of vacant lot remediation. Relying on the same organization that conducted citywide vacant lot greening and stabilization in Philadelphia, PA, they randomly assigned 541 lots to receive full cleaning and greening ($n = 206$), cleaning and mowing ($n = 174$), or no-treatment control condition ($n = 161$). They examined 38-months of reported crime data (18 months pre and post intervention). The study found the full cleaning and greening was associated with a -3 % reduction in gun assaults compared to the control condition. Both combined interventions were associated with a -5 % decrease in gun assaults relative to the control condition of no intervention. The study also examined displacement using buffers of 0.1 and 0.2 km around each vacant lot, finding no evidence of gun assaults rising in adjacent buffers.

Moyer et al. (2019) extended this experimental evaluation in Philadelphia and estimated the effect of remediating vacant lots on firearm shootings. The authors found that the full cleaning and mowing were associated with a -7 % and -9 % reduction in monthly shootings with no evidence of displacement to adjacent buffers of 300 to 600 m.

MacDonald, Nguyen, Jensen, Branas (2021a) also extended the vacant lot remediation quasi-experimental and experimental evaluations in Philadelphia. In a quasi-experimental evaluation, they found vacant lot remediation was associated with a -21 % reduction in robberies per month between 2006 and 2018. In the experimental replication, they found that vacant lot remediation was associated with a -16 % decrease in assaults per month. In both quasi-experimental and experimental analyses, they assessed displacement using three buffers of 500, 100, and 1500 ft around each lot, as well as a model that controlled for spatial correlation. Overall, there was no evidence of displacement.

Stern and Lester (2021) evaluated the impacts of Chicago's Large Lots Program, which transfers land ownership to the community. Buyers had to be property owners in the same block, but residency was not a requirement, and they had to retain ownership of the new land for at least five years. The authors compared crime changes between block faces with a property sold via the program and those without sales. The difference-in-differences design showed a − 4 % reduction in overall crime (including violent, property, and low-level criminal offenses) in blocks experiencing lots sale. The effect increased to a crime reduction of −7 % when the buyer was a resident of the same neighborhood. This research design did not account for potential treatment-control contamination, which could have attenuated the estimates.

Beam et al. (2021) examined the conversion of vacant lots in Milwaukee, WI, on reported crimes. They examined the change in violent and property crimes around 53 community gardens to 159 vacant lots matched based on the same neighborhood areas. Converting vacant lots into community gardens was associated with a yearly reduction in violent crime of −4 % (sum of homicide, simple assault, and aggravated assault) within a 250 m buffer. The study did not assess displacement effects.

Overall, the evidence suggests that addressing property abatement through demolitions, abandoned housing rehabilitation, or vacant land remediation and greening can significantly reduce violent crime in high-crime areas. However, the studies do not focus on the violent crime hot spots as a whole, and many do not adequately address displacement effects.

2.3. Visibility and surveillance

Changing surveillance and visibility of public spaces in violent crime hot spots is another potential way to improve public safety, making it more difficult for criminal offenders to conceal violent behaviors and easier for citizens and police to observe criminal behavior. Improved street lighting and closed-circuit television cameras (CCTV) are two examples of ways to increase surveillance and may generate public safety benefits in violent crime hot spots. Improved lighting and CCTV may thwart criminal offending by increasing the perceived certainty of apprehension (Akers, 1990; Becker, 1968). Police officers may also be more likely to detect criminal behavior and arrest offenders in well-lit areas or places with CCTV (Welsh et al., 2022). Given the concentration of crime among a relatively small number of offenders, even a small increase in arrests could lead to an appreciable decline in crime (Cook, 1986; Ratcliffe, 2002; Roman et al., 2009).

Improved surveillance may also change public use of spaces during nighttime hours if individuals feel safer in well-lit areas or places with CCTV presence (Painter, 1996). More outdoor activity among people may increase the number of "eyes upon the street", and people acting as capable guardians (Cozens & Davies, 2013; Cozens & Hillier, 2012). On the other hand, more people in a given area means more potential victims and a greater supply of criminal opportunities (Roncek & Maier, 1991). Greater visibility also might empower potential offenders by reducing their search costs, enabling them to locate more vulnerable victims or lucrative criminal opportunities (Ayres & Levitt, 1998; Welsh & Farrington, 2008). The effect of ambient lighting and CCTV on crime is, therefore, theoretically ambiguous.

