This is a pre-print of an article published in the *Journal of Experimental Criminology*. The final authenticated version is available online at https://doi.org/10.1007/s11292-017-9320-4.

Effect of Emergency Winter Homeless Shelters on Property Crime

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1 Abstract

Objectives. We evaluate the effect of emergency winter homeless shelters on property crimes in the nearby communities.

Methods. Every winter between 2009 and 2016, the City of Vancouver, Canada opened shelters to protect the homeless from harsh winter conditions. The city opened 19 shelters, but only five to nine of them were open in any one winter. Using the variation in timing and placement of the shelters, we contrast crime rates in the surrounding areas when the shelters are open and closed.

Results. The presence of a shelter appears to cause property crime to increase by 56% within 100m of that shelter, with thefts from vehicles, other thefts, and vandalism driving the increase. However, when a homeless shelter opened, rates of breaking and entering commercial establishments were 34% lower within 100m of that shelter. The observed effects are concentrated close to shelters, within 400 meters, and dissipate beyond 400 meters. Consistent with a causal effect, we find a decreasing effect of shelters with increasing distance from the shelter.

Conclusions. While homeless shelters are a critical social service, in Vancouver they appear to impact property crime in the surrounding community. Shelters may warrant greater security to control property crime, but the data suggest any increase in security need not extend beyond 400 meters, about 2 to 3 blocks, from the shelters.

Keywords: community design, homeless shelters, property crime, Vancouver

2 Introduction

Homeless shelters offer temporary accommodations and social services to those lacking permanent housing. Studies suggest that the benefits of this type of public health intervention on its target population and surrounding community are numerous. Comparative evaluations of homeless populations reveal that both, sheltered youth and women, have better health outcomes than their unsheltered counterparts, with these sheltered populations respectively reporting fewer serious health issues, and better physical and mental health (Klein, et al., 2000; Nyamathi, Leake, & Gelberg, 2000).

Unsurprisingly, occupants of homeless shelters also report greater access to food than their peers on the streets (Regional Steering Committee on Homelessness, 2012). While compared to the general population sheltered homeless people have a greater mortality rate (Barrow, Herman, Cordova, & Struening, 1999; Hwang, 2000), sheltered homeless populations seem to have fewer risk factors for mortality in comparison to unsheltered homeless individuals (Montgomery, Szymkowiak, Marcus, Howard, & Culhane, 2016).

Despite the potential benefits of sheltering the homeless, neighborhood stakeholders such as property owners, business owners, and residents often oppose the establishment of such shelters in their neighborhoods. In addition to concerns about property values and business disruption, the risk that shelters might increase crime rates is a primary driver of their reticence. This study addresses this issue, providing empirical evidence for the effect of emergency homeless shelters on crime. This paper begins with an overview of the existing literature related to homeless shelters and crime. The following sections discuss the data used in the study, the difference-in-differences analysis method employed, the results, and the conclusions drawn based upon the results.

3 Prior Literature

Criminological theories support the possibility of crime increasing after the implementation of homeless shelters. Specifically, routine activity and lifestyle victimization theories both propose mechanisms for how homeless individuals affect crime rates whereas broken windows theory proposes mechanisms for how the built environment of a neighborhood, such as shelters, could influence crime. In accordance with routine activity theory, crime might increase after a shelter opening due to the convergence of motivated offenders, suitable targets, and the absence of capable guardians (Cohen & Felson, 1979). For example, homeless individuals may commit acquisitive crimes due to a lack of basic necessities, be suitable targets due to their vulnerability, and may frequent areas with an absence of security. Shelters may vary in the degree of police and security presence. Lifestyle victimization theory suggests that the opening of homeless shelters could lead to more crime, as homeless individuals tend to experience high-risk lifestyles that make them easier targets for crimes (Anderson, 2014). High rates of victimization (Fitzpatrick, La Gory, & Ritchey, 1993; Kushel, Evans, Perry, Robertson, & Moss, 2003) and offending (Redburn & Buss, 1986; Snow, Baker, & Anderson, 1989) among the homeless support these theories. Although congruent with the notion that shelters could increase crime, broken windows theory proposes that the increase could be due to the social disorder signaled by the existence of a shelter and the presence of homeless people in proximity of shelters. According to the theory, crimes can occur anywhere once communal barriers, the sense of mutual regard and the obligations of civility, are lowered by physical signs of social disorder that seem to signal that “no one cares” (Wilson & Kelling, 1982) . Therefore, because of its anonymity, the high population turnover, and the past experience of “no one caring”, homeless shelters could signal the presence of the breakdown of community controls, indicating to potential criminals that the surrounding area is not preoccupied with or has lost control of those locations.

