Journal of Criminal Justice 60 (2019) 57–63

Contents lists available at ScienceDirect

Journal of Criminal Justice

journal homepage: www.elsevier.com/locate/jcrimjus

Exploring the impact of 9398 demolitions on neighborhood-level crime in Detroit, Michigan

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ARTICLE INFO

Keywords:
Demolitions
Neighborhood Crime
Crime Policy

ABSTRACT

The intersection of neighborhood-level processes and crime has received a wealth of attention in the criminological literature over the last century. In line with this tradition, the current study focuses its attention to one of the more recent, and woefully under-explored, policy phenomena embraced by a growing number of cities throughout the United States: demolitions. From 2010 to 2014, the city of Detroit successfully completed a total of 9398 demolitions, making it the nation's leader in the demolitions experiment. Focusing specifically on crime at the block-group level, we examine the association between demolitions and changes in four crime types (i.e. total crime, violent crime, drug crime, and property crime) by calling upon a set of publicly available geo-spatial crime and demolition data. We find that demolitions have a statistically and substantively meaningful negative relationship with total crime, violent crime, and property crime in 2014, net of controls for prior crime and structural covariates. Supplemental analyses also indicate that reductions in crime from 2009 to 2014 were greatest among block-groups that experienced the greatest number of demolitions. We conclude with a discussion of the theoretical and policy implications of demolitions as a potentially valuable crime reduction strategy.

1. Introduction

A sizable criminological corpus, dating back to the early 1900s, charges that neighborhood stability influences criminal opportunities (Shaw & McKay, 1942). Indeed, seminal works in criminology and criminal justice highlight the importance of neighborhoods' social and physical environments' roles in explaining crime and criminality (Cohen & Felson, 1979; Jeffery, 1977; Newman, 1972; Shaw & McKay, 1942; Skogan, 1990; Wilson & Kelling, 1982). Even theories that have a geographical orientation, such as social disorganization, primarily focus on the social ecology of criminogenic areas. Thus, while Shaw and McKay (1942) paid limited consideration to neighborhoods' physical features through their descriptive characterizations of the five zones, they ultimately studied the social environments, not physical environments (Jeffery, 1977). The most recent housing crisis in the United States has led to a relatively new line of research exploring whether home foreclosures and vacancies affect neighborhood-level crime.

Despite advances in our understanding of the effects of distressed-properties on community-level crime, one related area remains underdeveloped (see Whitaker, 2011). Specifically, there is a significant gap in knowledge as it relates to a byproduct of foreclosure and vacancy: property demolition. Although municipalities rely on many innovative solutions to deal with distressed properties (Accordino & Johnson, 2000), several cities, such as, Baltimore, Cleveland, and Chicago have implemented aggressive demolition programs to remove vacant and blighted structures. Surprisingly, few empirical studies have explored if these campaigns have had any appreciable impact on crime. The current study explores the impact of a citywide mass demolition program on neighborhood-level crime in Detroit, Michigan. Drawing upon demolition and crime data collected and maintained by the City of Detroit, we assess 1) whether demolitions are associated with crime in Detroit at the block-group level and 2) whether change in crime from 2009 to 2014 varies by magnitude of demolition exposure. Our results suggest that, net of relevant controls of prior crime and structural characteristics, demolitions are, on average, associated with lower total crime, violent crime, and property crime, but not drug crime. Further, supplemental analyses show that reductions in crime from 2009 to 2014 are greatest among block-groups that experienced the most

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https://doi.org/10.1016/j.jcrimjus.2018.11.002
Received 6 September 2018; Received in revised form 11 November 2018; Accepted 12 November 2018
Available online 29 November 2018
0047-2352/

demolitions. In the end, our findings contribute to the nascent literature on the effects of demolitions on crime by highlighting the impact of *concentrated* demolitions within neighborhood block groups.

2. Literature review

Understanding how the social and physical environments of neighborhoods influence crime and criminality has been the focus of much criminological research. Attention to foreclosure processes emerged in the late 2000s, as the United States faced a housing crisis of epic proportion (Crump et al., 2008), and for good reason: many homes that enter the foreclosure process become vacant for some period of time (Whitaker, 2011). For this reason, we view the foreclosure process and subsequent vacancies as antecedents to demolitions, and maintain that each phase of this process has serious implications for neighborhood well-being.

