DRUG OFFENCE DETECTION DURING THE COVID-19 LOCKDOWN: A SPATIOTEMPORAL STUDY OF CHANGE IN A STREET-LEVEL DRUG MARKET

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ABSTRACT

The COVID-19 pandemic and the associated orders to ‘stay-at-home’ have been linked to a decline in most types of crime. However, the study of drug markets has been neglected. In this paper, using data from Queensland, Australia, we explore how the street-level drug market of Fortitude Valley was affected and whether drug market participants were displaced. Using a spatiotemporal generalised additive model (GAM), we find that drug offence detections did not change in the greater Fortitude Valley region but that the street-level drug market was significantly affected. We document locations of both nearby and distal displacement and explore their environmental and contextual characteristics using systematic study of Google Street View (GSV). This study finds that street-level drug markets were less active during the lockdown, but drug market activity seems to have been displaced to new locations. Routine activities, diminished guardianship, and lower levels of passive surveillance all seem to be important factors in the location choice of displaced drug market participants.

Introduction

Illicit drug consumption is a ubiquitous feature of modern society in most countries around the world (see United Nations Office on Drugs and Crime, 2020). Despite even the declaration of a ‘war on drugs’ (see, for example, Baum, 1996), international drug trafficking syndicates continue to thrive (see United Nations Office on Drugs and Crime, 2016, 2020) and the macro-level demand for drugs has remained relatively unchanged (see United Nations Office on Drugs and Crime, 2016, 2020). At the micro-level, efforts to disrupt the supply of illicit drugs and to remediate or eradicate illicit drug markets have also been mostly unsuccessful (Mazerolle et al., 2020; Mazerolle et al., 2007), except, perhaps, for those partnership initiatives which seek to discourage drug market activity through community control mechanisms that reshape the physical and contextual environment (see, for example, Linton, Jennings, Latkin, Gomez, et al., 2014; Linton, Jennings, Latkin, Kirk, et al., 2014). As Tarkhanyan (2014) suggests, a critical component of any drug market eradication and crime prevention strategy is to understand how and where drug market participants position themselves, as well as how and to what extent they respond to changes in the dynamics of their market (Tarkhanyan, 2014).

In this study we examine what happened in a street-level drug market during the first three-month COVID-19 lockdown in Queensland, Australia. The site of our analysis is the busy inner-city locale of Fortitude Valley, a red-light district situated one and a half kilometres to the north-east of the Brisbane CBD, at the centre of the Brisbane Local Government Area (see Figure 1). Fortitude Valley is a well known area (see Aitken et al., 2002; Coomber and Maher, 2006; Darchen and Ladouceur, 2013; Davies, 2011; Dwyer, 2009; Gibson et al., 2005; Gibson et al., 2003; Higgs et al., 2008; Manning et al., 2016) which has all the hallmark features of a ‘local’ street-level drug market. It is a busy commuter transit point and public transport interchange surrounded by a range of retail and commercial opportunities. Drug offence detections in the Fortitude Valley are among the highest in the region (averaging at around 100 per month) and are highly clustered around the Fortitude Valley train station and the nearby Brunswick Street Mall. We hypothesise that drug-related activity will have significantly declined because the

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situational and environmental features that normally precipitate activity within markets like Fortitude Valley (see, for instance, Reuter and McCoun 1993; Eck 1994) were the most significantly disrupted by the government mandated social distancing and stay at home orders.

[Figure 1 about here.]

Prior Literature

Drug market facilitators and precipitators

Drug markets are complex structures designed to facilitate the trade of illicit products, while minimising the risk of detection and apprehension. Each market is unique. Its location, among all other possible locations, has likely been carefully selected to maximise profits and minimise costs. The illicit transaction calculus is multifaceted and accounts for both the location and size of nearby drug user populations, as well as the presence (or absence) of capable guardians. Rengert (1996), for example, argued that the “quality of [a drug selling] location is directly related to the quantity of profit” (Rengert, 1996) while Eck (1994) argued that location selection was ultimately a trade-off between accessibility and security because for illicit goods that are unregulated by legitimate market protections the exchange process is inherently “very risky” (Eck, 1994, p. 71). To this, Reuter and MacCoun (1993) add that successful drug markets typically establish in locations where drug buyers and sellers can stay safe, remain unnoticed and, ultimately, avoid violence from other drug market participants as well as detection by the police.

Responding to these competing risks, Eck (1994) proposed two alternative drug market models. The first is a social network market where drug transactions are limited to a network of familiar and trusted associates. These trusted networks provide opportunities to pre-arrange the illicit transaction, oftentimes in places or contexts which significantly limit the risk of detection. The second is a routine activities market where drug transactions are unplanned, often between strangers or unfamiliar acquaintances. As the name suggests, this second market type operates at the intersection of the drug buyers’ and drug sellers’ routine activities, commonly at points of commuter convenience such as train stations, shopping centers and night time economy establishments (see, for instance, Barnum et al., 2017; Bernasco and Jacques, 2015; Bouchard, 2007; Eck, 1995; Haracopos and Hough, 2005; May and Hough, 2004; Reuter and Pollack, 2012; Robinson and Rengert, 2006; St. Jean, 2007). In addition, research has shown street-level drug markets are more likely to proliferate in “business-friendly” (Willits et al., 2015) neighbourhoods with comparatively low levels of informal social control (Forsyth et al., 1992; McCord and Ratcliffe, 2007). Conversely, they seem not to proliferate in areas where legitimate place managers (i.e., local residents and business operators) are actively engaged in efforts of collective control and self-regulation (see Mazzerolle et al. 1998 Willits et al., 2015). In fact, even in areas that might normally attract drug sellers—for example, areas which service multiple complementary routine activities, especially for unemployed, poor, and under-educated populations (Willits et al., 2015)—markets might not emerge when local guardians have both the resources and the collective will to deter illicit conduct (Willits et al., 2015).

For the current study, it is important to recognise that street-level drug markets are not a random phenomenon. Instead, they typically establish in locations that offer “a balance between the spatial distribution of those who demand the product and the distance they would be required to travel to the market” (Tarkhanyan, 2014, p. 5000). In addition, security and safety are key considerations and spatial clustering in familiar locations is said to afford both drug sellers and drug buyers and perception of ‘protection in numbers’, by spreading the risk of apprehension across multiple participants (Kleiman 1991, cited in Taniguchi et al., 2009). The preferred locations are usually at or nearby clearly identifiable landmarks, making it easier to organise multiple ‘deals’ with different buyers. Importantly, they are also typically busy places with a mix of different legitimate uses—places where it would not be uncommon for drug market participants to ‘blend in’ (Tarkhanyan, 2014) with the general public as they loiter while waiting for a family member to finish in a nearby shop or a friend to arrive on the next train. Critically, it is the frenetic and multi-purpose nature of these locations that affords drug market participants the cover of anonymity and, if questioned by the police, a plausible deniability (see St. Jean, 2007 for a discussion).

What happens when circumstances change

In early 2020, as the pace of global transmission of SARS-CoV-2 increased, many countries introduced a range of social distancing and stay-at-home measures, each broadly defined in the criminological literature as a ‘COVID-19 lockdown’. These measures were specifically designed to ‘break the chain of transmission’, restricting, and in some cases legally prohibiting, non-essential and unnecessary social interaction. Quite intentionally, these government-imposed restrictions on social mobility had a considerable impact on the movement of people throughout the city and this turned the normally busy and frenetic streets into a “ghost town” of sorts (Young, 2021)². Google mobility data (Google, 2021) for Brisbane shows that, compared to a

²In Queensland, the first restrictions introduced were to limit large public gatherings from 19 March 2020, prohibiting non-essential indoor gatherings of over 100 people and non-essential outdoor gatherings of over 500 people. On 24 March, all non-essential businesses

pre-lockdown baseline, there was a significant decrease in visits to all major public location types. Public transport stations and transit hubs were the most significantly affected with daily visits falling by as much as 80 percent on 13 April. Following transport stations and transit hubs, places of work, retail and recreation were also considerably impacted by the government's stay-at-home orders, each falling by about 50 percent during the first three weeks of the lockdown.