Depending on design and implementation, shelters could reduce crime and the reduction could still be consistent with routine activity, lifestyle victimization, and broken windows theories. Routine activity

theory suggests that crime could decrease after shelters open as this infrastructure might make homeless people less vulnerable and less likely to be motivated to commit crimes out of necessity. This theory also proposes that homeless shelters could be linked to a decline in crime rates when paired with increased security and/or police presence, as adequate police and security planning could offset the risk of any increase in crime or reduce crime altogether. Likewise, lifestyle victimization supports the possibility that the opening of homeless shelters could lead to less crime, as the shelter may directly address the aspects of a high-risk lifestyle that puts the homeless at greatest risk. Broken windows theory also posits that crime could decrease near homeless shelters since these structures could remove signs of social disorder and may signal to potential offenders that stakeholders care about their community. Altogether, criminological theories suggest that homeless shelters could affect crime, but it is unclear in what direction the change would be.

While prior empirical research has shown that certain features of the built environment affect incidences of crime in its surrounding community, it has not extensively covered the effect of homeless shelters on crime. Instead, most studies have greatly focused on the topic of abandoned housing, transit, business improvement districts, and indigent housing (MacDonald, 2015). Although the topic of indigent housing is closely related to that of homeless shelters, indigent housing provides long-term stays to those in need and does not provide the same resources as homeless shelters. Thus, applying conclusions from indigent housing studies to the topic of homeless shelters would be speculative.

Since prior research has neither confirmed nor disproven the influence of homeless shelter on crime in either direction, our analysis will examine the roll out of emergency winter shelters in Vancouver and assess the effect of the activation of these shelters on crime in the surrounding community.

4 Emergency Winter Shelters in Vancouver

In 2008, Vancouver's homeless population numbered 1,570 people, with more than 50% unsheltered (Thomson, 2016). That same year, Dawn Bergman, a homeless Vancouver woman, died when her shopping cart caught fire. Shelters at the time did not allow shopping carts and, fearing her possessions would be stolen, Ms. Bergman refused the efforts of Vancouver police officers encouraging her to stay at a shelter during an unusually cold winter night. As a result of her death, Vancouver created a Winter Response Strategy to better manage the city's emergency winter shelter needs. Every year from 2009 to 2016, as part of its Winter Response Strategy program, the city of Vancouver opened seasonal shelters to protect the homeless from the harsh winter conditions. Consequently, although the homeless population grew 17% between 2008 and 2016, the percentage of the homeless population who were unsheltered declined to 29%.

Since the start of the program, numerous news articles have discussed the openings of emergency winter shelters. In combination with homeless counts conducted on seven occasions between 2008 and 2016, inclusively, these articles provide details on these facilities and their operation. From the end of 2008 to 2016, Vancouver opened winter shelters in 19 different locations. The city commissioned seven operators to manage the shelters with RainCity Housing and Support Society managing more than half of the homeless shelters. The shelters generally operate at or near capacity with the number of beds ranging between 30 and 200. In addition, many also offered services such as access to showers and

connections to housing options. Although nearly all shelters catered towards a clientele of all gender and ages, in practice shelters served a predominantly male and adult population; roughly 70% of shelter stays involved homeless men. At the time of their stay in these shelters, an estimated 83% of homeless shelter occupants had been homeless for over a month. Approximately 38% of Vancouver's sheltered homeless population reported suffering from mental illness and 53% from an addiction.

