

Blight Abatement of Vacant Land and Crime in New Orleans

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Abstract

Objectives: In 2005, Hurricane Katrina caused damage in New Orleans, Louisiana, and much of the land in low-resource neighborhoods became vacant and blighted. In 2014, New Orleans launched a program, Fight the Blight, which remediated properties in 6 neighborhoods. Our objective was to examine changes in crime rates near lots that were remediated (ie, debris removed and vegetation mowed).

Methods: We used a quasi-experimental design to test whether crime rates changed from preremediation (January 2013–October 2014) to postremediation (July 2016–March 2017) near 204 vacant lots that were remediated compared with 560 control vacant lots that were not remediated between October 2014 and July 2016. We also examined differences between remediated lots that received 1 treatment ($n = 64$) and those that received ≥ 2 treatments ($n = 140$).

Results: We found no significant differences between remediated and control lots in levels of violent, property, and domestic crimes from preremediation to postremediation. However, the number of drug crimes per square mile decreased significantly near all remediated lots (5.7% lower; $P < .001$) compared with control lots, largely driven by the significant decrease (6.4% lower; $P < .001$) in drug crimes found near lots that received ≥ 2 treatments.

Conclusions: Investing in programs that improve neighborhood environments affected by high rates of physical disorder and vacancy may be a way to decrease violence. However, routine remediation may be needed to increase the public health impact of blight abatement programs in warmer climates, where weeds and vegetation grow rapidly.

Keywords

blight abatement, vacant land, crime, violence, remediation

Violence prevention programs target the antecedents of crime and violence across multiple domains. Common strategies focus on modifying individuals' behavior to reduce their risks for perpetration or victimization (eg, education, outreach) or changing criminogenic social networks through, for example, targeted and intensive policing.¹ These efforts are important, and their impact can be considerable. However, focusing on individuals and interrupting social networks is resource intensive, and the public health effects often do not continue beyond the intervention period.² In contrast, programs that target high-risk environments (ie, the neighborhoods and places that surround victims of violence) present novel opportunities for creating structural, scalable, and sustainable ways to reduce crime and violence.^{3,4}

Studies illustrate the wide range of social, economic, and environmental forces that negatively influence neighborhoods, potentially leading to increased crime and violence. For example, economic restructuring, urban disinvestment,

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redlining (ie, systematic refusal of loans or insurance in certain areas), mortgage foreclosures, and environmental and engineering disasters (eg, hurricanes) leave neighborhoods with disproportionate amounts of social and physical disorder. These forces produce blighted environments that are characterized by reduced quality in housing, a decrease in local services, and vacant lots. Accompanying characteristics, such as poverty, high rates of population turnover, and low levels of social cohesion, also increase the risk for violence.⁵ Having a high density of alcohol outlets and readily available street drugs increases the risk of firearm homicide.⁶ Mortgage foreclosures and subsequent physical disorder, abandoned buildings, and vacant lots are also associated with increased violent crimes and property crimes.⁷⁻¹²

Several costs are associated with this increased violence, especially for local residents. In addition to facing increased risks for crime and violence, residents of high-crime neighborhoods may have health effects from exposure to violence or the threat of violence. Repeated exposure to violence, which could occur at the interpersonal level or the neighborhood level, can result in chronic stress, which can affect long-term cardiovascular health.¹³⁻¹⁵ Multiple forms of crime or violence, including homicide, violent assaults, drug crimes, property crimes, and misdemeanors, can affect the health of neighborhood residents.^{16,17} People who feel unsafe may develop mental illness or undertake unhealthy coping strategies, such as substance use or withdrawal from neighborhood social life.¹⁸⁻²⁴