Research has implicated real estate foreclosures as meaningfully contributing to neighborhood-level crime and disorder. Specifically, Teasdale, Clark, and Hinkle (2012) reported subprime lending foreclosures were associated with significant increases in five types of crime/disorder in Akron, Ohio. Similarly, Stuckey, Ottensmann, and Payton (2012) found that foreclosures in Indianapolis, Indiana contributed to an escalation in crime between 2003 and 2008. Interestingly, research using a longitudinal analysis focused on Glendale, Arizona concluded that the effect of foreclosures on crime, while significant, is temporary. Specifically, the authors reported that increased foreclosures were associated with significant increases in crime, but crime rates typically regressed to their normal level within three to four months depending on crime type (Katz, Wallace, & Hedberg, 2013). Others have suggested the foreclosure process does not, in and of itself, lead to crime. Rather, upticks in crime follow periods of vacancy (Cui & Walsh, 2015), or as Immergluck and Smith (2006, p. 854) more pointedly lamented, "… it is through longer-term vacancy and abandonment that foreclosures affect neighborhood crime."

Indeed, there is ample research suggesting abandoned properties are hazardous to community-wellbeing. These properties are characterized as "crime attractors" (Brantingham & Brantingham, 1995; Shane, 2012) because they serve as "criminal hangouts" (Boessen & Hipp, 2015; Sherman, 1993), and invite certain types of crime (e.g., metal scraping, house stripping, urban mining, illegal dumping, squatting, trespassing, vandalism; Shane, 2012). In layperson's terms, Holmberg (1998, D1) wrote that, "crooks, killers and losers tend to infest areas with dead buildings, like maggots on a carcass." Empirically speaking, vacant houses have been found to significantly influence burglary, drug crimes, larceny, vehicle theft, as well as aggravated assaults, robberies, and homicides (Boessen & Hipp, 2015; Jones & Pridemore, 2016; Raleigh & Galster, 2015). Vacant dwellings not only lead to increased crime, they also affect property values, as well as municipalities' budgets and tax revenue (Joint Center for Housing Studies, 2013). As such, many cities that have experienced a disproportionate number of vacancies have implemented demolition plans to address the problem, often times with aide from the federal government (Hackworth, 2016).

In comparison to the foreclosure and vacant properties literature, the demolition literature is underdeveloped. This is largely a product of the recency of cities' demolition programs. The nascent literate suggests demolishing blighted structures produces a crime reduction benefit, although findings vary based on city and unit of analysis. For example, Wheeler, Kim, and Phillips (2018) reported that when measured from the microplace (i.e., the demolished structure) demolitions in Buffalo, New York produced a significant reduction in part 1 violent and non-violent crimes, and the impact was diffused up to 1000 ft from the demolition site. However, when they aggregated demolitions to the census tract level, demolitions did not significantly impact crime. Conversely, in Saginaw, Michigan a block group level analysis suggested demolitions were responsible for a significant reduction in violent and property crime (Stacy, 2018). Moreover, in their assessment of the federal Neighborhood Stabilization Program, Spader, Schuetz, and Cortes (2016) found that demolitions reduced theft and burglary in Cleveland, OH (within 250 ft of the demolition), but produced no such effect in Chicago, Illinois. While these early studies report mostly positive findings, it is difficult to know the true impact of demolitions on crime because there are too few studies available to judge with any degree of certainty.

2.1. The case of Detroit

Detroit's landscape has been shaped by waves of abandonment that began in the 1950s, and the consequences of decades' long outward migration reached a critical point in 2010. By this time, 22% (79000) of Detroit's structures were abandoned (Mallach, 2012), and the number steadily increased in the aftermath of the nation's foreclosure crisis. By the time Detroit filed for bankruptcy in 2013, there were 85,000 abandoned structures (Farley, 2015). The city has long been attempting to cope with this abandonment, implementing foreclosure reform (in 1999), launching vacant property auctions and, more recently, adopting a controversial land bank program,[1] but it has not staved off the blight characterizing many city blocks.

While other rust-belt "legacy" cities have experienced similar patterns of population flight, and felt the pronounced effects of the mortgage crisis on home values, none were faced with a vacancy crisis of Detroit's scale. As a result, Detroit has become leader in removing vacant structures quickly and efficiently. In order to achieve a meaningful pace of demolition, Detroit reformed its demolition guidelines, streamlining the process and reducing the amount "red-tape" authorities had to navigate (Mallach, 2012). At the start of the program, the bulk of the abandoned structures were already foreclosed upon and thus under the ownership of either the county or the Detroit Land Bank Authority, enabling the city to accelerate its demolition process. In 2014 alone, the first year of Mayor Mike Duggan's, the city demolished 3739 structures—239 more than Buffalo, New York's blight removal program demolished in its five-year program (Dynamo Metrics, 2015; Yin & Silverman, 2015). Buffalo's demolition process, however, is lengthier and requires more resources. Buffalo's demolitions are among the most expensive in the country, costing the program an average of $19,000 per structure (Mallach, 2012). In comparison, Detroit's demolition process costs an average of $12,616 (Kurth, 2017).