Shelters were mostly located within or in close proximity to Vancouver's Central Business District, although some were in more commercial areas than others. Table 1 shows the timing and locations of the shelters. Table 1 shows that several shelters were operational by January 2009, the winter following Ms. Bergman's death, though one had been operational for the winters of 2007 and 2008. For logistical and political reasons that are not always clear, the majority of the 19 locations in which shelters were opened only hosted a shelter for three or fewer winters. Most shelters typically started operating in December prior to the year listed in the column headings in Table 1 and closed towards the end of the following April. However, sometimes shelters would not open until late December or January. As a result, we focus our attention on January to March when all emergency shelters were operational.

Table 1: Timing and Placement of Emergency Winter Homeless Shelters in Vancouver

Shelter Address	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
134 East Cordova Street		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
51B W Cordova Street				✓	✓	✓	✓	✓	✓	✓	✓
320 Hastings Street				✓	✓	✓	✓	✓	✓	✓	✓
201 Central Street				✓	✓	✓	✓	✓	✓	✓	✓
1442 Howe Street				✓		✓	✓				
1435 Granville Street				✓	✓						
1642 West 4th Avenue					✓	✓					
747 Cardero Street					✓	✓					
677 East Broadway Street					✓	✓					
1648 East 1st Avenue					✓	✓					✓
518 Richards Street							✓				
2950 Prince Edward Street							✓				
119 East Cordova Street							✓			✓	✓
1210 Seymour Street								✓			
2610 Victoria Drive								✓			
21 East 5th Avenue								✓	✓		
862 Richards Street								✓	✓		
1647 East Pender Street										✓	
900 Pacific Street											✓

The timing and placement of the shelters was not random. The placement often was a result of availability and suitability of space and an organization capable of managing the shelter. While current crime conditions were not an overt ingredient in the decision to place a shelter, crime could have

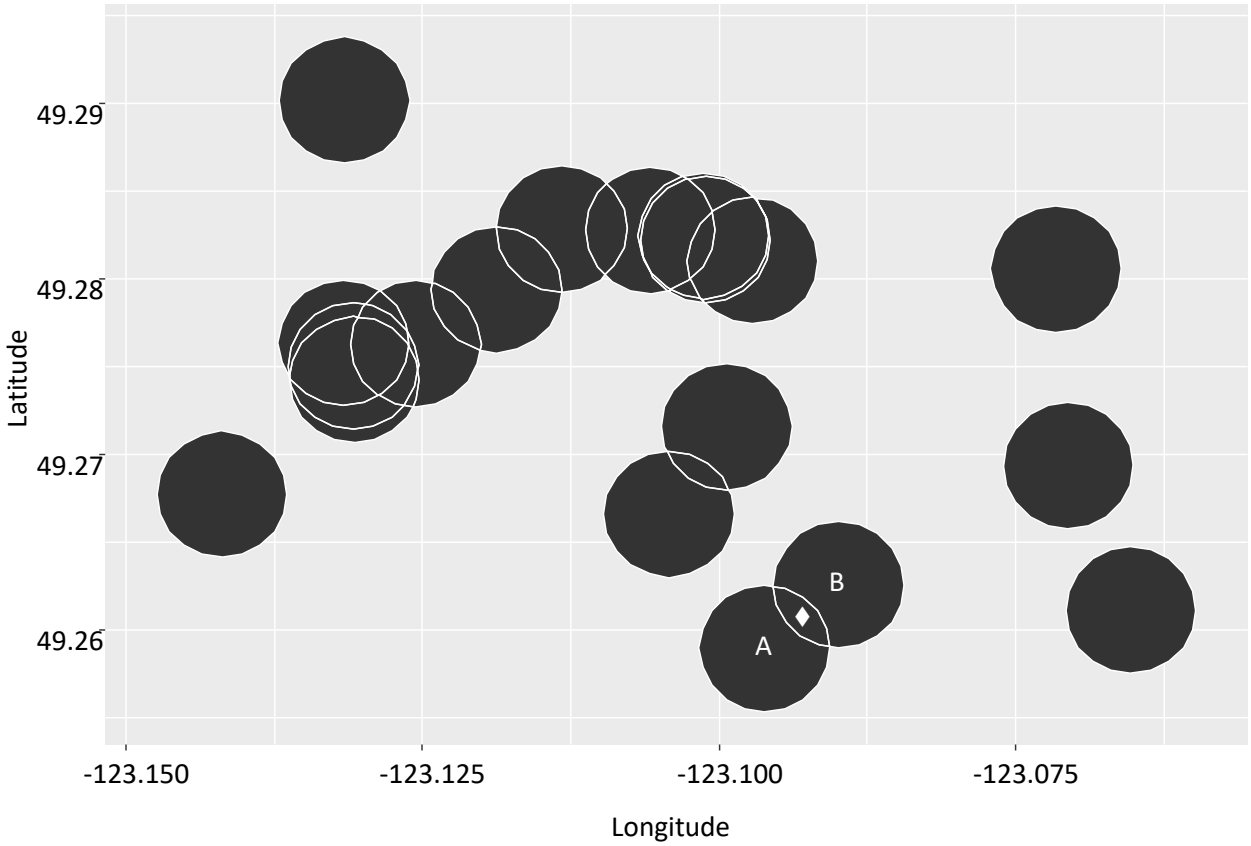
created conditions conducive to the opening of a shelter. For example, an office building may have closed down due to crime, thus providing available space for a shelter to move in. Consequently, in our analyses, we treat the shelter openings and closings as exogenous shocks to the community, but we also check for signals of crime trends in advance of the shelter openings.