Numerous cities are investing in programs that improve neighborhood environments affected by high rates of physical disorder and vacancy as a way to decrease crime and violence and improve public health. One intervention that has gained particular momentum in recent years is a blight remediation approach, known colloquially as “cleaning and greening.”²⁵ Several studies investigated the relationship between blight remediation and crime, providing some evidence of these programs’ benefits. One quasi-experimental study of thousands of vacant lots in Philadelphia, Pennsylvania, from 1999-2008 found a significant reduction in gun violence after these lots were cleaned and greened.²⁵ Another quasi-experimental study of a vacant-lot remediation program in Youngstown, Ohio, during 2011-2014 found a significant reduction in property crimes around lots that were cleaned and greened by contractors and a decrease in violent crimes around vacant lots that were cleaned and gardened by residents.¹² A randomized controlled trial of vacant-lot remediation in Philadelphia found an increase in perceptions of safety among residents living around vacant lots that were cleaned and greened compared with those that were left in blighted condition.²⁶ In addition, a case-control study in Philadelphia found an association between nearby presence of maintained vacant lots and decreased odds of homicide from 2008-2011.²⁷

Vacant-lot and blight remediation may hold promise as methods to improve public health and prevent violence. Whether the findings from studies conducted in selected

cities can be generalized to similar vacant-lot clean-and-green strategies in other cities is yet to be determined. The City of New Orleans embarked on a lot remediation program similar to programs in Philadelphia and Youngstown. No previous systematic study of this program was conducted. We used a quasi-experimental design to test whether crime rates changed around remediated vacant lots in New Orleans, many of which were left vacant after Hurricane Katrina in 2005.

Methods

The Chapter 66 Vacant-Lot Maintenance Program

In 2005, Hurricane Katrina caused damage—in some cases irreparable damage—to much of the built environment in New Orleans. After this natural disaster, many neighborhoods permanently lost populations and resources. The hurricane had a disproportionate effect in poor neighborhoods, where residents may not have had the resources needed to rebuild. As a result, much of the land in several low-resource neighborhoods became blighted, with growing numbers of vacant properties and abandoned buildings. This newly blighted property and land contributed to a surplus of blighted land. According to city records,²⁸ from January 2014 to September 2016, housing inspectors documented more than 154 000 violations of the Building Code²⁹ of the City Code across 4898 parcels of land.

In 2014, the city launched an ongoing program, Fight the Blight, that was codified in City Ordinance Chapter 66.³⁰ This legislation enabled the city to remediate and perform routine maintenance (ie, mowing) on properties in 6 targeted neighborhoods by using municipal resources, on behalf of property owners, with the costs of services recorded on the owners’ tax bill. City staff members identified properties during neighborhood inspection, with a target of 200 lots per neighborhood given available resources. Beginning in 2014, inspectors gave citations to lots that were unoccupied (usually vacant with no structure) and that had 1 or more of the following violations: grass or vegetation growth higher than 18 inches tall; trash, debris, or evidence of illegal dumping; and/or growth of noxious vegetation, such as poison ivy. Owners were given 7 days to remediate their property or request a code-enforcement hearing. On fewer than one-quarter of all cited lots, complaints by neighbors about nuisance properties triggered a citation and notice of violation by the city.

From October 2014 to July 2016, White Dove Landscaping Service, which provided job training for at-risk young people, remediated 1614 properties as part of a city-contracted service. Lot remediation involved inspection, notice (including a letter to the owner and a sign placed on the property), and removal of debris and mowing of all vegetation (ie, remediation or treatment; Figure 1). Lots were mowed at least once during the 2-year period, and in some cases multiple times, with a frequency of no more than every