Many cities, like Detroit, have launched blight removal programs. For example, St. Louis, Missouri launched a $13.5 million demolition program in 2017, aiming to demolish 1000 structures within its first year. Similarly, in 2016 Baltimore, Maryland launched Project C.O.R.E. to demolish "as many city blocks of blight as possible," using $93.5 million local and state funds. Buffalo, New York's "5-in-5" program (aiming to demolish 5000 structures in 5 years) from 2007 to 2012 was budgeted for $100 million, $15 million of which were Hardest Hit Fund dollars. By comparison, Detroit's program has been awarded $258 million from the Hardest Hit Fund to date (Thibodeau, 2016), making it the largest and most impactful program in the country with over 16,500 structures demolished since 2010. This assessment of Detroit's demolition program will be the most comprehensive study to date.

3. Data & methods

This study relies on crime, demolitions, and neighborhood characteristics data from Detroit, Michigan to examine the impact of the nation's largest demolitions program on crime at the block-group level. In general, it aims to assess whether the over 9000 demolitions completed from 2010 to 2014 were associated with discernible reductions

[1] The Detroit Land Bank Authority is a tax-payer funded office that has been under investigation by various levels of government for "fraud, bid-rigging, environmental violations, and mismanagement" (Neavling, 2017).

in neighborhood crime. More specifically, it focuses on whether demolitions were related with changes in total crime, violent crime, drug crime, and property-based crime in Detroit across that span. The following section offers detailed descriptions of the data used to execute the current study and the measures that were derived from them. These data form four specific categories: address-level crime data, address-level demolition data, and block-group structural characteristics.

3.1. Address-level crime data

The city of Detroit, like many other urban cities throughout the U.S., has increasingly prioritized data transparency in recent years, successfully launching its Open Data Portal in 2015. One body of data included in those efforts is crime data from the Detroit Police Department, which includes all reported crime events dating back to January 1st of 2009. The crime data made available through the portal exist for each reported incident and offer a wide-array of information, including, but not limited to, slight offset geographic coordinates (i.e. the address field is anonymized by replacing the last two digits of an address with "00") that allow for reported crime incidents to be matched with "place" up to the block-group level. Given the current study's focus on whether, and to what extent, demolitions are associated with crime in 2014, net of controls for crime in 2009 and structural factors, ArcGIS 10.6 was used to match singular crime events to Detroit's 879 block-groups to create annual crime counts across four categories of crime.

Following our main models, which examine the influence of total number of demolitions on four crime types in 2014, we perform supplemental analyses to assess *change in crime* (i.e. 2009 crime counts – 2014 crime counts) across block-groups using a categorical variable that captures magnitude of demolition exposure. The supplemental analyses serve as sensitivity analyses and allow us to contextualize whether there is a dose-response relationship between demolitions and crime. Importantly, change in crime from 2009 to 2014 was selected for our supplemental analyses because 2009 represents the most proximate year-period in which demolitions were not happening with any meaningful regularity. We believe the multi-model approach allows for the most rigorous assessment of the demolitions-crime relationship.

3.2. Address-level demolition data

The Detroit Open Data Portal has also prioritized up-to-date detailed information on successfully completed demolitions throughout the city. It was preceded in those efforts by Data Driven Detroit, which collected demolitions data from 2010 to 2013. Using data from these two sources, the current study focuses specifically on demolitions happening from 2010 to 2014, the first five years of the city's ramped up efforts to seriously address the blight affecting roughly 80,000 structures. Notably, the city was not earnestly addressing blight issues via demolition before 2010. In fact, only 217 demolitions were successfully completed in 2009, which falls in stark contrast to the nearly 1300 demolitions that completed in 2010 — which, as Fig. 1 highlights, is an annual figure that has only continued to increase.

Similar to this study's dependent variables, ArcGIS 10.6 was employed to match demolitions to the block-groups in which they were completed. Similar to recent work by Wheeler et al. (2018), we constructed a count of demolitions for all block-groups, which ranged from a low of 0 to a high of 160. For descriptive and supplemental analyses, we developed a five-group categorical variable that includes the following demolitions classifications: no demolitions, low demolitions (n = 1–5), moderate demolitions (n = 6–10), high demolitions (n = 11–20), and very high demolitions (n = 21–160) (Fig. 2).

3.3. Block-group structural characteristics

Given the current study's focus on changes in neighborhood-level crime, it is necessary to include measures of relevant socio-demographic and socio-economic factors that are established predictors of crime. As such, 2010 Census estimates of the following characteristics of each block-group are included in this study: population density (i.e., population/square-mile), median age, percent of households living in poverty, percent female-headed households with children younger than 18 years, number of housing units, and number of vacant units.