In Fortitude Valley, where about 6,000 unique passengers will board or alight the rail system every two hours (Jacobs. and Aecom, 2014), these mobility data suggest that there was a considerable change to the pedestrian activity in and around the local area. Coupled with the forced-closure of retail shops and non-essential businesses, this will have fundamentally transformed the landscape of the local area and with it the contexts and opportunities that normally precipitate drug market transactions. For example, fewer rail passengers and street pedestrians will have likely meant that drug dealers and drug buyers were less camouflaged from police and other surveillance, while the closure of retail shops and businesses will have quickly removed the protection of an ambient population as well as opportunities for the plausible deniability of their drug market engagements.

Not since the Spanish Flu of 1918 has there been such a wide-spread, rapidly developing public health event of major international concern and so the various local government 'lockdowns' have no contemporary precedent. Nevertheless, the drug-market intervention literature offers some useful insights from which we can draw our hypotheses. To be sure, criminologists have long studied the impact of different drug market interventions and Mazzerolle and colleagues (Mazzerolle et al., 2020) offer one of the most comprehensive and contemporary reviews. At the meta-level, the empirical evidence indicates that most law enforcement-led place-based interventions are of limited effect. This is particularly the case for those intensive and short-term strategies such as 'crack downs', 'raids' and visible policing saturation activities (Alexandris Polomarkakis, 2017; Coomber et al., 2019). Mostly, these initiatives have been shown to deliver short-term changes only—benefits which are sometimes offset by both the spatial and temporal displacement of drug users and potentially other criminal behaviour. The more promising interventions are those which energise local residents, property owners and business operators to collectively and more effectively manage their local area (see, for example, Braga et al., 2018). These partnership strategies exert pressure on drug market participants by redefining the legitimate use and guardianship of public spaces. In turn, this creates a sense of collective vigilance that helps to increase the perceived risk of apprehension and detection, thereby reducing the attractiveness of the market for "very risky" activities (Eck, 1994) and limiting the opportunities for incidental transactions.

While applying pressure on drug markets may yield some positive outcomes, criminologists have long been concerned that disruption and eradication efforts cause more harm than good. The concern is that any local benefits are wholly or mostly offset by spatial or temporal displacement - simply pushing the problem to elsewhere in the region without redressing the underlying causes (Garzón and Bailey, 2016; Green, 1995; Reuter and Pollack, 2012; E. Wood et al., 2004). For this reason, drug market interventions have been likened to 'popping a balloon' (Windle and Farrell, 2012 see also Garzón and Bailey, 2016) because achieving success is difficult and until the issues are redressed the size of the problem doesn't change, it just moves elsewhere. Much like the air inside a balloon, it is thought that drug markets are similarly fixed in their total volume because drug users and drug sellers are sufficiently motivated (either by their drug dependence or by the potential financial gain) to maintain their connection. Therefore, it is a commonly held view that drug market participants will first move to a different location rather than cease trading or abstain from their drug use altogether (Weisburd et al., 2006).

Generally, however, the criminological literature does not offer much support for the displacement hypothesis. Instead the evidence has shown that place-based and problem oriented policing initiatives are more likely to deliver a net benefit without any significant displacement of crime (see, for instance, Bowers et al., 2011; Braga et al., 2019; Guerette and Bowers, 2009; Hatten and Piza, 2021; Hinkle et al., 2020; S. D. Johnson et al., 2014). In an early meta-analysis, Bowers and colleagues (2011) considered the outcomes of 16 studies and concluded that place-based policing efforts are more likely to deliver an overall reduction in crime. Similarly, a recent Campbell Review (Hinkle et al., 2020) considered the results of 39 studies that had evaluated different problem oriented policing (POP) interventions. They concluded that POP initiatives deliver, on average, a 33% reduction in crime and disorder when compared to comparison or control areas. They also conclude that there was no consistent evidence of significant crime displacement.

To be sure, not all of the interventions included in the aforementioned meta-analyses were specific to drug market interventions and so there remains some ongoing concern about the displacement potential of place-based interdiction and eradication strategies. Perhaps the most significant concern is that while there might not be an increase in the incidence of 'detected' crime in neighbouring areas, there is still likely to be a displacement of drug users, bringing with it additional costs and consequences (see, for example, Caulkins, 1993; Kerr et al., 2005; Lawton et al., 2017; Maher and Dixon, 1999, 2001). In 2004, Wood and colleagues examined the displacement of drug users following a police-led crackdown in one of Canada's largest drug markets.

(e.g., bars, gyms, cafes) were directed to close. State border restrictions were introduced on 25 March with all interstate (domestic) travellers arriving into Queensland having to complete a mandatory quarantine of 14 days. Indoor gatherings were restricted to no more than 10 people on 27 March, and people were directed to stay-at-home unless for essential reasons from 29 March. By the end of the month (31 March) the Queensland border was closed to all non-essential travel and indoor gatherings were further restricted to no more than 2 people (on 2 April). Soon after, Queensland schools were ordered to close (on 4 April) to all students, except for the children of essential workers and those deemed vulnerable (Queensland Department of the Premier and Cabinet, 2020; Queensland Government, 2020b, 2020d).

They found little evidence of any change in the price or purity of drugs, nor any evidence of an increased enrollment in drug treatment (E. Wood et al., 2004). Instead, there was clear evidence that the once small footprint of drug users had consequently stretched into nearby areas and the authors argue that this only complicated the delivery of alcohol, drug and infectious disease services to those most in need. Closer to home, Maher and Dixon (2001) explored the consequences of a police crackdown in Cabramatta, one of Australia's largest heroin markets in the late 1990s and early 2000s (Maher and Dixon, 2001). Together, they document the displacement of heroin users to nearby suburbs and then catalogue a slew of other unintended criminal and public health consequences. Among these various consequences, the authors documented an increase in the use of several riskier drug storage, transfer and injecting practices as well as an increase in 'turf' related violence that was not often reported to the police.

Current study

We now know that the COVID-19 lockdown in Brisbane, Queensland, significantly (and deliberately) affected daily life across the city. For three months, the lockdown meant that shops were closed, the streets were empty and the rail networks were all but deserted. The once frenetic and busy streets of Fortitude Valley—Brisbane's largest street-level drug market—was undoubtedly a shadow of its former self. So how then did local drug users and drug sellers respond to this significantly new dynamic? Did they anticipate an increase in the risk of detection and leave the main market, exiting the market or laying low until the lockdown ended? Or maybe they found somewhere new to connect, perhaps in an existing market nearby or maybe to somewhere "just around the corner" (Weisburd et al., 2006)?

Whatever the answer, there is little doubt that the COVID-19 lockdown has afforded us a unique opportunity (Stickle and Felson, 2020) to explore how drug markets responded to what is clearly a once-in-a-generation change to the situational and environmental fabric of the city landscape. Although the 'intervention' in this case was not specifically targeted at drug users or crime it was, nevertheless, unprecedented in its scale and universal in its reach across the entire city. There has never before been an opportunity like this to document how street-level drug markets responded when the usual precipitators—being a large ambient population of legitimate visitors who's mixed use of the area offers the protection of perceived legitimacy and plausible deniability—are suddenly removed.

Situated in the Local Government Area of Brisbane, Queensland, this study documents what happened in the street-level drug market of Fortitude Valley during the three months of the COVID-19 lockdown. We use a spatiotemporal generalised additive model on pre-COVID-19 offence data to generate location-specific predictions for statistical meshblocks in the greater Fortitude Valley region. We then compare these predictions to what actually transpired throughout the lockdown months of April-June 2020. We hypothesise that drug offence detections will have decreased in the street-level drug market, despite a considerable overall increase across the rest of the city (reference removed for peer review). We also expect that in the surrounding areas there may be signals of drug market displacement and we expect these sites to share many of the same precipitating features as others have elsewhere identified.