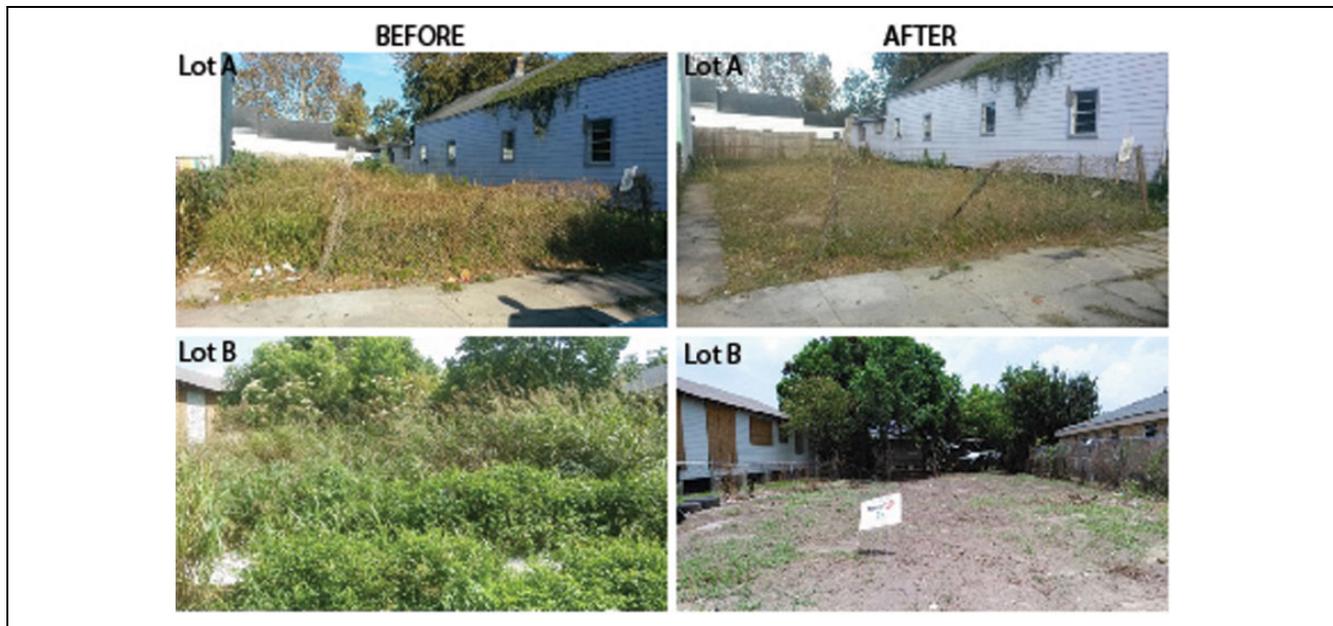


Figure 1. Before and after vacant-lot remediation on 2 lots as part of the Fight the Blight program, New Orleans, 2014-2016. The ongoing Fight the Blight program began in 2014 and enabled New Orleans to abate and perform routine maintenance on properties in 6 targeted neighborhoods.³⁰ Lot abatement involved inspection, notice (including a letter to the owner and a sign placed on the property), and remediation (ie, removal of debris and mowing of all vegetation).

3 weeks, especially during summer months. Because of the climate, vegetation could grow to 18 inches within 30 days after mowing during warmer months. Although the program intended that cited lots receive remediation for at least 1 year, in some cases, because of limited resources, remediation occurred only once.

Matching

Our unit of analysis was vacant lots. We randomly matched Chapter 66 remediated lots with control lots that were eligible for Chapter 66 remediation but did not receive it. Although 1614 lots received Chapter 66 remediation, we selected only 204 lots that violated the property ordinance for weed and plant overgrowth or for sanitation and that were remediated between October 2014 and July 2016. Of these 204 remediated lots, 64 lots received only 1 treatment (ie, debris and vegetation removal), and the remaining 140 lots received ≥ 2 treatments. Most of the 204 lots received citations for both weed overgrowth and sanitation; as such, we were unable to stratify our analysis.

We selected 612 control lots that received violations for weed and plant overgrowth or sanitation but were not remediated. The city chose the number of lots to remediate based on available funding and then allocated available resources for remediation throughout the area. These control lots were at least 250 feet away from each remediated lot. We randomly matched remediated lots to control lots in a 1:3 ratio within 19 neighborhood statistical areas (Figure 2). After matching, the minimum distance between a remediated lot

and a control lot was 251 feet, the maximum distance was 1581 feet, and the average distance was 476 feet.