4. Results

4.1. Descriptive statistics

Table 1 reports descriptive statistics for four outcome variables, a set of three unique demolition variables that capture both the presence and magnitude of demolitions, and a series of six Census variables that effectively measure the structural characteristics of block-groups. In 2014, Detroit's block-groups experienced an average of 153.74 (SD = 99.77) total crimes, 36.49 (SD = 36.49) violent crimes, 3.68 (SD = 4.08) drug crimes, and 60.98 (SD = 46.69) property crimes. Table 1 also shows averages for those four crimes in 2009, which were all greater in 2009 than they were in 2014.

Also shown in Table 1, the vast majority of Detroit's block-groups experienced at least one demolition from 2010 to 2014, with the average number of demolitions resting at 10.69 (SD = 14.78). The experience of demolition, even at this particularly small unit of analysis, was much closer to the rule than the exception for neighborhoods throughout the city. Interestingly, in one of the few studies on this subject, Wheeler et al. (2018) modeled the impact of 2035 demolitions on crime in Buffalo, New York from January 2010 to October 2015. Buffalo's exposure to demolitions, while notable for most other cities in the U.S., pales in comparison to the over 9000 demolitions that were completed in Detroit during a similar, though even shorter, period of time.[2] Our five-category variable capturing the magnitude of demolition exposure shows that while only 16% of Detroit's block-groups experienced no demolitions from 2010 to 2014, 34% experienced one to five demolitions, 15% experienced six to 10 demolitions, 18% experienced 11 to 20 demolitions, and 17% experienced at least 21 demolitions.

Given the linear nature of the four dependent variables and measures of block-group structural characteristics, a series of *t*-tests were performed to test for differences across block-groups based on demolition exposure. These tests revealed both statistically and substantively meaningful differences across two of four crime types in 2014, three of four crime types in 2009, and five of six block-group structural characteristics (see Table 2). Interestingly, while count of total crime in 2009 was statistically greater ($p < .05$, t-value = −2.45) among block-groups that experienced demolition from 2010 to 2014 (mean = 209.92, SD = 150.31) than those that did not (mean = 176.97, SD = 105.23), such differences were no longer seen in 2014 counts of all crime. The same pattern existed for count of violent crimes by demolition exposure in 2009, when statistical differences existed, and 2014, when no differences were evident. Lastly, while there was no difference in count of property crime in 2009 based on demolition exposure, statistical differences emerged in 2014 ($p < .05$, t-value = 2.16) where counts of property crime became lower among block-groups that experienced demolition (mean = 59.47, SD = 48.85) than block-groups that did not (mean = 68.83, SD = 31.58).

Similar to crime, t-tests also revealed sizable differences across structural characteristics based on demolition exposure. For the 137 block-groups that did not experience a single demolition from 2010 to 2014, their average population/square-mile, median age, and number of housing units were significantly higher than the 742 block-groups

[2] Importantly, because there are differences in the populations of Buffalo and Detroit, these differences exist on a per capita basis as well.

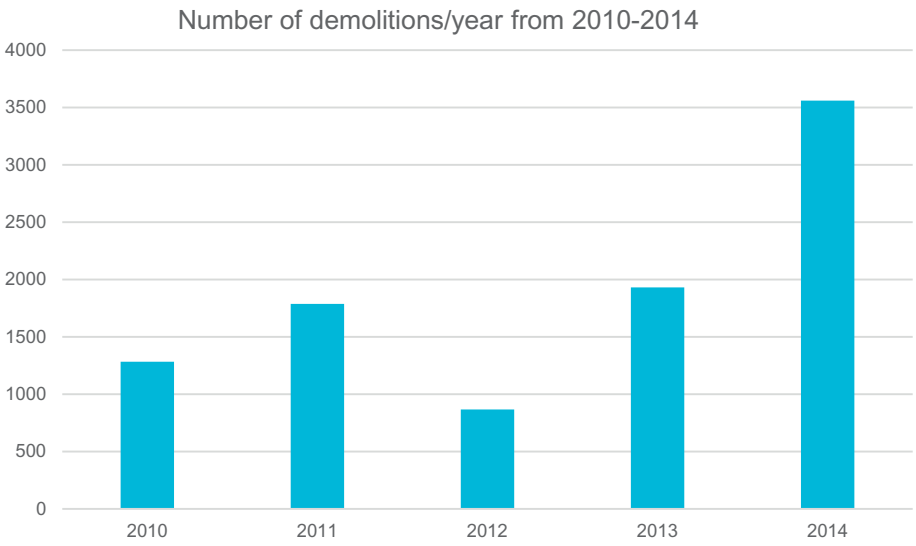

Fig. 1. Total number of demolitions in Detroit per year from 2010 to 2014.

that did experience demolition. On the contrary, block-groups that experienced at least one demolition had a larger share of households living below the poverty line and a greater number of vacant housing units than block-groups that had no demolitions. There were no differences in the percentage of female-headed households with children under the age of 18 based on demolition exposure.