5 Data and Methods

Vancouver publishes data on crimes reported to the Vancouver Police Department (VPD) (City of Vancouver, Canada, 2017). For every crime incident, the data indicate the type of offense as well as the year and the month in which it occurred. The reported crimes fall into eight categories: Commercial breaking and entering, residential breaking and entering, homicide, mischief (vandalism or property destruction), attacks against a person, theft from vehicle, theft of vehicle, and non-vehicle related theft. The dataset also included the geographic location of each property crime by indicating its approximate address and geographic coordinates. For privacy concerns, VPD does not make publicly available the location of offenses against a person. Therefore, our analysis focuses on property crimes. We included data from 2006 through 2016. We started with 2006 to provide three years of data before the start of the emergency winter shelter program.

Combining the crime timing and locations with the shelter openings and locations shown in Table 1, we aim to discern whether having an active homeless shelter influences crime in the surrounding community. Because shelters open and close at various times and places, we can use each area as its own control and contrast crime in an area when the shelter is open and when it is closed. We considered an area to have a shelter if it was within a given radius around an active shelter. We used radii of 100m, 200m, 300m, 400m, and 500m and report the results for each of these. We included a crime in the analysis only if it occurred between January and March (when the shelter program was active) and occurred in an area that was within the buffer radius of a location that had a shelter at some time during the study period. Figure 1 shows the geography for a 400m buffer radius. These are the buffers for all 19 shelters that were active between 2009 and 2016, but not all of them were active in every year.

Figure 1: Shelter buffers for a 400m buffer radius. White outlines mark areas where shelter buffers overlap.



Buffers around each shelter can overlap and occurs to a greater extent when considering larger radii. To accommodate the overlap in the analysis we carved the collection of circles into the set of non-overlapping regions. In Figure 1 this produced 41 non-overlapping regions. A crime occurring in the location marked with a diamond in Figure 1 will be labeled as a crime near an open shelter if shelter A is open, shelter B is open, or both shelter A and shelter B are open (and not near a shelter if both shelter A and B are closed).