Crime and Demographic Data

We obtained data on demographic characteristics that could confound the association between vacant-lot remediation and crime at remediated lots and control lots. We obtained data on demographic characteristics, including median household income, percentage of households at the federal poverty level, percentage of people with a high school diploma, percentage of unemployed civilians, and estimated percentage of housing units that were vacant based on census tract-level estimates from the 2011-2015 American Community Survey.³¹ To avoid the modifiable areal unit problem (ie, artificial changes in demographic characteristics in space because of administrative boundaries), we estimated a smoothed surface of values across the study area for each demographic characteristic. We assigned census values to the centroids (geographic centers) of each census tract in the study area, and we applied a weighted average of these values to interpolate values between each of these centroids by using an inverse distance weighting tool.

For data on crime, we obtained point locations from all 911 telephone calls reporting crimes to the New Orleans Police Department between January 2013 and March 2017 for a minimum 22-month preremediation period (time between January 2013 and each lot's remediation date) and 9-month postremediation period (time between each lot's remediation period and March 2017). We considered only telephone calls for service with a report-to-follow

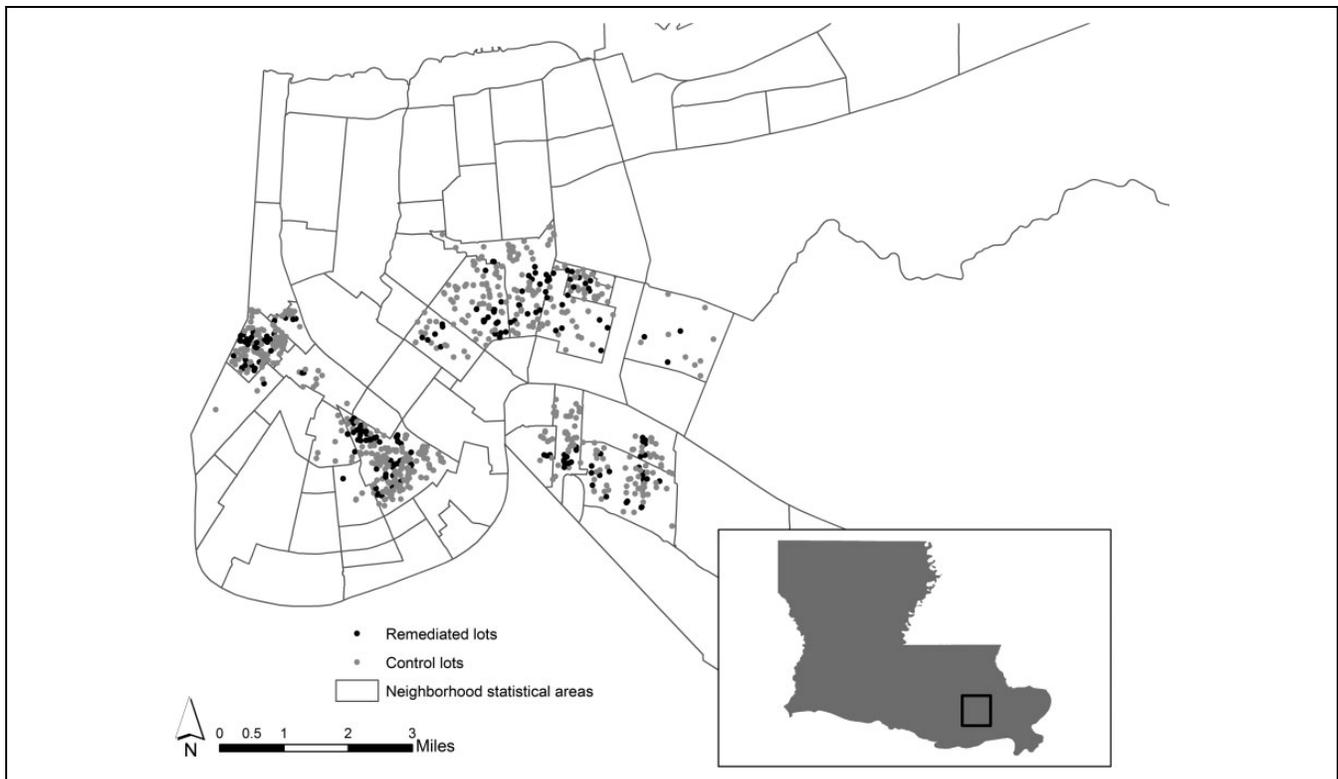


Figure 2. Map of remediated lots ($n = 204$) and control lots ($n = 612$) in a study of the effects of vacant-lot remediation on crime, New Orleans, 2014-2016. The ongoing Fight the Blight program began in 2014 and enabled New Orleans to abate and perform routine maintenance on properties in 6 targeted neighborhoods.³⁰ Lot abatement involved inspection, notice (including a letter to the owner and a sign placed on the property), and remediation (ie, removal of debris and mowing of all vegetation).

designation to indicate that responding police officers believed the call was credible enough to generate an official report. We constructed the following classifications of crime: burglary, domestic disturbance, drug violation, theft, and violent crime (eg, homicide, robbery, assault, and rape). Rather than calculating a count of crimes within an arbitrary distance from each lot, we estimated crime density at the centroid of each lot. We calculated this density by converting point locations of crime incidents to a smoothed grid surface (interpolating density between crime locations using kernel density estimation), in which each 100×100 -ft grid cell was assigned the density of crimes per square mile at that location. We calculated crime density outcomes from January 2013 through March 2017, aggregated to 17 three-month time periods (eg, January-March 2013, April-June 2013). The average preredemption period was 10 quarters or 30 months, and the average postredemption period was 5 quarters or 15 months.