4.2. Multivariate analyses

A set of four negative binomial models were performed to examine the relationship between the number of demolitions that occurred from 2010 to 2014 and crime in 2014 at the block-group level, net of controls for crime in 2009 (the year preceding Detroit's demolition efforts) and potential structural influences. Negative binomial models were the selected analytic technique because of the over-dispersed nature of our outcome variables. Because negative binomial models in Stata do not allow for post-estimation assessment of multicollinearity, we ran an ordinary least squares model after each of our four models to effectively examine VIF scores. All VIF scores were under 3 and thus well within a healthy range.

Model 1 in Table 3 specifically describes the relationship between the number of demolitions between 2010 and 2014 and total crime in 2014. Net of controls, this model demonstrates that there is a robust relationship between demolitions completed during that span and levels of crime across block-groups. Specifically, the Incidence Rate Ratio for count of demolitions in the total crime model is 0.997 ($p < .001$, SE = 0.001), meaning that for every demolition, there was a consequent 0.3% reduction in crime. In other words, for roughly every three demolitions completed from 2010 to 2014, block-groups experienced an average reduction in crime of almost 1%. Considering that the average block-group in this study experienced about 10.7 demolitions during that span, the average reduction in count of all crimes attributable to demolitions was approximately 3%. Over 35% of block-groups experienced more than 10 demolitions, which indicates that those

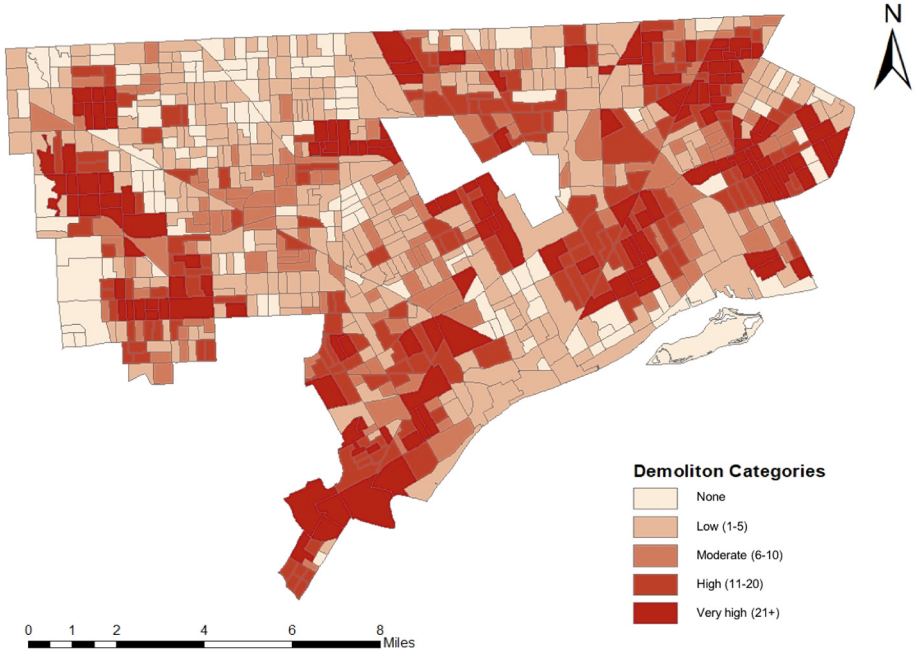

Fig. 2. Block group classifications based on frequency of demolitions.

Table 1
Descriptive statistics across block-groups (N = 879).

	Mean	SD
Crime		
Count of all crime (2014)	153.74	99.77
Count of violent crime (2014)	36.49	19.44
Count of drug crime (2014)	3.68	4.08
Count of property crime (2014)	60.93	46.69
Count of all crime (2009)	204.79	144.66
Count of violent crime (2009)	44.16	23.96
Count of drug crime (2009)	5.75	5.93
Count of property crime (2009)	86.58	63.79
Demolitions		
Experienced at least 1 demolition	0.84	–
Number of demolitions	10.69	14.78
Demolitions-No demolitions (ref)	0.16	–
Demolitions-Low (1–5)	0.34	–
Demolitions-Moderate (6–10)	0.15	–
Demolitions-High (11 − 20)	0.18	–
Demolitions-Very high (21 +)	0.17	–
Structural characteristics		
Population/square-mile in 2010	6542.33	2973.55
Median Age	35.28	6.51
Percent below poverty-line	0.41	0.18
Percent female-headed households	0.60	0.33
Number of housing units	397.24	190.66
Number of vacant units	90.70	60.71

block-groups were likely to have an average reduction in total crime counts that was even greater.