We organized the data so that for each year, for each of the 41 regions, we had an indicator of whether there was an active shelter within the buffer radius and the number of crimes reported within the region. We used a Poisson regression model to model the crime counts

$$\begin{aligned} \mathrm{y}_{it} &\sim \mathrm{Poisson}(\lambda_{it}) \\ \log(\lambda_{it}) &= \beta_1 \mathrm{shelter}_{it} + \alpha_i + \gamma_t \end{aligned} \tag{1}$$

where y_{it} is the number of crimes reported in region *i* at time *t*, $\mathrm{shelter}_{it}$ is a 0/1 indicator of whether there was an active shelter within the buffer radius for region *i* at time *t*, α_i is a fixed effect for region *i*, and γ_t is a fixed effect for year *t*, with γ_1 fixed at 0 making 2006 the reference year. Since α_i captures the crime rate for region *i* and γ_t captures the crime trends, $\exp(\beta_1)$ measures how many times larger the crime rate is with an active shelter nearby. We used a sandwich estimator for the standard errors to

account for overdispersion in the crime count outcome, but not to account for spatial or temporal correlation. We used a Poisson model with robust standard errors instead of a negative binomial model because the former is more efficient and robust (Wooldridge, 2010). We relied on a permutation test to address spatial and temporal correlation.

We conducted a permutation test of $\beta_1 = 0$. Confidently estimating the correct null distribution for $\hat{\beta}_1$ using traditional statistical theory is challenging. The null distribution would need to address correlation in space and time while also addressing areas that multiple shelters overlap. Permutation tests sidestep these issues by simulating the reference distribution under the null hypothesis that shelter timing and placement are uncorrelated with crime. Fisher's exact test for testing the independence of two categorical variables is the best known permutation test (Fisher, 1935). In this special case, Fisher showed that, rather than having to simulate or enumerate all the possible permutations of the observed categories yielding a contingency table matching the observed table margins, the hypergeometric distribution could compute tail probabilities over the permutation distribution.

We cannot enumerate all possible permutations of the timing and locations of shelters. Instead to simulate the reference distribution we randomly shuffled the timing and locations of the active shelters, effectively randomly shuffling the checkmarks in Table 1. We fixed the marginal distribution of the number of open shelters in each year to match the observed number of open shelters that year and permuted the shelter openings using Patefield's algorithm (Patefield, 1981). This restricts the permutation test from considering implausible scenarios, such as having all shelters open or all shelters closed in a given year. For each permutation, we relabeled all of the regions (like those shown in Figure 1) as having an active shelter or no shelter. Then we refit the model (1), storing the estimated coefficient $\hat{\beta}_1$ from each model fit. We repeated this 2,000 times and used the collection of 2,000 estimates of $\hat{\beta}_1$ as the null distribution. This process generates the null distribution showing us the distribution of $\hat{\beta}_1$ we should expect when shelter timing and locations are random and unrelated to crime (Figure 2 in the results shows an example).

Permutation tests can be underpowered in designs such as equation (1) when the error structure is complex, so permutation test p-values will be conservative (Wang & DeGruttola, 2016). While most traditional tests provide a test that the average treatment effect is 0, the permutation test described here (as with Fisher's exact test) provides a test of the sharp null hypothesis that there is no effect on crime for any of the shelters (Imbens & Rubin, 2015).

We conducted these analyses for total property and mischief crime as well as separately for each individual crime type.

6 Results

We found strong evidence that the presence of a shelter is associated with an increase in property and mischief crime, with a decreasing effect with increasing distance from the shelter. When shelters open we find that within 100 meters of the shelter total property and mischief crimes increase by 56.3%. The permutation test assures us that an effect of this magnitude is outside of what we should expect from chance variation. Figure 2 shows the permutation test null distribution for what the model in (1) would

estimate to be the percent increase in property crime attributable to a shelter opening if in fact shelters and crime were unrelated. When we randomly shuffle the shelter openings (and break any relationship between crime and shelters) the histogram in Figure 2 shows the estimates that we should expect if shelters have no effect. Estimated effects between a decrease of 30% or an increase of 30% in property crime could reasonably occur by random chance. However, our estimate was an increase of 56.3%, marked in Figure 2 by a vertical line, well outside the normal random variation we would expect by chance. Because we generated the null distribution through simulation, the histogram's spread properly accounts for spatial and temporal correlation and for multiple shelters operating within the same areas.