Statistical Analyses

We used Poisson regression analysis to test for effects of vacant-lot remediation on crime, including violent crime. We used robust standard errors, or specified that standard errors allow for intragroup correlation,^{32,33} by using the remediation-control match group as the cluster variable.

We calculated adjusted regression models using the following equation:

$$Y_{it} = \beta_0 + \beta_1 P_{it} + \beta_2 R_{it} + \beta_3 (P_{it} \times R_{it}) + \beta_4 t + \beta_5 M_i + \sum_{k=17}^p \beta_k S_i + \sum_{k=4}^p \beta_k X_{it} + \xi_i + \varepsilon_{it}.$$

Vacant-lot interventions (i) per 3-month period of the study (t) served as the unit of observation. The variable of interest was a difference-in-differences term, $P_{it} \times R_{it}$, with P_{it} indicating preredemption status (0) versus postredemption status (1) and R_{it} indicating remediation lot status (1) versus control lot status (0). We used the β_3 interaction coefficient of the difference-in-differences term to estimate the effect of the remediation on the crime outcome.³²

Equation 1 shows the regression model, which included a crime outcome Y_{it} ; a pre-post remediation term $\beta_1 P_{it}$; a remediation-control status term $\beta_2 R_{it}$; a difference-in-differences term $\beta_3 (P_{it} \times R_{it})$; a term indicating season, $\beta_4 t$; a preredemption period mean outcome interaction term to adjust for regression to the mean, $\beta_5 M_i$; terms indicating neighborhood statistical area, S_i ; a series of p independent demographic control variables (described previously), X_{it} ; and residual error, ε_{it} . We allowed the residual error ε_{it} to vary by location by using robust standard errors.³³ We

estimated models for lots that received 1 treatment and ≥ 2 treatments separately.

We reported adjusted incidence rate ratios (IRRs) with 95% confidence intervals (CIs) to reflect relative differences between remediated lots and control lots. We considered $P < .05$ to be significant. Because no human subjects were involved in this research, institutional review board review was waived.

Results

We found significant differences between remediated lots and control lots by median household income, percentage in poverty, percentage unemployed (all $P < .001$), and vacant ($P = .004$). Among remediated lots that received 1 treatment, none of the demographic variables were significantly different. Among remediated lots that received ≥ 2 treatments, median household income, percentage in poverty, percentage unemployed (all $P < .001$), and vacant ($P = .003$) were significantly different (Table 1).