Method

Data and measures

Our data are drawn from the Queensland Government's Open Data Portal (Queensland Government, 2020c) where unit records for all drug offence detections are available for the past five years. We collate these data at the lowest geographical resolution (ie. Statistical Meshblocks) and aggregate the recorded offences into monthly and quarterly counts. We present the data in spatial plots for the greater Fortitude Valley region which is defined herein by Level 2 of the Australian Statistical Geographical Standard (SA2 305011106, see Australian Bureau of Statistics, 2011). SA2305011106 is an area of approximately 4,000 square kilometers and is divided into 85 separate statistical Meshblocks - 31 of which are designated as having a primary commercial land use and 51 are designated as residential. The region accommodates around 4,300 private dwellings (mostly in high density structures) and is home to about 7,100 residents (see Australian Bureau of Statistics, 2016a). Through the centre of the region runs Brunswick Street, a main vehicular thoroughfare and commercial strip that is home to the Fortitude Valley train station (known locally as Brunswick Street Station) and the Brunswick Street Mall.

The dependent variable in this study is the raw quarterly count of the number of drug offence detections recorded in each Meshblock. We have opted to use raw counts rather than population standardised rates because a large proportion of Meshblocks in the Fortitude Valley Region are commercial and have little or usual resident population. Further, we expect the Fortitude Valley region has a significant ambient population of non-local residents, both in the daytime and during the active hours of the night-time economy. Without reliable measures of the ambient population and its daily flux, standardisation would lead to biased estimates. Finally, for the presentation of these data in geospatial plots, the offence count is recorded at the centremost point of each Meshblock. This is the lowest level of spatial disaggregation in these data, although we recognise this as a limitation given that all offences detected in a single Meshblock are not likely to have occurred at its centermost point.

Identifying change during the lockdown

As Caulkins (1993) reminds us, displacement is complex, multifaceted, and difficult to measure with precision using police arrest data. For this reason we use a combination of methods to identify whether drug offence detections changed, and where, if anywhere, displacement might have occurred during the lockdown. First, we use a spatiotemporal negative binomial generalised additive model (GAM) to examine the quarterly drug offence detection data for four years leading up to the lockdown. We then generate 95% Bayesian prediction intervals for the COVID-19 lockdown period, using 10,000 simulations of the GAM model parameters at each meshblock. The actual number of drug detections was then compared to the predicted range and meshblocks were flagged if the detections were higher or lower than the 95% prediction interval. The GAM is a flexible generalised modeling framework where geospatial correlations are captured using a non-linear smoothing function (known as a spatial thin-plate spline) to represent the covariance structure of multiple points in a spatial field. The matrix in this case is defined by the longitude and latitude coordinates of each meshblock and the number of points needed to define the covariance structure is selected by the GAM procedure using a restricted maximum likelihood (REML). GAM models are a popular tool in geospatial analysis and have recently been used to model SARS-CoV-2 infection rates in the UK (see S. N. Wood, 2021), and even the spatiotemporal patterns of such things as mean global temperatures (see Peristeraki et al., 2019).

Table 1 provides the GAM model parameters and summary diagnostics, while Figure 3 presents a graphical representation of the spatial thin-plate spline—reflecting the model’s estimated spatial covariance structure. The trend and seasonal variation is captured through two fixed effects, one which measures the year as a linear trend and another which measures (as dummy variables) the average difference between the quarters of each year. For each meshblock, the predicted number of drug offence detections during the lockdown (assuming the lockdown didn’t happen) is a product of the spatial covariance structure taking into account the general linear trend and predictable seasonal patterns across the greater Fortitude Valley region. The model is a good fit to the data (REML = 2457, Adjusted R² = 0.70). The spatial thin-plate spline is estimated with 68 degrees of freedom (covariance points) and is statistically significant (X²=1590, $p=0.00$). There is no evidence of a linear trend, but drug offences detections do typically vary by seasons, with the highest numbers recorded in the fourth quarter each year.

[Figure 2 about here.]

[Figure 3 about here.]

The GAM model is but one method for identifying change and is limited in a number of important ways. For example, so-called ‘statistically significant changes’ are more likely to be identified where a single meshblock records an unusually large increase or decrease. The approach is far less sensitive, however, to clusters of small changes across multiple meshblocks or changes which are unusual given the lockdown trend in surrounding areas³. For this reason we complement the GAM model by mapping the raw difference between the number of drug offence detections recorded during the lockdown and the number recorded in three months prior. We use these measures to explore two types of displacement - nearby displacement and distal displacement. For nearby displacement, we note any meshblock in the immediate vicinity of the Fortitude Valley train station and street-market where drug offence detections increased. We speculate that any area near to the main street-market that increased was a likely site of nearby displacement—especially for any drug market participants that went looking for a convenient location nearby to their main transaction point. For distal displacement, we look to the meshblocks further away from the train station and note any statistically significant changes as well as any meshblock clusters where there was a combined increase of 10 or more detections.

Describing local characteristics

To the extent that our analysis identifies sites of nearby and distal displacement, the final research question is whether these locations have features that might explain their attraction to drug market participants. We use Google Street View (GSV) to catalogue the characteristics of each location⁴. Our approach was inductive and we used three general criteria from the literature to identify environmental characteristics that may have acted as temporary precipitators for displacement. These were: (a) guardianship - areas where guardianship was absent or likely to have been absent during the lockdown; (b) concealment - areas which likely afforded opportunities to conceal oneself from residents and other surveillance apparatus; and (c) routine activities - areas where new routine activities (such as essential businesses and services) might have emerged in the lockdown context. Using these rules, the authors independently examined GSV images for the entire block or blocks where displacement was considered likely. A combined list of environmental features was developed to inform the results of this study.

GSV is a free and accessible online tool that generates panoramic street-level views using high-definition photos taken by camera-equipped cars (Odgers et al., 2012). To generate its images, GSV uses signals from satellites to accurately position

³For example, if six adjoining meshblocks in the main street-level market all decline, but a seventh actually increases, this might signal some nearby displacement even if the magnitude of the increase is not statistically significant.

⁴We would note that physical data collection was not feasible due to the continued restrictions on inter-state travel and movement restrictions still in place for many parts of Australia.

the imagery onto the online maps, and adjacent cameras on the car take overlapping pictures to avoid gaps in the street. These images are later ‘stitched’ together to create a 360 view of the street (Vincent, 2007), and blurring software is applied to faces and registration plates to protect the privacy of individuals. There is a precedent for using GSV in criminological research (Vandeviver, 2014), with Robert Sampson stating, in his American Society of Criminology presidential address of 2012, that “Google Street View can be and is being used to systematically code a variety of urban street scenes, right down to the level of specific places” (Sampson, 2013, p. 4). In more recent years, GSV has been successfully utilised to conduct environmental audits on local neighbourhoods by researchers searching for signs of social disorganisation (see, for example, Kronkvist, 2013; Odgers et al., 2012; Rundle et al., 2011). The tool has also been used to study burglary target selection (S. H. Langton and Steenbeek, 2017), to examine violent crime concentration (He et al., 2017) and crime diversity across a city (Khorshidi et al., 2021). While GSV is not without its limitations (some of the street views can be up to three-years old (Vandeviver, 2014)), it has been shown to be a reliable, objective and cost-effective method for collecting data on neighbourhoods and their characteristics (Ben-Joseph et al., 2013; Clarke et al., 2010; Kelly et al., 2012).