Figure 2: Null distribution for the effect of shelters on total property crime within 100m

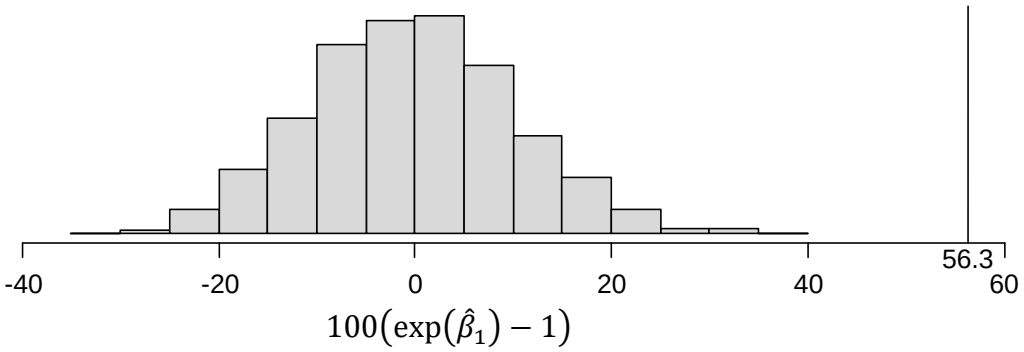


Table 2 shows the percent increase in crime attributable to the opening of an emergency winter homeless shelter for each of the property crime categories. We varied the size of the radius around each homeless shelter in order to assess the range of the shelter's effect. The primary drivers of the increase were thefts from vehicles, other thefts, and mischief to some degree. Other thefts appear to double after the opening of a shelter compared to years when the shelters are not open.

Shelters did not affect all crime categories in the same direction. We find strong evidence that rates of breaking and entering commercial buildings was substantially lower when a homeless shelter was nearby. Within 200 meters of a shelter, the percentage of break-ins of commercial establishments declined by 27%.

Table 2: Percent increase in crime for areas within a given radius of an open homeless shelters