Overall crime increased at remediated lots and control lots during the study period. A plot of overall crime levels during the study period showed parallel trends between remediated lots and control lots (Figure 3). The total number of crimes per square mile at remediation lots (minimum = 139.6, maximum = 192.6, mean = 165.9) was similar to the number of crimes per square mile at control lots (minimum = 137.8, maximum = 190.5, mean = 166.5). This finding indicates that the difference-in-differences term can be interpreted correctly as relative change in crime postremediation.

According to effect estimates from regression models, shown as adjusted IRRs (Table 2), the rate of drug violations per square mile was 5.7% lower (adjusted IRR = 0.94; 95% CI, 0.91-0.97) around all remediated lots than around control lots postremediation. This finding translates to 5.4 fewer drug violations per square mile around remediated lots compared with control lots postremediation within a 1-year period. More specifically, the rate of drug violations per square mile was 6.4% lower (adjusted IRR = 0.94; 95% CI, 0.91-0.97) at remediated lots that received ≥ 2 treatments than at control lots. This finding translates to 6.3 fewer drug violations per square mile around remediated lots within a 1-year period. However, after adjusting for neighborhood demographic characteristics, the differences in the incidence of any of the other 4 types of crime were not significantly different between remediated lots and control lots.

Discussion

Although one of the goals of Fight the Blight was a reduction in homicides, we found that preremediation to postremediation changes in crime, including violent crime, around remediated lots that received at least 1 treatment for debris and vegetation removal were not significant. We did, however, find a significantly lower rate of drug violations around all remediated lots, and the difference was predominantly driven

Table 1. Demographic characteristics of remediated lots and control lots^a as part of the Fight the Blight program,^b New Orleans, January 2013 through March 2017

Demographic Characteristic	All Lots (N = 816)					
	Remediated (n = 204), Mean (95% CI)	Control (n = 612), Mean (95% CI)	Remediated Lots With 1 Treatment (n = 64), Mean (95% CI)	Control Lots (n = 192), Mean (95% CI)	Remediated Lots With ≥ 2 Treatments (n = 140), Mean (95% CI)	Control Lots (n = 420), Mean (95% CI)
Median household income, \$	22 630 (21 920-23 340)	24 987 (24 423-25 552)	22 325 (21 219-23 430)	23 772 (22 868-24 676)	22 770 (21 859-23 680)	25 543 (24 836-26 250)
Poverty, %	41.7 (40.5-42.8)	38.2 (38.2-39.6)	39.5 (37.4-41.5)	37.9 (36.7-39.1)	42.6 (41.3-44.0)	39.3 (38.5-40.1)
Unemployed, %	16.1 (15.5-16.7)	15.1 (14.8-15.4)	14.1 (13.0-15.1)	14.1 (13.5-14.6)	17.0 (16.3-17.6)	15.5 (15.1-15.9)
High school diploma, %	30.0 (29.5-30.6)	29.5 (29.1-29.9)	29.6 (28.5-30.8)	29.5 (28.8-30.2)	30.2 (29.6-30.9)	29.5 (29.0-30.0)
Vacant neighborhood properties, % ^c	25.8 (25.2-26.4)	24.8 (24.5-25.2)	24.8 (23.6-25.9)	24.1 (23.4-24.8)	26.3 (25.6-27.0)	25.2 (24.8-25.6)

^aOf the vacant lots in the study that received weed and plant overgrowth or sanitation violations between October 2014 and July 2016, a total of 204 lots were remediated (ie, removal of debris and mowing of all vegetation) and 612 lots were not remediated (control). Remediated lots were matched to control lots in a 1:3 ratio in 19 neighborhood statistical areas.

^bThe ongoing Fight the Blight program began in 2014 and enabled New Orleans to abate and perform routine maintenance on properties in 6 targeted neighborhoods.³⁰ Lot abatement involved inspection, notice (including a letter to the owner and a sign placed on the property), and remediation.