Similar to the total crime model, demolitions were associated with reductions in counts of both violent crime and property crime at the block-group level in 2014. In both cases, the Incident Rate Ratio was again 0.997, which equates to a one-third of a percent reduction in violent crime (p < .05, SE 0.001) and property crime (p < .05, SE = 0.001) for every demolition. While the Incident Rate Ratio of demolitions is consistent across these two crime types, considering the 2014 counts of violent crime (mean = 36.49) and property crime (mean = 60.93) demonstrates that demolitions from 2010 to 2014 contributed to a larger reduction in number of property crimes than violent crimes. Finally, contrary to 2014 counts of all crime, violent crime, and property crime, demolitions appear to have no statistically discernable relationship with counts of drug crimes in 2014, although the measure was approaching significance in the model (Table 4).

4.3. Supplemental analyses

A supplementary set of four OLS models were estimated to further specify the relationship between demolitions and crime in Detroit. Specifically, the supplementary models examine a secondary outcome, *change in crime* from 2009 to 2014, using a categorical measure of demolition exposure ranging from 1 (None) to 5 (Very high). Employing an alternative analytic technique and measure of demolitions helps

Table 2
Between-group differences across block-groups by demolition exposure.

Crime	No demolitions (n = 137)		*	t-value	Demolitions (n = 742)	
	Mean	Std. Dev			Mean	Std. Dev
Count of all crime (2014)	158.06	78.45		0.55	152.94	103.25
Count of violent crime (2014)	34.34	16.69		−1.41	36.89	19.89
Count of drug crime (2014)	2.42	3.57	**	−3.98	3.92	4.13
Count of property crime (2014)	68.83	31.58	*	2.16	59.47	48.85
Count of all crime (2009)	176.97	105.23	*	−2.45	209.92	150.31
Count of violent crime (2009)	35.56	20.36	**	−4.62	45.75	24.24
Count of drug crime (2009)	3.19	5.51	**	−5.57	6.22	5.88
Count of property crime (2009)	83.02	43.94		−0.71	87.23	66.81
Structural characteristics						
Population/square-mile in 2010	7289.71	2956.78	**	3.21	6404.34	2960.03
Median age	38.85	7.42	**	7.17	34.62	6.11
Percent below poverty-line	0.34	0.19	**	−4.97	0.42	0.17
Percent female-headed households	0.60	0.32		0.24	0.60	0.33
Number of housing units	444.07	297.16	**	3.14	388.59	162.43
Number of vacant units	69.83	73.18	**	−4.42	94.55	57.34

Between group differences assessed using t-tests.
** p < .01.
* p < .05.

Table 3
Negative binomial models assessing the influence of demolitions on 2014 crime counts.

	Total crime (n = 879)				Violent crime (n = 879)				Drug crime (n = 879)				Property crime (n = 879)			
	Coef	IRR	SE	*	Coef	IRR	SE	*	Coef	IRR	SE	*	Coef	IRR	SE	*
Count of demolitions	0.002	0.997	0.001	*	−0.002	0.997	0.001	*	0.001	1.000	0.002		−0.003	0.997	0.001	*
Count of 2009 crime (by crime type)	0.002	1.002	0.000	***	0.011	1.011	0.000	***	0.057	1.058	0.006	***	0.005	1.005	0.000	***
Population/square-mile in 2010	0.001	0.999	0.000	*	0.000	1.000	0.000		0.000	0.999	0.000	**	0.000	0.999	0.000	
Median Age	0.006	0.993	0.002	*	−0.009	0.990	0.002	***	−0.029	0.971	0.001	***	−0.002	0.998	0.002	
Percent below poverty-line	0.009	1.009	0.072		0.142	1.152	0.080		−0.006	0.993	0.206		−0.166	0.846	0.076	*
Percent female-headed households	0.087	1.091	0.033	***	0.138	1.148	0.037	***	0.138	1.148	0.104		0.088	1.092	0.037	*
Number of housing units	0.001	1.001	0.000	***	0.001	1.001	0.000	***	0.000	1.001	0.000	**	0.001	1.001	0.000	***
Number of vacant units	0.001	0.998	0.000	***	−0.001	0.998	0.000	***	0.000	1.000	0.000		−0.001	0.998	0.000	***

* p < .05
** p < .01
*** p < . 001

confirm the stability of the results generated by our main models. Moreover, they allow us to develop a more specific understand of how the effect of demolitions on crime may vary across the magnitude of demolitions that a block-group experienced from 2010 to 2014. Importantly, OLS is employed for the change in crime models because the outcome variables are normally distributed, which negative binomial models, used for our main models, are not suited for.