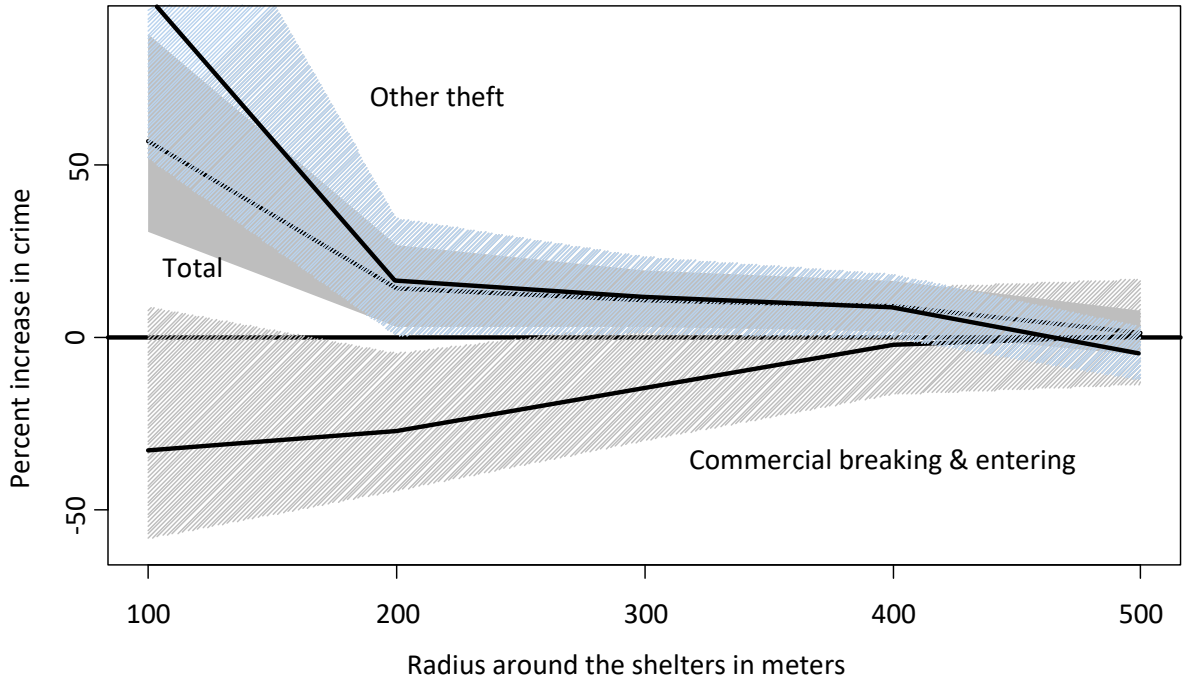
	Average crime count per year within 300m of shelters	Radius around shelters				
		100m	200m	300m	400m	500m
Total Property and Mischief Crime	1780	56.3 (30.2, 87.7) <0.001*	14.0 (2.9, 26.4) 0.005*	10.8 (2.9, 19.3) 0.007*	8.7 (1.5, 16.5) 0.009*	0.9 (-5.3, 7.6) 0.444
Break and Enter Residential	75	82.5 (-13.8, 286.3) 0.009*	9.4 (-22.0, 53.4) 0.295	-0.7 (-21.6, 25.9) 0.430	-1.4 (-18.4, 19.1) 0.444	2.5 (-14.4, 22.9) 0.433
Break and Enter Commercial	137	-33.5 (-58.9, 7.5) 0.035	-27.1 (-44.4, -4.5) 0.001*	-14.9 (-30.1, 3.7) 0.040	-2.5 (-16.7, 14.1) 0.467	0.3 (-13.8, 16.7) 0.397
Theft from Vehicle	538	42.9 (2.2, 99.9) 0.007*	15.8 (-1.5, 36.1) 0.024	20.7 (7.3, 35.8) <0.001*	15.1 (2.0, 29.9) 0.012*	12.0 (0.6, 24.7) 0.053
Theft of Vehicle	57	-39.9 (-72.2, 29.8) 0.059	-19.8 (-47.7, 23.1) 0.088	-2.4 (-26.6, 29.9) 0.376	-11.0 (-29.7, 12.6) 0.099	-9.5 (-26.2, 11.0) 0.157
Other Theft	709	98.1 (51.0, 159.7) <0.001*	16.4 (0.7, 34.6) 0.023	11.5 (1.0, 23.1) 0.015*	8.5 (-0.3, 18.0) 0.040	-5.1 (-12.5, 2.9) 0.104
Mischief	264	26.3 (-9.7, 76.7) 0.033	28.3 (8.2, 52.1) <0.001*	8.5 (-4.8, 23.7) 0.097	7.8 (-4.0, 21.0) 0.060	2.3 (-7.9, 13.6) 0.428

Note: For each crime type and for each radius we show the estimated percent change in crime $(100(\exp(\hat{\beta}_1) - 1))$, a 95% confidence interval accounting for overdispersion (but are not valid since they do not account for spatial/temporal correlation or shelter overlap), and the permutation test p-value (without any adjustment for multiple comparisons). The p-values marked with * remain significant after a Benjamini-Hochberg adjustment for multiple comparisons. The second column shows the average number of crimes per year within 300 meters of the shelter areas to give the reader an idea of the additional number of crimes that occur when shelters open.

When arguing for cause of an observed effect, the gradient criterion, one of the Hill criteria for providing evidence of a causal relationship, suggests that higher doses of a treatment should result in a larger corresponding response (Hill, 1965). In the case of shelters, we should see a stronger effect of the shelters in areas closest to them and a smaller effect as we expand the radius to include areas farther away from the shelters. Indeed, Table 2 demonstrates a decreasing effect with increasing radius. Figure

3 shows graphically the Table 2 results for other theft, commercial breaking and entering, and in the background, total property and mischief crime. All of these crime categories show that near the shelter the effect is strong, but converges toward a null effect once we consider a radius of 500 meters, further supporting the conclusion that shelters are causing the changes in crime.