^cPercentage of housing units that were vacant based on census tract-level estimates from the 2011-2015 American Community Survey.³¹

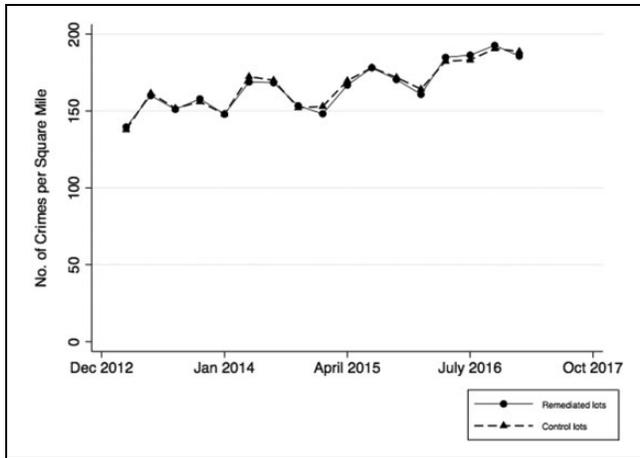


Figure 3. Number of crimes per square mile at remediated lots ($n = 204$) and control lots ($n = 612$), New Orleans, 2013-2017. The ongoing Fight the Blight program began in 2014 and enabled New Orleans to abate and perform routine maintenance on properties in 6 targeted neighborhoods.³⁰ Lot abatement involved inspection, notice (including a letter to the owner and a sign placed on the property), and remediation (ie, removal of debris and mowing of all vegetation). Remediated lots were those that received at least 1 treatment (ie, mowing), and control lots did not receive any remediation.

by lots that received ≥ 2 treatments, suggesting that the number of treatments may play a role in crime density.

Evidence in other cities indicates that a reduction in non-violent crimes may eventually lead to a reduction in more serious crimes.³⁴ Targeting misdemeanor, nonviolent crimes for overall crime reduction can have varying outcomes. Zero-tolerance policing or broken-windows policing (in which officers emphasize policing of minor offenses), along with other criminal justice approaches that emphasize policing of individuals rather than changing criminogenic places and environments, have been found to have a limited effect on the incidence of violent crimes.^{1,35}

The results of this analysis are generally inconsistent with the results of previous studies of relationships between vacant-lot remediation and crime and violence. Studies in Youngstown and Philadelphia¹² found that blight remediation programs were associated with reductions in violent crime, and a case-control study in Philadelphia⁶ found that maintained vacant lots were one of the environmental factors associated with reduced odds of adolescent homicide. One potential explanation for the differences in effects when comparing the results of our study in New Orleans with study results from Youngstown and Philadelphia is that New Orleans has a built and natural landscape that is appreciably different from these other cities. For example, lot size and yard size are larger in New Orleans, climate and vegetation are different, and all built and natural features in New Orleans are affected by extreme weather events, such as hurricanes. As such, our intervention may not have made a lasting or perceivable difference in the landscape. New

Orleans has a tropical climate with high year-round humidity. Vegetation can regenerate rapidly under these conditions, especially during warmer months. A single treatment might be visually noticeable only for a period of a few weeks. Our findings may indicate that more than 1 treatment is needed to reduce crime. Notably, the blight remediation programs studied in other states referred to drastic structural changes to buildings, whereas our study included only debris and vegetation removal.

Routine activities theory³⁶ may explain the finding that drug violations decreased at remediated lots compared with control lots postremediation. This theory states that risks for crime increase with the confluence of motivated offenders, suitable targets, and a lack of suitable guardianship. Drug violations do not have any direct victims in the sense that violent crimes do; rather, they represent manufacture, selling, or buying of illegal substances. Nevertheless, it is possible that lot remediation will cue potential offenders to the presence of a local population invested in the well-being of their neighborhood. In this way, remediation may reduce drug violations in areas proximate to the treated lots through perceived increases in suitable guardianship. The increased line of sight that the remediation created could have contributed to this phenomenon. Why these effects were observed only for drug violations and not for other crimes is unclear and may be due to unmeasured or poorly understood local conditions in New Orleans. It is also not clear from our results whether the full public health impact of the remediation was to reduce drug violations across the city or whether drug violations increased elsewhere (in which case, the program simply shifted the geographic distribution of drug violations).