Results

Overall trends

Figure 4 tracks the longitudinal drug offence detection rate for the greater Fortitude Valley region (SA2 305011106). The plot includes data for the 24 months preceding the COVID-19 lockdown, together with the three month period when Brisbane was under official lockdown restrictions (shaded in grey). Across Fortitude Valley, the rate has consistently fluctuated between 100 and 200 detections per month, tracking a very modest downward trend. The lockdown period was not particularly unusual. Each month there were around 120 drug offences and this is well within the historical range for this area. We do note that in the month prior to the lockdown (March 2020) the drug offence detection rate fell below 100 offences. Still, this low number was not particularly unusual and not without recent historical precedent.

[Figure 4 about here.]

Figure 5 plots the geospatial distribution of the count of drug offence detections for two three-month time periods. The first is for the first three months 2020 (January-March 2020), before the lockdown was introduced. The second is for the three month period when the Brisbane lockdown was in effect (April-June 2020). Visually, there are some clear and notable differences between the two plots. In particular, drug offence detections in the pre-lockdown period appear more highly clustered around the Fortitude Valley train station and Brunswick Street Mall precinct and this is consistent with various historical descriptions of street-level drug markets (see, for instance, Barnum et al., 2017; Bernasco and Jacques, 2015; Eck, 1995; Haracopos and Hough, 2005; May and Hough, 2004; Reuter and Pollack, 2012; Robinson and Rengert, 2006; St. Jean, 2007). During the lockdown, however, detections appear less concentrated and seem to have spread in all directions across a greater number of meshblocks.

[Figure 5 about here.]

To help illustrate the change in spatial distribution during the COVID-19 lockdown, Figure 5 (Change) plots the raw difference in detection numbers between the two time periods. The size of each point on the map indicates the numerical difference between the pre-lockdown and lockdown periods, while the direction and colour of the triangle indicates whether the change was up or down. This simplifies the comparative analysis and shows that while the overall number of drug detections in the greater Fortitude Valley did not change, the location of those detections did. For example, in the area surrounding the Fortitude Valley train station and Brunswick Street Mall, drug offence detections fell considerably. At the train station itself, detections fell from 39 in the three months before lockdown, to 16 during the lockdown and this was the single largest numerical change of any location. Detections also declined in several meshblocks adjacent to the train station - mostly to the south-east and around the open-mall precinct known by local residents as ‘China town’.

Nearby displacement

Offsetting the decline around the train station and shopping precinct was a sizable increase in drug offence detections at several adjoining meshblocks. These adjoining meshblocks are each located within a short walk from the train station and would be easily and quickly accessed by drug buyers and sellers looking to relocate. For the purposes of this study, we define these locations as places of potential ‘nearby displacement’.

[Figure 6 about here.]

Using the train station as a centrepiece, the nearest site of displacement was to a meshblock directly across the road, to the east of the train station (Figure 6, Location D1). This meshblock is home to a multi-story car parking station⁵ and is surrounded by several high-rise office buildings and commercial blocks at the eastern end. Pre-lockdown, the car parking station is likely to be a busy location with regular vehicular and pedestrian traffic. It is also likely well-guarded and serviced by a full complement of parking station attendants and other staff. During the lockdown, however, as nearby office workers stayed home, the parking station was likely to have been considerably underutilised, if not closed altogether. At the western end of the meshblock, closest to the train station, there was also a construction site that was enclosed with timber panel fencing⁶. Like the parking station, the enclosed construction zone would have also been absent its usual site controllers and trades workers.

The second and next-nearest site of displacement was also to the east of the train station, but several blocks further to the north (Figure 6, Location D2). This meshblock is a wholly non-residential location, home to a large luxury vehicle sales yard and services depot⁷. The land has several buildings and workshop warehouses which were likely closed during the lockdown. What makes this location distinct is that much of the land is flat, unfenced and, but for a large number of parked cars, is mostly open and unrestricted. Before the lockdown, the sales yard is likely to have been well serviced by staff and business operators making it difficult to loiter within the yard without being seen and moved on. During the lockdown, however, the yard would have been an attractive, off-the-street location for drug buyers and sellers to meet.

The third site of nearby displacement was a small meshblock located at the north-western corner of the Brunswick Street mall (Figure 6, Location D3). The location itself is unremarkable, accommodating a mix of relatively modern residential and commercial buildings. However, what is notable about this location is that it shares its southernmost boundary with a Commonwealth Government Centrelink Office⁸, which is a joint services hub for a mix of Federal Government services, including social security and unemployment benefits. The Fortitude Valley office is one of the largest in the region, servicing residents from a large catchment area that includes most of the inner city and central business districts. The nearest alternative is more than six kilometers away. During the lockdown, the Federal government announced two financial support packages (Worthington, 2020a, 2020b) to help people who had lost work or working hours during the pandemic. This included the introduction of a new program known as JobKeeper, as well as a widening of the eligibility criteria of Australia's principal unemployment benefit known as JobSeeker. There was considerable publicity about both payments and many news reports of long lines and queues that developed outside Centrelink offices (Henriques-Gomes and McGowan, 2020; Worthington, 2020c).

Finally, the fourth site of nearby displacement is a meshblock to the south-west corner of the train station. This location is particularly notable for two reasons (Figure 6, Location D4). First, of the four nearby displacement sites it had the highest drug detection rate prior to the lockdown (29 offences). Second, unlike all other "high-frequency" locations which declined during the lockdown, this site experienced an increase (11 additional offences; up to 40 in total throughout the lockdown). This was the largest increase seen at any single location across the greater Fortitude Valley region. In terms of geographical features, this area houses a relatively new mixed-commercial and residential high-rise building which is not particularly unusual or remarkable when compared to nearby areas. On the western edge, however, there are a number of relatively old and somewhat derelict commercial establishments which are strikingly different to the adjacent residential complex. Most are run down, marred by graffiti and littered with other signs of social disorganisation. Most notably, sitting among these older buildings at the very north-western corner of the meshblock is an adult store and 'mens club' trading under the name 'The Den'⁹.

Distal displacement

Beyond the area immediately surrounding the Fortitude Valley train station there were a number of other locations where drug offence detections increased during the lockdown. For the purposes of this study, we describe these areas as locations of distal displacement and we include single meshblocks where drug offence detections increased by five or more as well as clusters of adjoining meshblocks where the combined increase in drug offence detections was also 5 or more.

Distal displacement seems to have emerged in almost every direction. To the north (Figure 6, Location D5), there was a cluster of four meshblocks nearby to the Fortitude Valley Police Station. As a whole, this cluster recorded a total of 24 drug offence detections during the lockdown months. This was up from just four offences in the three months prior. The largest number of any single meshblock in this cluster was recorded in a small area surrounding a local church¹⁰ which has several well-concealed backstreets, while the next largest was notable because it houses an open-air carpark at its north-eastern corner.¹¹

⁵<http://maps.google.com/maps?q=-27.45724,153.03567>

⁶<http://maps.google.com/maps?q=-27.45680,153.03460>

⁷<http://maps.google.com/maps?q=-27.45481,153.03665>

⁸<http://maps.google.com/maps?q=-27.45451,153.03333>

⁹<http://maps.google.com/maps?q=-27.45618,153.03180>

¹⁰<http://maps.google.com/maps?q=-27.45358,153.03805>

¹¹<http://maps.google.com/maps?q=-27.45500,153.03875>

To the east (Figure 6, Location D6), there was a cluster of meshblocks which each recorded an increase of two or three detections during the lockdown (for a total of 9 detections throughout the lockdown period). Although not a high number relative to other clusters, it is notable because this region had very few drug offences before the lockdown and is an affluent area that rarely records drug offences. At the heart of this cluster there is a church with an expansive parkland style property and open grounds¹². The surrounding areas are made up of a mix of low-rise commercial and residential properties, however, the residents in this area are the most affluent of the greater Fortitude Valley region. Those who live in this area share a socioeconomic index (SEIFA) that places them in the top 10 percent of all residential locations in Australia (Australian Bureau of Statistics, 2016c).