An improvement in the physical environment of a neighborhood, such as the installation of new street lights and CCTV cameras, may also serve as a cue that an area is cared for and that criminal behaviors violate community norms (Sampson et al., 1997). Under this theory, street lighting and CCTV may signal a higher level of collective use of space and informal social controls.

2.3.1. Street lighting

While the academic literature on street lighting is summarized in a recent systematic review by Welsh et al. (2022), two recent papers provide critical proof-of-concept on the benefits of ambient lighting. Doleac and Sanders (2015) and Domínguez and Asahi (2023) use the variation in ambient lighting induced by the discrete shift to daylight savings time (DST) in March and October of each year to estimate the impact of street lighting on crime. Both studies found that ambient lighting at a given hour of the day, driven by a changeover to DST, reduces street crimes, particularly robbery. But neither study examines the impact of lighting on violent crime hotspots.[2] A few recent quasi-experimental studies examine the impact of street light outages, either planned or unplanned, on violent crime in small geographic areas.

Chalfin, Kaplan, et al. (2022) examined what happened to crime in Chicago, IL, between 2010 and 2018 on street segments where approximately 300,000 street light outages were reported compared to street segments within 500 ft of the impacted street. The paper finds null effects on nighttime robberies and assaults on street segments with major light outages, but an increase of 7 % in robberies and 2 % in assaults in street segments within 500 ft. The findings from this study suggest that the major street light outages may have displaced violent crime nearby, a potential artifact of a shift in human activity to adjacent

[2] Doleac and Sanders (2015) study the effect of daylight savings time in the United States using data from the National Incident-Based Reporting System while Domínguez and Asahi (2023) examine the effect of daylight savings time using data from Chile.

areas.

Tompson et al. (2023) studied variations in lighting conditions in Thames Valley, United Kingdom, where lights were either turned on or off at midnight on a given block on a given day. Switching the lights off at midnight reduced thefts from vehicles by −44 % on affected streets, but was offset by an increase in thefts from vehicles of 55 % on adjacent streets. Shutting off lights at midnight reduced violence by −25 % (p = .06) on impacted street blocks, with no evidence of displacement to adjacent blocks.[3]

There is a single field experiment on the effect of enhanced street lighting on crime. Chalfin, Hansen, et al. (2022) studied the random allocation of temporary street lights to 40 public housing developments in New York City, finding that additional street lights reduced serious outdoor nighttime crimes by −36 % percent during the initial six months of follow-up. The effect largely persisted over three additional years (Mitre-Becerril et al., 2022). This experiment provides evidence that lighting can be used tactically to reduce serious crime in public housing complexes that are hot spots for violence. However, the study has notable limitations. The study examined large temporary light towers that were extraordinarily bright and were not a natural part of the neighborhood environment. The crime reduction benefits might not be as great if the streets had more modest street lights. Additionally, the unique nature of the treated places, which are high-rise public housing complexes, means there is substantial uncertainty about the external validity of the findings. This experiment does provide rigorous evidence of the causal effects of enhanced street lights in high-rise public housing complexes, and is consistent with several older quasi-experimental studies that found installing enhanced street lights reduced crime in commercial and residential blocks in Atlanta, Milwaukee, Fort Worth, and Kansas City (Welsh & Farrington, 2008).

2.3.2. *Surveillance cameras*

The technology that makes surveillance cameras possible has existed since the late 19th century (Salazard et al., 2006). The use of surveillance cameras has been particularly salient in the United Kingdom (UK). The UK Home Office in the 1990s devoted a substantial share of its budget to installing CCTV cameras throughout UK cities as part of its crime prevention plan (Armitage, 2002).

