Research Paper

Did community greening reduce crime? Evidence from New Haven, CT, 1996–2007

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HIGHLIGHTS

- The relationship between community-based tree planting and crime is understudied.
- A quasi-experimental approach revealed predominantly null findings.
- Imprecise measurement of treatment and exposure need more careful consideration.

ARTICLE INFO

ABSTRACT

For some volunteers, neighborhood safety is one of the reasons for becoming involved in community greening. For example, many volunteers of the Community Greenspace program at the Urban Resources Initiative in New Haven, Connecticut believe that there is a potential reduction in crime from community greening activities, even though it is not an explicit goal of the program. These types of community-led interventions are distinct from both existing tree canopy and large-scale municipally led initiatives. These types of interventions remain understudied with respect to the potential for reducing crime. We therefore used a quasi-experimental difference-in-differences (DID) approach to test whether more than a decade of street tree planting (1996–2007) in New Haven had an effect on crime levels at planting sites (n = 300) compared to control sites that received no Community Greenspace-planted trees (n = 893). We examined violent, property, and misdemeanor crimes (comprised of vandalism, prostitution, and narcotics crimes) individually and jointly to test for crime-type specific effects, while controlling for sociodemographic factors and spatio-temporal trends. In general, we found a null relationship between trees planted and crime on block faces per year at the p < 0.05 level. Increases in crime were not observed on treatment sites. We discuss implications for tree inventories and monitoring, study design, and techniques to assess impacts of tree planting efforts.

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1. Introduction

Dozens of cities across the US are embarking on ambitious tree planting campaigns that aim to significantly increase canopy in hopes of improving urban sustainability and livability (Young & McPherson, 2013). Many of these programs are motivated by the theory that increasing tree canopy will also improve community safety. Studies have reported mixed results with respect to the relationship between urban vegetation and crime; early research suggests bushes and shrubs may provide criminals with places to conceal themselves and/or illegal contraband (Fisher & Nasar, 1992; Michael, Hull, & Zahm, 2001; Nasar, Fisher, & Grannis, 1993). However, recent studies have shown a negative association between presence of trees or tree canopy and crime (e.g. Gilstad-Hayden et al., 2015; Troy, Grove, & O'Neil-Dunne, 2012). Some theorize that the social processes associated with greening, namely enhanced

territoriality, could be a causal mechanism for crime reduction (Kuo and Sullivan, 2001a). But there appears to be little empirical investigation on the topic. Research is needed to examine the possible influence of community-based greening on crime.

Community-based greening activities are driven by the goals of volunteers rather than government agencies and municipal sustainability plans. For example, the Community Greenspace program at the Urban Resources Initiative (URI) in New Haven, CT supports projects initiated by volunteers who identify where and what activities they wish to pursue–not government agencies, nor their sustainability plans. These activities include, for example, street tree planting in the public right-of-way, lead remediation and beautification in private front yards, stewardship and planting in city parks, and reclamation of abandoned vacant lots (Murphy-Dunning 2009). Volunteers are sometimes motivated to become involved in community greening because they hope this activity will result in making their neighborhood safer. In this study we use a quasi-experimental difference-in-differences (DID) approach to test for effects of a community-based greening in New Haven, CT on crime from 1996 to 2007 at greened street segments in comparison to randomly matched non-greened control segments.

1.1. Previous research

Early investigations into the relationship between urban vegetation and crime suggest that areas of low-lying vegetation may host criminal activity (Fisher and Nasar, 1992; Michael et al., 2001; Nasar et al., 1993), and therefore may increase crime. This could cast doubt on urban greening programs that seek to increase vegetation, e.g. via green infrastructure installations. However, the role of low-lying vegetation in crime should be viewed as distinct from the role of other types of urban vegetation, such as trees.

Subsequent research employing cross-sectional designs with aggregate data establishes a negative association between urban vegetation and crime. For example, fewer total crimes, property crimes, and vandalism co-occurred when more street trees, trees on residential lots, and where bigger crowned trees were present in Portland, OR (Donovan and Prestemon, 2012). Wolfe and Mennis (2012) found a negative relationship in Philadelphia, PA between urban greenness and robberies, burglaries, and aggravated assaults, but not thefts when controlling for other confounders. A negative association between robbery, burglary, theft and shooting crimes and tree canopy cover was found in a study of Baltimore City and County (Troy et al., 2012). A subsequent study in Baltimore found a strong association between front yard landscaping, including presence of yard trees and other "cues to care" (Nassauer, 1995), and an index of crimes including robbery, burglary, theft, assault, vandalism, arson, and shooting crimes (Troy, Nunery, & Grove, 2016). Deng (2015) found a negative association between tree height and mean tree patch size with property crimes, and between tree abundance and violent crimes. Previous research in New Haven found 15% fewer violent crimes, and 14% fewer property crimes with 10% more abundant tree canopy cover (Gilstad-Hayden et al., 2015).