To the south (Figure 6, Location D7), a cluster appeared across five adjoining meshblocks which, together, recorded 28 drug offence detections during the lockdown (up from a pre-lockdown total of 9). The westernmost meshblock of this cluster is a retail shopping strip¹³ known as Cathedral Village and to the east there are two meshblocks which house a school and several small parks—the only major parkland in the Fortitude Valley region¹⁴.

Finally, a cluster appeared to the west of Fortitude Valley in a mixed residential and commercial area that is divided through the middle by Brunswick Street (Figure 6, Location D8)¹⁵. There were 40 drug offence detections in this area during the three-month lockdown—21 more offences than were recorded before the lockdown. What distinguishes this area is that Brunswick Street is a main arterial access route that connects Brisbane’s northern suburbs to both Fortitude Valley and the city CBD. Also, the residential area on the southern side of Brunswick Street is the most disadvantaged of all areas in the greater Fortitude Valley region. According to the most recent Census this area had a socioeconomic index (SEIFA) of 953.5, placing it in the bottom 30th percentile of all residential locations across Australia (Australian Bureau of Statistics, 2016b).

Where did displacement not occur?

The study of displacement is often framed as an examination of where crime moves to, and the characteristics of those locations are often described as crime-attractors or displacement precipitators. However, of equal importance to the study of displacement are places where crime, or in this case drug market activity, did not move to. To examine this, we focus specifically on the areas nearby to the main street market where we have already noted location D1 and D2 as sites of nearby displacement. Between them, however, were two other meshblocks where there had been no recorded drug offence detections in the three months before the lockdown and no new detections during the lockdown. It seems something about these two locations was not attractive to drug market participants, even as the COVID-19 lockdown sent drug buyers and sellers off looking for alternative places to meet.

Using GSV, we operationalised the same methodology to understand what environmental features might have made these two locations unattractive as an alternative site of drug market activity. To our surprise, the block had at least one open car-parking area¹⁶ that could have been used as a transaction site, although it appears much more open and visible to the street. There were also several alleyways and concealed driveways which we might expect were vacant and less often used during the lockdown¹⁷. But again, these were relatively open and visible from the street.

In short, two meshblocks with no increase in drug offence detections were sandwiched between two other meshblocks where detections did increase, all at a time when the main street market was in considerable temporary decline. All three locations share features which could ‘attract’ drug market participants, but not all of them did and we think the difference is best explained as a function of relativity. The multi-story parking station at D1 and the unfenced car-dealership at D2 were, we think, relatively better locations than the small car park and alleyways of the meshblocks in-between. By ‘better’ we mean that these two locations offered more protection from passing residents and patrolling police cars, which suggests that ‘detection risks’ were an important component of the displacement decision making process.

Discussion

In many parts of the world, the social mobility and social distancing regulations introduced during the early phases of COVID-19 have been associated with significant reductions in crime (Andresen and Hodgkinson, 2020; Ashby, 2020a, 2020b; Campedelli, Aziani, et al., 2020; Campedelli, Favarin, et al., 2020; Mohler et al., 2020), in particular property crime (see, for example, (reference removed for peer review)) and, to a lesser extent, police-recorded non-domestic violent crime (reference removed for peer review). The mechanisms underpinning this change are hotly contested, although the rapid transformation of routine

¹²<http://maps.google.com/maps?q=-27.4571,153.0390>

¹³<http://maps.google.com/maps?q=-27.46000,153.03263>

¹⁴<http://maps.google.com/maps?q=-27.46055,153.03137>

¹⁵<http://maps.google.com/maps?q=-27.45408,153.02959>

¹⁶<http://maps.google.com/maps?q=-27.45757,153.03724>

¹⁷<http://maps.google.com/maps?q=-27.45596,153.03621>

activities (see Andresen and Hodgkinson, 2020; Stickle and Felson, 2020), the reduction in situational offending opportunities (see Hodgkinson and Andresen, 2020; Stickle and Felson, 2020), and the increase in relative capable guardianship (reference removed for peer review) are among the most often cited.

However, illicit drug activity—defined in this paper as the incidence of drug offence detection by police—did not decline during the COVID-19 lockdown. To be sure, the emerging empirical evidence in Australia and elsewhere in the world (see, for instance, S. Langton et al., 2021) has shown that drug offence detections were higher than predicted and statistically higher for at least one month during the lockdown (Andresen and Hodgkinson, 2020). In Queensland, Australia, where the current study is situated, the three-month government imposed lockdown (April-June 2020) coincided with the single greatest month-to-month increase in drug offence detections (from April to May) and this, in turn, resulted in the highest per capita rate of drug detections on record for that jurisdiction (reference removed for peer review).

On face value, these data suggest that drug markets were largely unaffected by the government's demands to stay-at-home and, given the compulsive nature of drug use (see, for example, Shand et al., 2010), we should not be surprised by the resilience of drug transaction networks. That said, we do consider the city-wide results to be somewhat incongruous with several decades of research that has documented the key precipitators and facilitators of street-level markets—the same environmental and contextual features which the COVID-19 lockdown had undoubtedly transformed (Google, 2021). In this study, we focus our sights on one of Australia's most well known street-level drug markets—Fortitude Valley—to document what, if any, impact the lockdown had on the spatial distribution of drug buyers and sellers. We hypothesised that the street-level market experience will not have been as resilient as the city-wide picture portrays because it is a market that is more heavily reliant on incidental street-level exchanges and these should have been negatively affected as the once busy and bustling streets, now empty, increased surveillance potential and the likelihood of detection.

Using a comparison of actual and predicted counts from a negative binomial generalised additive spatiotemporal model, we conclude that the greater Fortitude Valley region did not experience any sudden or significant declines in drug offence detections during the three month lockdown. While each of the three months were on the low-side of the long-term trend, the number of detections was not unusually low given the history of that area. Across the region, however, there was a notable and statistically significant decline in detections at the Fortitude Valley train station and in the vicinity of the Brunswick Street mall. These two areas are the most likely to have been affected by a significant decline in pedestrian foot traffic as well as the closure of shops and businesses during the lockdown.

Nearby to the main street market, within easy walking distance, we noted four potential locations of displacement. Drug offence detections in these areas increased against the overall downward trend and the increase at one location was statistically higher than predicted. Further afield, we also noted four areas where drug offence detections increased across a cluster of adjoining meshblocks and in each cluster at least one meshblock was statistically higher than predicted. We conclude that the street-level drug market was significantly disrupted during the lockdown, but that drug offence detection rates did not change because drug market participants found new locations and opportunities to engage.

Using GSV, we cataloged the environmental and contextual features of those places where displacement occurred and we found a number of important similarities. First, a number of displacement sites sat at the intersection of what was likely to have evolved as a new set of routine activities during the lockdown. Drug offence detections increased, for example, around a federal government services building where there was a significant influx of people applying for unemployment or other job-support payments (Worthington, 2020a, 2020c). Others have documented the long queues that emerged outside federal services buildings (Henriques-Gomes and McGowan, 2020; Worthington, 2020c) and these locations would have been among the busiest in the region while other non-essential businesses and services were closed, operating on reduced trading hours, or serving a limited number of patrons. Several of the other displacement locations were situated near a grocery or liquor store (or both) which were permitted to remain open during the lockdown as essential services. What these data cannot tell us is whether drug sellers moved their business to these locations to capitalise on the routine activities of drug buyers, or whether drug buyers and sellers agreed in advance to meet at a location of mutual convenience. Only future qualitative research with drug market participants will be able to reveal the specifics of this dynamic.