Limitations

Our study had several limitations. First, other blight remediation programs were operating in New Orleans concurrently during the study period. As such, it is possible that our pre-post and case-control designations were contaminated. To address this limitation, we selected neighborhoods that were targeted by the Fight the Blight program, and we selected a temporal period to minimize this problem. However, our results may have been attenuated because of this limitation. Second, because of funding limitations, no systematic, equivalent treatment took place at all vacant lots in violation of the code. For example, not all lots with citations received treatments, some lots received 1 treatment, and other lots received ≥ 2 treatments. However, because of records of actual treatments, we knew which lots received treatments and when, and we were able to stratify models to test for various effects of multiple treatments. Nevertheless, this study highlights the need for partnerships between cities and research groups early in a program's lifespan to design remediation and record-keeping to facilitate evaluation.

Third, although we were able to validate the remediation of some lots, the years for which images in Google Street View were available differed among lots, precluding the use

Table 2. Adjusted difference-in-difference estimates of the effect of vacant-lot remediation on crime types per square mile, with absolute change in crime counts per square mile per 1-year period, by type of crime and number of treatments at remediated lots, New Orleans, 2014-2016^a

Type of Crime	Adjusted IRR ^b (95% CI) [Absolute Change]		
	All Remediated Lots (n = 204)	Remediated Lots With 1 Treatment	Remediated Lots With ≥2 Treatments
Violent crime ^c	1.01 (0.99-1.03) [1.78]	1.00 (0.98-1.03) [0.36]	1.01 (0.99-1.03) [2.26]
Burglary	1.00 (0.98-1.02) [0.23]	1.01 (0.98-1.04) [1.51]	1.00 (0.98-1.02) [-0.11]
Domestic disturbance	1.00 (1.00-1.01) [0.66]	1.01 (1.00-1.03) [2.05]	1.02 (0.99-1.01) [0.33]
Drug violation	0.94 (0.91-0.97) ^d [-5.42]	0.97 (0.88-1.06) [-2.67]	0.94 (0.91-0.97) ^d [-6.34]
Theft	1.03 (1.00-1.05) [1.75]	1.01 (0.95-1.07) [0.67]	1.03 (1.00-1.06) [1.75]

Abbreviation: IRR, incidence rate ratio.

^aLots were abated as part of the ongoing Fight the Blight program, which began in 2014 and enabled New Orleans to abate and perform routine maintenance on properties in 6 targeted neighborhoods.³⁰ Lot abatement involved inspection, notice (including a letter to the owner and a sign placed on the property), and remediation (ie, removal of debris and mowing of all vegetation).

^bThe IRR is a rate ratio of crimes occurring near remediated lots compared with control lots postremediation (July 2016–March 2017) and preremediation (January 2013–October 2014). Rates are adjusted for median household income, percentage of households at the federal poverty level, percentage of people with a high school diploma, percentage of unemployed civilians, and estimated percentage of housing units that were vacant. An IRR of 0.94 indicates that 6% fewer crimes occurred near remediated lots than near control lots. Control lots were lots that were eligible for remediation but did not receive it.

^cIncludes homicide, robbery, assault, and rape.

^dBased on z score. Significant at $P < .001$.

of this resource to systematically assess environmental conditions over time. Historical images, such as from Google Street View, could be a useful tool for validating the actual change that occurred from preremediation to postremediation.³⁷ It is also possible that illicit activity shifted geographically (eg, to other neighborhood statistical areas) as a result of the program intervention. Future analyses should test for this dynamic. Finally, we were not able to assess for the mechanisms of association between this program and drug violations. However, one possibility is that the remediation of vacant lots inspired collective efficacy among neighbors, which deterred these crimes.

Conclusions

Small but significant decreases in drug crimes around blight-remediated vacant lots may have had some safety-related benefits to residents of New Orleans. More routine and greater structural remediation may be necessary to increase the public health impact of blight remediation programs in climates that support rapid weed and vegetation growth.

Declaration of Conflicting Interests

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