One explanation for a negative relationship between greenery and crime is that exposure to green space can reduce psychosocial stress, physiological stress and mental fatigue in urban settings (Kuo, 2001; Kuo & Sullivan, 2001b; Taylor & Kuo, 2009; South, Kondo, Cheney, & Branas, 2015), and stress can elevate aggressive behaviors including certain types of crime. Therefore greener environments may reduce aggressive and violent criminal activities (Kuo & Sullivan, 2001b). In this view, greenery works indirectly to reduce crime with greenery via stress reduction.

Another theory explaining the negative relationship between urban vegetation and crime is that more "eyes upon the street" makes it more difficult for criminals to elude capture with so many available known witnesses (Jacobs, 1961: 35). This idea can be

extended to include urban vegetation, as more welcoming treed environments may bring people together, and increase social ties among neighbors (Kuo et al., 1998; Kuo, 2003). Some evidence suggests that community gardeners may also become involved in other activities together, including crime-watch efforts (Armstrong, 2000). Similarly, defensible space theory posits that community order can be partially maintained by the physical appearance of neighborhoods designed to facilitate community interactions, and the opportunities for informal surveillance (Newman, 1972). A third related "broken windows" theory asserts that visibly disinvested built environments encourage crime because they signal low levels of care, which provides a visual cue to would-be criminals that effective law enforcement might also be lacking (Wilson and Kelling, 1982).

These three theories challenge the assumption that trees' only relationship with crime is that they provide would-be criminals a place to hide. Instead of merely reducing visibility, these vegetated elements in the built environment may actively signal well-cared for spaces. Such "cues to care" or signifiers of human intention (Nassauer, 1995) have been found to be negatively related to criminal activity, while landscaping features indicative of neglect were positively associated with robbery and rape crimes across an urban-rural watershed (Lidman, 2008). The interrelated causal mechanisms of increasing social cohesion with more eyes upon the street, defensible space, and broken windows theories, as well as cues to care each help explain the empirical evidence showing negative correlations between urban vegetation and crime.

The newest wave of research uses experimental and quasi-experimental evidence from interventions to begin testing for effects. These research projects go beyond correlations supported by theory, and move toward testing for causality. Multiple studies of cleaning and greening interventions on vacant lots have found negative impacts on crime. One study in Philadelphia found significant reductions in gun assaults and vandalism around greened lots, compared to untreated control vacant lots (Branas et al., 2011). Similar cleaning and greening interventions have been shown to lead to a stronger sense of security and feelings of safety in Philadelphia, PA (Garvin, Cannuscio, & Branas, 2013). A study of vacant lots greened in Youngstown, OH found significant reductions in property crimes around lots greened by the city and its partners, and significant reductions in violent crimes around lots greened by community groups, compared to around control lots (Kondo, Hohl, Han, & Branas, 2015). Using similar methods, a study of crime impacts near green stormwater infrastructure projects, a type of visible and vegetation-based public investment, in Philadelphia found consistent reductions in narcotics possession near project sites compared to control sites (Kondo, Low, Henning, & Branas, 2015). Finally, the first natural experiment on the association between *tree loss* and crime (Kondo, Han, Donovan, & MacDonald, 2017) found that tree loss due to emerald ash borer infestation between 2005 and 2014 in Cincinnati, OH was significantly and positively associated with increases in property crimes and violent crimes.

Previous research does not specifically address community-based street tree planting and crime, despite the reasonable yet seemingly untested notion that "the *process* of tree planting could enhance residents' territoriality, thereby deterring crime over and above the direct effect of the presence of vegetation" (emphasis added, Kuo & Sullivan 2001b) proposed more than a decade ago. The purpose of this paper is to fill this void by asking: did community-based greening lead to a reduction in crime in New Haven, CT from 1996 to 2007? Using a quasi-experimental difference-in-differences method, we matched the locations of community-led interventions to control sites and compared crime rates over the twelve-year study period.