Second, a number of locations were home to spatial features which might have been more vulnerable to misuse by drug users during the lockdown because the level of guardianship was likely much lower than usual. For example, the site of displacement nearest to the main street market houses an multi-story above-ground car parking station. This car-park would have been easily accessible from the street and much less busy than usual as its customers (local office workers) stayed home. At another site, there was a ground-level only open-air car-park, while at another there was a large, open-air car dealership. All three were within a reasonable walking distance from the train station and each represented a clear off-the-street opportunity to meet and loiter beyond the watch of nearby residents and passersby.

Not unlike car parks and dealerships, several other displacement locations were home to non-government schools and churches. These were areas where a small number of buildings were situated upon large grounds and open gardens. Some were more enclosed, but surrounded by concealed laneways and service alleys. While not all schools closed in Queensland during the

lockdown, most non-government schools transitioned quickly to online learning (Queensland Government, 2020a, 2020e) and so students and teachers were mostly away from the school grounds. For places of worship, attendance was mostly proscribed by the stay-at-home regulations so there was not likely to be the usual number of visitors nor the unpredictability of their comings and goings. In all locations, the level of guardianship and passive surveillance was likely to be lower than usual as employees, security attendants, and usual daily visitors stayed home.

Third, there were a number of locations that might not have been all that convenient to users of the main-street market, but were places where people and pedestrian activity was permitted and ‘expected’. To the south, for example, displacement seems to have occurred in Fortitude Valley’s main parkland area—one of few places where local residents might have been expected to participate in exercise and outdoor activities during the lockdown. Much like the federal services office to the northwest, the parks to the southwest might have been a key intersection of routine activities. In addition, it is a location of many legitimate uses. Meeting with a drug seller and hanging around to use drugs are both activities which should have been easy to conceal among the many other people that were attending the park, and the many other different activities that they were likely to be engaged in.

Our final observation was of a mixed residential and commercial area to the west of the main Fortitude Valley street-market. This area was by no means the only site of displacement, but it was the largest in terms of the number of drug offences recorded during the lockdown. Unlike almost all other sites, it had no obvious features which might have helped attract drug buyers and sellers or facilitate the concealment of their activity. Instead, we noted that this site of distal displacement was situated on the border of Fortitude Valley’s most socio-economically disadvantaged community. We suggest that while there was nothing that attracted new routine activities in this location, it was nevertheless ‘closer to home’ for many of those who might have normally frequented the main Fortitude Valley market. This was routine activities of a different kind, where the market seems to have moved closer to the homes of drug users (and possible drug sellers), probably as both were hoping for a speedy transaction in a location where their outside presence was plausible if questioned by the police. We also believe that the main street-market typically thrives at the train station because it services both local and outside residents. With the lockdown in place and public transport use at a historical low, there was likely to have been fewer outside visitors looking to buy drugs. Because of this, there was now no reason for drug sellers to wait in or nearby to the train station, so it is likely that their efforts were redirected closer to the homes of local buyers.

Of course, our conclusions should be interpreted with some caution since most drug offence detections data do not singularly reflect the behaviour of drug users and drug sellers, but also the actions and activities of police and bystanders (see also Ariel and Bland, 2019; Hughes et al., 2019; Mazerolle et al., 2020; Weatherburn, 2000). While we have seen some evidence here that is suggestive of displacement, we cannot discount that these results reflect the changing habits and activities of the police who ‘worked’ the Fortitude Valley area, or the concerned citizens who stayed at home and might have reported unusual or suspicious behaviour in their local neighbourhood. Fewer pedestrians (see Google, 2021) and lower property crime rates (reference removed for peer review) in and around the train station and mall also likely meant that fewer police spent time in the areas where drug detections have been historically high. Instead, with more time and a more intensive focus on compliance with health and other stay at home orders, perhaps Fortitude Valley police officers themselves ventured farther afield and detected more drug offences in the outer-areas. In other words, these data alone cannot confirm that COVID-19 disrupted the street-level market of Fortitude Valley, nor that it displaced drug transactions, though it certainly looks that way. Instead, future research is needed to complement these detection data with the qualitative experiences of drug users, drug sellers, and police.

We conclude that, contrary to state- and city-wide aggregate results, street-level drug markets were significantly interrupted during the COVID-19 lockdown as drug buyers and sellers responded rapidly to the new context by finding new places to transact. In most cases, these locations were likely to have been more vulnerable to misuse because of the lockdown, but shared many of the characteristics that drug market researchers have long pointed to as key precipitators. Of course, we should not be surprised by this since drug markets have long been shown to be resilient to interdiction efforts by law enforcement (Mazerolle et al., 2020) and drug use, at least, has been shown to displace quickly when risks change (Garzón and Bailey, 2016; Green, 1995; Reuter and Pollack, 2012; E. Wood et al., 2004). At this point we are reminded that drug offences are not like other offences in that there is no immediate victim and only two motivated offenders who have the capacity to manipulate the circumstances of their exchange so as to evade detection and avoid surveillance (L. T. Johnson, 2009). In street-level markets, transactions may well be unplanned and incidental (Namli, 2021), but they are also easily relocated if the perception of detection changes and becomes unpredictable or high¹⁸. The criminal transaction is therefore comparatively fast when considered against other crime types and the greatest risk is likely to the user (for possession) as they depart the site of transaction or sometime after use. We also know that participants of street-level markets tend to persist despite a heightened perception of their detection probability (reference removed for peer review) so it is difficult to imagine how some government-mandated stay at home orders would add to that risk so much so that drug buyers and sellers exited the market altogether. If nothing else, COVID-19 has simply

¹⁸We would also note that nowadays, when all one needs is the email address, telephone number or social media account of a drug dealer to arrange a transaction (see, for example, Bergeron et al., 2020; Namli, 2021), drug transactions are perhaps even more resilient to law enforcement. It could also be the case that during COVID-19, when routine activities and movement were restricted, drug users and dealers shifted their behaviour into online transactions and ‘over-the-phone’ deals.

reaffirmed what drug law enforcement and policy makers have known for years—established street-level drug markets are difficult to eradicate, at least not through a global increase in surveillance and detection risks (see Braga et al., 2018; Mazerolle et al., 2020) because, like squeezing a balloon (Windle and Farrell, 2012), drug buyers and sellers do just “move around the corner” (Weisburd et al., 2006).