Surveillance through CCTV has the potential to control crime through several different mechanisms. First, the presence of CCTV may deter offenders by raising the perceived or actual probability of apprehension for a given crime (Clarke, 1995; Gill & Spriggs, 2005). Actively monitored CCTV can increase the probability of apprehension by routing nearby police personnel to the location of a crime in progress or providing video footage in police investigation (Ashby, 2017). As long as offenders perceive that CCTV increases the likelihood of apprehension, they may have a deterrent impact on crime, even if they do not actually raise the probability of apprehension. If CCTV raises the probability of arrest, it may also generate incapacitation of active offenders (Ratcliffe, 2006). Four recent studies offer causal evidence from quasi-experimental and experimental designs on the effects of CCTV on violent crime.[4]

Circo et al. (2023) evaluated Project Green Light, an integrated CCTV program that provided enhanced use of CCTV cameras in 560 commercial and residential areas deemed as crime hot spots to 1136 other addresses with at least one crime in Detroit, MI, between 2017 and 2019. The study found no change in violent crime around properties enrolled in the CCTV program, and a 7.4 % *increase* in property crime was driven by the earlier adoption locations.

Gómez et al. (2021) studied the expansion of CCTV in Medellin, Colombia, on crime between 2013 and 2015. They compared changes in crime in 70 × 70 meter grid cells within 120 m of 587 locations with CCTV installed compared to grid cells more than 300 m from CCTV. The study also used adjacent grid cells of 120 to 300 m as a spillover comparison. CCTV decreased violent crime by an estimated −26 % and property crime by −17 % after installation, with no evidence of displacement.

Piza et al. (2015) studied the effect of enhanced CCTV operation in Newark, NJ, on crime over an 11-week intervention. The research team randomly assigned 19 CCTV cameras to have an additional camera operator and two dedicated patrol cars compared to 19 CCTV cameras that operated with the usual police response. The study found that the enhanced use of a camera operator and dedicated patrol decreased violent crime by −40 % to −48 %.

Priks (2015) studied the installation of CCTV in Stockholm, Sweden, in 100 stations from 2004 to 2009. Relying on the exogenous timing of camera installations, the study compared changes in robberies and other crimes before and after CCTV installation. The installation of CCTV led to an estimated − 60 % decrease in robberies and no statistically significant effects for assaults. Notably, the number of robberies in Stockholm subways is rare, so the reduction equates to only a few total robberies.

In summary, while research on CCTV and street lights has expanded over the last decade, there are notable limitations when understanding its effects in violent crime hot spots. First, there continues to be uncertainty about the specific contexts in which CCTV cameras and lights are more effective. While the available evidence suggests that surveillance cameras are particularly useful for reducing vehicle thefts in parking lots (Welsh et al., 2022), there is no compelling evidence about reducing violent crime hot spots. Major light towers in public housing complexes in New York City appear to help reduce nighttime violence on the streets, but it is unclear how this translates to more normal street lights or non-public housing complexes. Active monitoring appears in one important experiment in Newark, New Jersey, and it may be that the effects of CCTV cameras on violent crime hot spots depend critically on the responsiveness of law enforcement monitoring. Understanding how law enforcement works in tandem with actively monitored cameras is a continuing priority for future research. Finally, relatively little is known about the usefulness of street lights or CCTV in solving crimes and incapacitating offenders. Some evidence suggests that the availability of surveillance footage can modestly increase case clearance rates (e.g., Ashby (2017); Morgan and Dowling (2019); Jung and Wheeler (2023)), but more systematic evidence is needed. Additionally, research identifying if eyewitnesses are more likely to get good descriptions of criminal suspects on streets with improved street lighting is critical to know if lights provide some impact on crime through the incapacitation of active offenders.

3. Weaknesses of existing research and future directions

This review suggests that place-based interventions could be critical to improving some of the situational aspects of places that help form violent crime hot spots. However, the research has several weaknesses in methods, causes of effects, specific strategies, and external validity.

The majority of studies reviewed do not test for displacement. When studies test for displacement, many do not have sufficient statistical power to rule out no displacement or spillover. Some criminology studies rely on the weighted displacement quotient, which provides no standard errors and does not allow one to test whether the displacement or spillover is larger than one would expect by chance. The weighted displacement quotient is an algebraic reformulation of a difference in

[3] Steinbach et al. (2015) and Davies and Farrington (2020) both study a similar intervention in the United Kingdom in which lights were switched off – or dimmed – at night to save money. However, these studies focused on large administrative areas of either the district (Davies & Farrington, 2020) or Middle Super Output Areas (Steinbach et al., 2015) and neither study detects an effect on violent crime.