A few patterns emerge in the results of the OLS models. First, for models predicting change in counts of total crime and property crime from 2009 to 2014, all four categories of demolitions were associated with a larger reduction than block-groups that did not experience any demolitions. Specifically, in the total crime model, block-groups that experienced low, moderate, high, and very high level of demolitions experienced 30.547 ($p < .001$, SE = 9.123), 27.844 ($p < .01$, SE = 9.075), 23.810 ($p < .01$, SE = 9.078), and 34.393 ($p < .001$, SE = 9.963) fewer total crimes in 2014, respectively, relative to block-groups with no demolitions. Further, in the property crime model, block-groups that experienced a low, moderate, high, and very high levels of demolitions demonstrated 12.367 ($p < .001$, SE = 3.689), 13.982 ($p < .001$, SE = 3.508), 11.685 ($p < .001$, SE = 3.480), and 14.717 ($p < .001$, SE = 3.850) fewer property crimes in 2014, respectively, relative to block-groups where no demolitions occurred. In sum, for both types of crime, demolition exposure, regardless of whether that exposure was low or high, contributed to a reduction in crime from 2009 to 2014. Importantly, the significance of these categories lends support to the findings demonstrated in our main models.

Second, a similar pattern of crime reduction benefits was demonstrated in the violent crime model, where three of the four demolitions magnitude estimates were significant. While the model showed that a low level of demolitions from 2010 to 2014 was not related to a reduction in crime from 2009 to 2014, moderate, high, and very high demolitions were associated with reductions of 4.852 ($p < .05$, SE = 2.220), 6.148 ($p < .01$, SE = 2.126), and 6.627 ($p < .01$, SE = 2.325) violent crimes, respectively. Again, these findings support the results of the negative binomial model in our main analyses that shows an association between demolitions and violent crime in 2014. Finally, only one of the four demolitions magnitude categories were statistically significant in the drug crime model. Specifically, only block-groups that experienced a very high number (i.e. at least 21) of demolitions saw a reduction in drug crime ($b = -1.968$, $p < .001$, SE = 0.621). Again, this finding supports the results of our main models that showed no statistically discernible relationship between demolitions and drug crime in 2014.

5. Discussion

The current study explored the impact of the nation's most aggressive demolition program on neighborhood crime in Detroit, Michigan, adding to the nascent literature on the effects of blight removal policies on neighborhood-level outcomes. Although not without limitations (discussed below), our main analyses demonstrate that demolitions from 2010 to 2014 were associated with total crime, violent crime, and property crime in 2014, net of controls for crime and structural factors. Our supplemental analyses provide further support for those findings, and also show that block-groups that experienced the greatest number of demolitions from 2010 to 2014 also witnessed the greatest reductions in crime across all four crime types. Concerns over the criminogenic effect of vacant properties have been expressed by scholars for decades, and our study provides additional preliminary empirical evidence that removing vacant properties should potentially be considered as a crime reduction strategy.

It is important to reiterate that the study location for this project is unlike any other in the United States in terms of its vacant housing problem and the size and scale of its demolition program. Thus, the results reported here might not be generalizable to other locales. Although this is a legitimate concern, we maintain the findings are substantively meaningful and contribute to the growing literature in this area. Again, our main models show that demolitions are associated with less total crime, violent crime, and property crime, but not drug crime. Supplemental provide further support for the relevance of demolitions for neighborhood crime, and also show that block-groups that experienced the greatest number of demolitions were likely to experience the greatest reductions in crime, relative to block-groups with no demolitions, from 2009 to 2014.

From a policy perspective, the results suggest that demolition programs might be a valid approach for cities facing concentrated vacancy issues. In the case of Detroit, its large-scale program has not only reduced the number of vacant properties across the city, it has also led to greater reductions in crime in areas where more demolitions have occurred. This suggests, as others have found, that removing distressed structures does have an appreciable impact on crime patterns (Stacy, 2018). Additionally, our results align with literature that implicates abandoned properties as “crime attractors” (Brantingham & Brantingham, 1995; Shane, 2012) and “criminal hangouts” (Boessen & Hipp, 2015; Sherman, 1993). That is, it makes sense that removing places from neighborhoods that generate criminogenic opportunities results in less criminal activity in those areas. Although our results lend to promising conclusions, there are still many unanswered questions regarding the impact of demolitions on crime patterns and the overall wellbeing of neighborhoods. Some of these are a result of limitations

Table 4
OLS models assessing the influence of demolitions on changes in crime counts from 2009 to 2014.