References

- Aitken, C., Moore, D., Higgs, P., Kelsall, J., & Kerger, M. (2002). The impact of a police crackdown on a street drug scene: evidence from the street. *International Journal of Drug Policy*, 13(3), 193–202. [https://doi.org/https://doi.org/10.1016/S0955-3959\(02\)00075-0](https://doi.org/https://doi.org/10.1016/S0955-3959(02)00075-0)
- Alexandris Polomarkakis, K. (2017). Drug law enforcement revisited: The “war” against the war on drugs. *Journal of Drug Issues*, 47(3), 396–404. <https://doi.org/10.1177/0022042617697017>
- Andresen, M. A., & Hodgkinson, T. (2020). Somehow I always end up alone: COVID-19, social isolation and crime in Queensland, Australia. *Crime Science*, 9(1), 25. <https://doi.org/10.1186/s40163-020-00135-4>
- Ariel, B., & Bland, M. (2019). Is crime rising or falling? A comparison of police-recorded crime and victimization surveys. *Methods of criminology and criminal justice research*. Emerald Publishing Limited.
- Ashby, M. P. J. (2020a). Changes in Police Calls for Service During the Early Months of the 2020 Coronavirus Pandemic. *Policing: A Journal of Policy and Practice*, 14(4), 1054–1072. <https://doi.org/10.1093/polic/paaa037>
- Ashby, M. P. J. (2020b). Initial evidence on the relationship between the coronavirus pandemic and crime in the United States. *Crime Science*, 9(1), 6. <https://doi.org/10.1186/s40163-020-00117-6>
- Australian Bureau of Statistics. (2011). Australian statistical geography standard (asgs).
- Australian Bureau of Statistics. (2016a). 2016 census quickstats.
- Australian Bureau of Statistics. (2016b). Census.
- Australian Bureau of Statistics. (2016c). Census of population and housing: Socio-economic indexes for areas (seifa), australia, 2016.
- Barnum, J. D., Campbell, W. L., Trocchio, S., Caplan, J. M., & Kennedy, L. W. (2017). Examining the environmental characteristics of drug dealing locations. *Crime Delinquency*, 63(13), 1731–1756. <https://doi.org/10.1177/0011128716649735>
- Baum, D. (1996). *Smoke and mirrors: The war on drugs and the politics of failure*. Little, Brown Boston.
- Ben-Joseph, E., Lee, J. S., Cromley, E. K., Laden, F., & Troped, P. J. (2013). Virtual and actual: Relative accuracy of on-site and web-based instruments in auditing the environment for physical activity. *Health Place*, 19, 138–150. <https://doi.org/https://doi.org/10.1016/j.healthplace.2012.11.001>
- Bergeron, A., Décary-Héту, D., & Giommoni, L. (2020). Preliminary findings of the impact of COVID-19 on drugs crypto markets. *International Journal of Drug Policy*, 102870. <https://doi.org/https://doi.org/10.1016/j.drugpo.2020.102870>
- Bernasco, W., & Jacques, S. (2015). Where Do Dealers Solicit Customers and Sell Them Drugs? A Micro-Level Multiple Method Study. *Journal of Contemporary Criminal Justice*, 31(4), 376–408. <https://doi.org/10.1177/1043986215608535>
- Bouchard, M. (2007). On the Resilience of Illegal Drug Markets. *Global Crime*, 8(4), 325–344. <https://doi.org/10.1080/17440570701739702>
- Bowers, K., Johnson, S., Guerette, R. T., Summers, L., & Poynton, S. (2011). Spatial displacement and diffusion of benefits among geographically focused policing initiatives. *Campbell Systematic Reviews*, 7(1), 1–144. <https://doi.org/https://doi.org/10.4073/csr.2011.3>
- Braga, A. A., Turchan, B., Papachristos, A. V., & Hureau, D. M. (2019). Hot spots policing of small geographic areas effects on crime. *Campbell Systematic Reviews*, 15(3), e1046. <https://doi.org/https://doi.org/10.1002/cl2.1046>
- Braga, A. A., Weisburd, D., & Turchan, B. (2018). Focused deterrence strategies and crime control. *Criminology Public Policy*, 17(1), 205–250. <https://doi.org/https://doi.org/10.1111/1745-9133.12353>
- Campedelli, G. M., Aziani, A., & Favarin, S. (2020). Exploring the Immediate Effects of COVID-19 Containment Policies on Crime: an Empirical Analysis of the Short-Term Aftermath in Los Angeles. *American Journal of Criminal Justice*. <https://doi.org/10.1007/s12103-020-09578-6>
- Campedelli, G. M., Favarin, S., Aziani, A., & Piquero, A. R. (2020). Disentangling community-level changes in crime trends during the COVID-19 pandemic in Chicago. *Crime Science*, 9(1), 21. <https://doi.org/10.1186/s40163-020-00131-8>
- Caulkins, J. P. (1993). Local drug markets’ response to focused police enforcement. *Operations Research*, 41(5), 848–863.
- Clarke, P., Ailshire, J., Melendez, R., Bader, M., & Morenoff, J. (2010). Using google earth to conduct a neighborhood audit: Reliability of a virtual audit instrument. *Health Place*, 16(6), 1224–1229. <https://doi.org/https://doi.org/10.1016/j.healthplace.2010.08.007>
- Coomber, R., & Maher, L. (2006). Street-Level Drug Market Activity in Sydney’s Primary Heroin Markets: Organization, Adulteration Practices, Pricing, Marketing and Violence. *Journal of Drug Issues*, 36(3), 719–753. <https://doi.org/10.1177/002204260603600310>

- Coomber, R., Moyle, L., & Mahoney, M. K. (2019). Symbolic policing: Situating targeted police operations/‘crackdowns’ on street-level drug markets. *Policing and Society*, 29(1), 1–17. <https://doi.org/10.1080/10439463.2017.1323893>
- Darchen, S., & Ladouceur, E. (2013). Social sustainability in urban regeneration practice: a case study of the Fortitude Valley Renewal Plan in Brisbane. *Australian Planner*, 50(4), 340–350. <https://doi.org/10.1080/07293682.2013.764909>
- Davies, A. (2011). *A case of community safety: displacing complex ‘social’ problems in Fortitude Valley* (Thesis).
- Dwyer, R. (2009). *Agency and exchange: An ethnography of a heroin marketplace* (Thesis).
- Eck, J. E. (1994). *Drug markets and drug places: A case-control study of the spatial structure of illicit drug dealing*. (Thesis).
- Eck, J. E. (1995). A general model of the geography of illicit retail marketplaces. *Crime and place*, 4, 67–93.
- Forsyth, A., Hammersley, R. H., Lavelle, T. I., & Murray, K. J. (1992). Geographical aspects of scoring illegal drugs. *The British Journal of Criminology*, 32(3), 292–309. <https://doi.org/10.1093/oxfordjournals.bjc.a048219>
- Garzón, J. C., & Bailey, J. (2016). Displacement Effects of Supply-Reduction Policies in Latin America. *The handbook of drugs and society*, 482.
- Gibson, A., Day, C., & Degenhardt, L. (2005). The impact of illicit drug market changes on health agency operations in Sydney, Australia. *Journal of Substance Abuse Treatment*, 28(1), 35–40. <https://doi.org/https://doi.org/10.1016/j.jsat.2004.10.004>
- Gibson, A., Degenhardt, L., Topp, L., Day, C., Hall, W., Dietze, P., & McKetin, R. (2003). Global and Australian heroin markets. *Sydney, National Drug and Alcohol Research Centre, University of New South Wales*.
- Google. (2021). Queensland covid-19 community mobility report.
- Green, L. (1995). Cleaning up drug hot spots in Oakland, California: The displacement and diffusion effects. *Justice Quarterly*, 12(4), 737–754. <https://doi.org/10.1080/07418829500096271>
- Guerette, R., & Bowers, K. (2009). Assessing the extent of crime displacement and diffusion of benefits: a review of situation crime prevention evaluations. *Criminology*, 47(4), 1331–1368. <https://doi.org/https://doi.org/10.1111/j.1745-9125.2009.00177.x>
- Haracopos, A., & Hough, M. (2005). Drug Dealing in Open-Air Markets. Problem-Oriented Guides for Police. Problem-Specific Guides Series. Guide No 31.
- Hatten, D., & Piza, E. L. (2021). When Crime Moves Where Does It Go? Analyzing the Spatial Correlates of Robbery Incidents Displaced by a Place-based Policing Intervention. *Journal of Research in Crime and Delinquency*, 0(0), 00224278211016030. <https://doi.org/10.1177/00224278211016030>
- He, L., Páez, A., & Liu, D. (2017). Built environment and violent crime: An environmental audit approach using google street view. *Computers, Environment and Urban Systems*, 66, 83–95. <https://doi.org/https://doi.org/10.1016/j.compenvurbsys.2017.08.001>
- Henriques-Gomes, L., & McGowan, M. (2020). Queues at centrelink offices and mygov website crashes ahead of coronavirus shutdowns.
- Higgs, P., Owada, K., Hellard, M., Power, R., & Maher, L. (2008). Gender, culture and harm: an exploratory study of female heroin users of Vietnamese ethnicity. *Culture, Health & Sexuality*, 10(7), 681–695. <https://doi.org/10.1080/13691050802203838>
- Hinkle, J. C., Weisburd, D., Telep, C. W., & Petersen, K. (2020). Problem-oriented policing for reducing crime and disorder: An updated systematic review and meta-analysis. *Campbell Systematic Reviews*, 16(2), e1089. <https://doi.org/https://doi.org/10.1002/cl2.1089>
- Hodgkinson, T., & Andresen, M. A. (2020). Show me a man or a woman alone and i’ll show you a saint: Changes in the frequency of criminal incidents during the covid-19 pandemic. *Journal of Criminal Justice*, 69, 101706. <https://doi.org/https://doi.org/10.1016/j.jcrimjus.2020.101706>
- Hughes, C., Seear, K., Ritter, A., & Mazerolle, L. (2019). *Monograph No. 27: Criminal justice responses relating to personal use and possession of illicit drugs: The reach of Australian drug diversion programs and barriers and facilitators to expansion*. (Report). National Drug and Alcohol Research Centre, UNSW Sydney. <https://doi.org/http://doi.org/10.26190/5cca661ce09ce>
- Jacobs., & Aecom. (2014). Bat project: Enviromental impact statement (chapter 4: Traffic and transport).
- Johnson, L. T. (2009). *Classifying Drug Markets by Travel Patterns: Testing Reuter and MacCoun’s Typology of Market Violence* (Thesis).
- Johnson, S. D., Guerette, R. T., & Bowers, K. (2014). Crime displacement: what we know, what we don’t know, and what it means for crime reduction. *Journal of Experimental Criminology*, 10(4), 549–571. <https://doi.org/10.1007/s11292-014-9209-4>
- Kelly, C. M., Wilson, J. S., Baker, E. A., Miller, D. K., & Schootman, M. (2012). Using google street view to audit the built environment: Inter-rater reliability results. *Annals of Behavioral Medicine*, 45(suppl_1), S108–S112. <https://doi.org/10.1007/s12160-012-9419-9>
- Kerr, T., Small, W., & Wood, E. (2005). The public health and social impacts of drug market enforcement: A review of the evidence. *International Journal of Drug Policy*, 16(4), 210–220. <https://doi.org/https://doi.org/10.1016/j.drugpo.2005.04.005>