[4] Much of the academic literature is summarized in a recent meta-analysis of the effects of CCTV on public safety by Piza et al. (2019) which surveys research spanning the last forty years, including observational and experimental studies.

differences estimator with an adjacent neighbor comparison group. Future research should use the difference in difference estimator with an adjacent neighbor comparison group instead of the weighted displacement quotient as it provides standard errors.

Research on place-based approaches to reducing violent crimes in places is largely silent on the mechanisms or the causes of the effects. Several interventions suggest that place-based interventions change the situational aspects of places, but they rarely actually evaluate the social dynamics of places before and after the intervention. One experiment on vacant lot remediation in Philadelphia did involve systematic qualitative work of ethnographers to identify candidate mechanisms (Branas et al., 2018). Future research should rely on direct or indirect social observations (Reiss, 1971) of places to see how human activity and interactions change after a place-based intervention has occurred in a violent crime hot spot. Cell phone mobility data are now available and can at least track human activity around places of interest, offering a new method for more easily collecting information on the volume and mixture of people in a place. Inexpensive acoustic and camera surveillance equipment, in partnership with machine learning algorithms, also offers new ways to capture changing human interactions in areas after a place-based intervention has occurred. These technologies should be deployed in future research to offer a clearer understanding of mechanisms by which place-based interventions impact violent crime hot spots. Failing to account for the potential change in the ambient population and who uses the place could lead to a divergence between reported crime and victimization risk (Massenkoff & Chalfin, 2022). The use of activity-adjusted crime rates in place-based interventions is an area of future research. Likewise, complementing quantitative metrics with qualitative and ethnographic findings is important to understand whether public safety perceptions and local attitudes are also changing.

Nearly all studies of place-based interventions also do not examine the efficacy by the type of land use (see MacDonald, Nguyen, Jensen, Branas, 2021a, 2021b). As a result, the literature does not inform whether place-based interventions (CCTV, street lighting, BIDs, supplemental services, and abandoned housing remediation) are more or less effective around crime attractors (e.g., transportation hubs, bars, and taverns), residential areas, or commercial zones.

The literature remains largely a set of idiosyncratic place-based interventions in different contexts. Ideally, future research would evaluate violent crime hot spot interventions focusing on place-based changes to the built environment. These interventions could entail a mixture of supplemental services (e.g., extra street cleaning, litter removal, community ambassadors), property and land remediation, street light improvements, mural arts, and active use of CCTV or other surveillance systems in partnership with local community groups, businesses, and law enforcement. A portfolio of place-based approaches could be tested in violent crime hot spots through either experimental evaluations or randomized sequencing in time as an equitable way to test what strategies may work in the most violent crime places in resource-constrained cities.

4. Implementation of the actual interventions

A crucial aspect of successfully implementing place-based interventions relies on their costs and benefits, scalability, applicability, and local capabilities. Most of the studies in this literature review do not provide a cost-effectiveness analysis (a common criticism in scholarly research). The ones that provide it, such as street lighting and urban remediation, show that these strategies have societal returns on investments to prevent serious crime, even in their most conservative estimates. This result is consistent with place-based interventions averting violent crime, which causes large societal costs. Moreover, by focusing on areas where crime is concentrated, it makes more sense from an effectiveness and efficacy perspective to allocate resources to small areas rather than dilute the intervention across large geographical areas.

There are reasons to be optimistic about the scalability and applicability of place-based interventions. Several problems these strategies aimed to address, such as vacant and dilapidated property and streets with inadequate street lights, are common across cities. Place-based interventions have low variable costs, which means that as programs expand, the implementation costs grow slower, making it easier to scale up. The fixed costs also tend to be relatively inexpensive, making them more feasible in a resource-constrained environment. Moreover, most place-based interventions in this review literature do not require specialized knowledge or technology to be successfully replicated in other jurisdictions.

Identifying the stakeholders with the levers to influence local behavioral changes is also relevant for a successful implementation. Law enforcement is still a crucial actor in this arena, particularly with increased surveillance and police deployment to deter crime and react promptly when it happens. Businesses have followed suit. While BIDs offer other services, enhancing private security is the primary driver to reduce crime within the business district strategy. Moreover, public-private partnerships have enabled the streaming of real-time footage directly to law enforcement to reduce crime.