Figure 3: Percent change in crime as a function of the shelter buffer radius



Note: The figure shows the point estimate and the pointwise 95% confidence intervals

The observed effects potentially could be attributable to city officials placing shelters in areas that are already experiencing crime changes. If this is the case, then the opening of a shelter should be correlated with the crime in the *prior* year. As a falsification test we dropped the data from 2006 and replaced the model (1) with a model predicting crime the year prior as shown in (2).

$$\log(\lambda_{i,t-1}) = \beta_0 + \beta_1 \text{shelter}_{it} + \alpha_i + \gamma_{t-1} \quad (2)$$

For almost all crime types and at all radii around shelters we find shelters not to be predictive of crime levels in the prior year. The one exception might be mischief crimes at 100 meters (p-value = 0.01, but Benjamini-Hochberg adjusted p-value = 0.19). That is, increases in vandalism and property damage may precede the placement of shelters. Though not statistically significant after accounting for multiple comparisons, there is a decreasing relationship with the prior year's mischief crimes with an increasing radius, indicating that disorder already may be developing in places where shelters open. For other crime types we see no trend by distance from shelter in the relationship between shelter openings and the prior year's crime, with point estimates equally likely to be positive or negative and generally large p-values.

7 Discussion

This study aimed to examine the effect of homeless shelters on crime in Vancouver. The opening of a shelter appears to be linked with a significant increase in property crime in the shelter's immediate vicinity. An exception to this finding was that incidences of commercial breaking and entering decreased. The effect of the shelter decreases with distance from the shelter offering further support that the observed effect is causal.

In an attempt to further explore the commercial environment and the relationship with commercial breaking and entering, we gathered data on the number of business licenses within 200m of each shelter location. All but three shelters were in heavily commercial areas with 50 or more businesses licensed within 200m of the shelter. While we are interested in uncovering more about the impact of siting shelters in different kinds of neighborhoods and how this moderates the treatment effect, the lack of variation in Vancouver makes this infeasible.

Routine activity theory may offer an explanation for the observed decrease in the occurrences of commercial breaking and entering. Local businesses may increase security, such as using roll-up sheet doors, cameras, and security personnel. It is also possible that by providing shelter to homeless people, these individuals may be less motivated to seek shelter in empty businesses during the night. Indeed, the CEO of the Downtown Vancouver Business Improvement Association noted that many fewer homeless were sleeping in the alcoves of retail storefronts and the downtown had a sharp decline in trespassing after the shelters opened (Gauthier, 2017).

The increase in property crimes could be explained by one or a combination of three mechanisms. First, these results may provide support for the broken windows theory. The presence of homeless shelters and the potential increase of the homeless population could increase social disorder, which could consequently increase crime committed by the homeless and non-homeless. Second, it is possible that homeless shelters encourage the convergence of suitable targets, motivated offenders, and a lack of guardians, therefore resulting in crime. Third, there is a possibility that homeless shelters generate crime by attracting a homeless population whose lifestyle choices put them at risk of being victimized. However, because we do not have data on the circumstances leading to each crime, we are not able to identify which of these three mechanisms contributed to these changes in crime.

It is possible that these results do not reflect an increase in new crime. Indeed, crime that would have been committed elsewhere in the city might have been displaced to the area surrounding homeless shelters. Moreover, crime might have been affected by increased detection associated with changes in police presence and in the behavior of the people present in the area near shelters.

Regardless of the reason for the increase in crime rates, these findings indicate that greater security or policing intervention may be necessary to minimize the potential negative effects shelters have on the surrounding community and to address crime that was committed, but had remained undetected until the implementation of homeless shelters. Police interventions such as place-based interventions focusing on crime and disorders associated with the homeless could potentially reduce crime, as it appears to have done in Los Angeles (Berk & MacDonald, 2010). Since our research demonstrates a rapidly decreasing effect with increasing radius away from the shelters, security measures and police

interventions need not be extensive and may be confined to a small area within 400 meters (2 to 3 blocks in Vancouver) of the shelters.

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