	Total crime (n = 879)			Violent crime (n = 879)			Drug crime (n = 879)			Property crime (n = 879)		
	B	SE	*	B	SE	*	B	SE	*	B	SE	*
Demolitions-No demolitions (ref)	–	–	–	–	–	–	–	–	–	–	–	–
Demolitions-Low (1–5)	−30.547	9.123	***	−3.085	1.804		−0.467	0.500		−12.367	3.689	***
Demolitions-Moderate (6–10)	−27.844	9.075	**	−4.852	2.220	*	−0.719	0.657		−13.982	3.508	***
Demolitions-High (11–20)	−23.819	9.078	**	−6.148	2.126	**	−1.092	0.608		−11.685	3.480	***
Demolitions-Very high (21 +)	−34.393	9.963	***	−6.627	2.325	**	−1.968	0.621	***	−14.717	3.850	***
Population/square-mile in 2010	0.005	0.001	***	0.001	0.000	***	0.000	0.000		0.001	0.000	**
Median Age	1.577	0.573	**	0.079	0.096		−0.138	0.042	***	0.875	0.273	***
Percent below poverty-line	14.526	13.968		2.927	3.284		−0.324	1.313	*	1.355	6.299	
Percent female-headed households	18.846	8.780	*	2.856	1.570		0.352	0.607		9.514	3.452	**
Number of housing units	−0.053	0.034		0.007	0.005		0.004	0.002	*	−0.058	0.020	**
Number of vacant units	−0.064	0.089		−0.065	0.018	***	−0.022	0.006	***	0.056	0.046	

* $p < .05$.
** $p < .01$.
*** $p < .001$.

associated with the present study, while others are a product of a lack of information about demolition processes, more generally.

With regard to the latter, no studies have explored whether there is a threshold effect in which demolitions beyond a certain point result in diminishing returns. Relatedly, there is only one study, to our knowledge, that specifies the temporality of the effects of demolitions on crime (see Spader et al., 2016). These are very important details to consider for policymakers contemplating demolition programs and expecting quick or effective results. It is unlikely that a single demolition of a distressed property within a block group results in meaningful reductions in crime, but it could be that reductions are visible after three demolitions, for example. Similarly, there might be an interactive effect between concentration of demolitions and time so that reductions in crime are evident only after a certain level of concentration *and* enough time has passed for the neighborhood-level processes to be affected. Other questions remain about whether the effects are sustained over time. It is possible that crime reductions are noticeable shortly after completed demolitions but regress to normal levels after a certain amount of time.

Importantly, there are various methodological limitations that the current study is constrained by. Perhaps most notably, our analyses are cross sectional in nature and cannot bear out any causal effects. While this is a serious and legitimate limitation, we view our analyses as exploratory and representing the first step toward understanding how large-scale demolition programs *might* affect crime. Also, some might be concerned that we treat demolitions as an isolated process, even though there are undoubtedly potentially relevant events that follow the demolition of a home that might be tied to changes in neighborhood-level crime, as well as the tax and mortgage foreclosure processes preceding home demolition that also affect crime (Immergluck & Smith, 2006; Lacoe & Ellen, 2015). For instance, a small but growing body of recent experimental work suggests that remediation of vacant properties has real implications for crime happening in and around those properties, and they determine these effects even extend to violent crime specifically (Branas et al., 2016; Kondo, Keene, Hohl, MacDonald, & Branas, 2015). We acknowledge post demolition efforts likely influence collective efficacy, social networking, and opportunities for crime, and that aggressive demolition programs in general may potentially have other, deleterious impacts on communities. For example, in Detroit communities have raised concerns over physical health implications centered on lead and asbestos exposure (Dixon, 2017; MacDonald, 2015). However, trying to account for these efforts in Detroit would be a monumental task. Lastly, although beyond the scope of this paper, we did not address the possibility of crime displacement, which other studies have found (Frazier et al., 2013).

Undoubtedly, researchers will continue to study the effects of demolitions on neighborhood-level crime, disorder, and other social processes, especially in light of their continued growth throughout the country. Future research should attempt to address the aforementioned limitations. Additionally, scholars should focus efforts on understanding the impact of demolitions on residents' mental and physical health, exercise patterns, and overall quality of life. While we have provided preliminary evidence that concentrated demolitions are associated with significant reductions in crime, we still need to answer whether razing Detroit is actually raising Detroit.

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