A growing interest shared by multiple federal, state, and local agencies, along with community-led organizations and residents, has expanded how violence can be attenuated outside police departments' purview using place-based programs. Some of these strategies are born from the need to reduce crime, among other local nuisances. For example, local ordinances mandating the remediation of abandoned and damaged property or the demolition of vacant and abandoned single-family homes are overseen by local building code enforcing authorities and other departments, such as land banks, planning, and development. Other place-based programs require the coordination of different government levels. Particularly the demolition of public housing works through coordinated efforts and resources between federal, state, and local authorities. This arrangement is understandable given the scale of the funding needed and the legal framework around public housing. Moreover, the community's involvement in providing interventions tailored to their needs and with their support and involvement has shown to be an effective strategy to decrease violence. Violence interruption programs are an example of partnerships between community nonprofit groups and law enforcement, though the evidence on their efficacy in individual-level quasi-experimental and experimental studies is mixed (Bhatt et al., 2024; Hureau et al., 2023). Other place-based interventions have not been designed solely with a crime-reducing intention, even though they bring such benefits. For instance, city and municipal agencies, in collaboration with utility companies, are typically responsible for providing adequate street illumination. Road traffic safety, energy efficiency, and maintenance costs are usually the most pressing concerns in improving and expanding street lighting programs. Nevertheless, it is a cost-effective approach to decrease serious crime without widening the criminal justice system.

The public health model offers a compelling emphasis on defining the problem, identifying causes, developing and testing interventions, and implementing those interventions at scale to impact populations (Mercy et al., 1993). Though the public health approach to violence prevention focuses on "input from diverse sectors including health, education, social services, justice, policy, and the private sector,"[5] it is worth noting that the majority of place-based interventions to address violent crime hot spots do not involve the work of public health departments. Instead, the work in transforming the social and built environment of violent crime hot spots is most often done by community groups, housing and license and inspection agencies, street departments, and the police (e.g., CCTV). It is important to recognize that the public health approach to violence prevention is a strategy that largely does not rely on the actual public health departments. One can imagine that

[5] According to the official Webpage of the CDC: https://www.cdc.gov/violenceprevention/about/publichealthapproach.html

could change if public health departments were more involved in engaging in violence prevention strategies by assigning public health officers to work with community groups and other municipal agencies to use their regulatory enforcement of health ordinances to help address systemic causes of violence in a given area.

5. Conclusions

Violent crime is spatially concentrated in hot spots of all major cities, suggesting that there are endemic features of places that may be changed to prevent violence. A growing body of high-quality quasi-experimental and experimental studies identify place-based interventions that appear to help reduce violence and serious crime. Remediating abandoned property and vacant land has the most consistent evidence in helping reduce serious violence. More extensive housing renovation and vacant land remediation appear to generate long-lasting changes in serious violence. Enhanced street lights and active monitoring of CCTV offer an area with compelling evidence that their strategic use may help thwart violence. While the mechanisms by which place-based interventions help reduce violence are not carefully tested, environmental criminology suggests that they likely change situational aspects of places that make violence less attractive in a given place. Some key work has been done involving systematic qualitative work of anthropologists and ethnographers alongside trialists to unpackage actual mechanisms (Branas et al., 2018), but more studies need to focus on identifying how situational aspects of places changes after environmental interventions. Given that cities are always undergoing urban development and infrastructure maintenance and upgrades, place-based interventions offer a compelling way to implement and test approaches to reducing violence in the small segments of every city that suffer the highest social costs of violence (MacDonald et al., 2019). Place-based interventions offer a practical approach to helping address the geographic concentration of violence in a relatively small number of hot spots and one that should be continually evaluated to inform policy approaches to reducing violence at the population level.

CRediT authorship contribution statement

John M. MacDonald: Writing – review & editing, Writing – original draft, Conceptualization. **Alex Knorre:** Writing – review & editing, Writing – original draft, Conceptualization. **David Mitre-Becerril:** Writing – review & editing, Writing – original draft, Conceptualization. **Aaron Chalfin:** Writing – review & editing, Writing – original draft, Conceptualization.

Declaration of competing interest

The authors report no interests to disclose.

Data availability

No data was used for the research described in the article.

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