- Khorshidi, S., Carter, J., Mohler, G., & Tita, G. (2021). Explaining crime diversity with google street view. *Journal of Quantitative Criminology*, 37(2), 361–391. <https://doi.org/10.1007/s10940-021-09500-1>
- Kronkvist, K. (2013). *Systematic social observation of physical disorder in inner-city urban neighborhoods through google street view: The correlation between virtually observed physical disorder, self-reported disorder and victimization of property crimes*. (Thesis) [2020-11-24T16:24:41.228+01:00].
- Langton, S., Dixon, A., & Farrell, G. (2021). Six months in: pandemic crime trends in England and Wales. *Crime Science*, 10(1), 6. <https://doi.org/10.1186/s40163-021-00142-z>
- Langton, S. H., & Steenbeek, W. (2017). Residential burglary target selection: An analysis at the property-level using google street view. *Applied Geography*, 86, 292–299. <https://doi.org/https://doi.org/10.1016/j.apgeog.2017.06.014>
- Lawton, B. A., Taylor, R. B., & Luongo, A. J. (2017). Police officers on drug corners in Philadelphia, drug crime, and violent crime: Intended, diffusion, and displacement impacts. *Drug abuse: Prevention and treatment* (pp. 63–87). Routledge.
- Linton, S. L., Jennings, J. M., Latkin, C. A., Gomez, M. B., & Mehta, S. H. (2014). Application of space-time scan statistics to describe geographic and temporal clustering of visible drug activity. *Journal of Urban Health*, 91(5), 940–956.
- Linton, S. L., Jennings, J. M., Latkin, C. A., Kirk, G. D., & Mehta, S. H. (2014). The association between neighborhood residential rehabilitation and injection drug use in baltimore, maryland, 2000–2011. *Health Place*, 28, 142–149. <https://doi.org/https://doi.org/10.1016/j.healthplace.2014.04.005>
- Maher, L., & Dixon, D. (1999). Policing and public health: Law enforcement and harm minimization in a street-level drug market. *British journal of criminology*, 39(4), 488–512.
- Maher, L., & Dixon, D. (2001). The cost of crackdowns: Policing Cabramatta's heroin market. *Current issues in criminal justice*, 13(1), 5–22.
- Manning, M., Mazerolle, L., Mazerolle, P., & Collingwood, P. (2016). Place managers in entertainment districts: the role of third party policing in shaping place manager actions. *Policing and Society*, 26(8), 889–906. <https://doi.org/10.1080/10439463.2014.989848>
- May, T., & Hough, M. (2004). Drug markets and distribution systems. *Addiction Research & Theory*, 12(6), 549–563. <https://doi.org/10.1080/16066350412331323119>
- Mazerolle, L., Eggins, E., & Higginson, A. (2020). Street-level drug law enforcement: An updated systematic review. *Trends and Issues in Crime and Criminal Justice*, (599), 1–20.
- Mazerolle, L., Soole, D. W., & Rombouts, S. (2007). Street-Level Drug Law Enforcement: A Meta-Analytic Review. *Campbell Systematic Reviews*, 3(1), 1–47. <https://doi.org/https://doi.org/10.4073/csr.2007.2>
- McCord, E. S., & Ratcliffe, J. H. (2007). A micro-spatial analysis of the demographic and criminogenic environment of drug markets in philadelphia. *Australian New Zealand Journal of Criminology*, 40(1), 43–63. <https://doi.org/10.1375/acri.40.1.43>
- Mohler, G., Bertozzi, A., Carter, J., Short, M., Sledge, D., Tita, G., Uchida, C., & Brantingham, P. (2020). Impact of social distancing during covid-19 pandemic on crime in indianapolis.
- Namli, U. (2021). Behavioral Changes among Street Level Drug Trafficking Organizations and the Fluctuation in Drug Prices Before and During the Covid-19 Pandemic. *American Journal of Qualitative Research*, 5(1), 1–22. <https://doi.org/https://doi.org/10.29333/ajqr/9691>
- Odgers, C. L., Caspi, A., Bates, C. J., Sampson, R. J., & Moffitt, T. E. (2012). Systematic social observation of children's neighborhoods using google street view: A reliable and cost-effective method [1469-7610]. *J Child Psychol Psychiatry*, 53(10), 1009–17. <https://doi.org/10.1111/j.1469-7610.2012.02565.x>
- Peristeraki, P., Bitetto, I., Carbonara, P., Carlucci, R., Certain, G., De Carlo, F., Gristina, M., Kamidis, N., Pesci, P., & Stagioni, M. (2019). Investigation of spatiotemporal patterns in mean temperature and mean trophic level of MEDITS survey catches in the Mediterranean Sea. *Scientia Marina*, 83(S1), 165–174.
- Queensland Department of the Premier and Cabinet. (2020). Queensland first to make emergency declarations in January [media release].
- Queensland Government. (2020a). Initial term 2 school arrangements for queensland announced.
- Queensland Government. (2020b). Queensland border restrictions.
- Queensland Government. (2020c, April 30). *Queensland offence rates - Open Data Portal* [SBS]. Retrieved April 30, 2020, from <https://www.data.qld.gov.au/dataset/offence-rates-monthly-from-july-1997>
- Queensland Government. (2020d). Roadmap to easing restrictions.
- Queensland Government. (2020e). Student free days for queensland state schools next week.
- Rengert, G. (1996). *The geography of illegal drugs*. Boulder, Colorado.
- Reuter, P., & Pollack, H. A. (2012). Good markets make bad neighbors: Regulating open-air drug markets high point drug market intervention: Policy essay. *Criminology Pub. Pol'y*, 11, 211.
- Robinson, J. B., & Rengert, G. F. (2006). Illegal drug markets: The geographic perspective and crime propensity. *Western Criminology Review*, 7(1), 20–32.
- Rundle, A. G., Bader, M. D. M., Richards, C. A., Neckerman, K. M., & Teitler, J. O. (2011). Using google street view to audit neighborhood environments. *American Journal of Preventive Medicine*, 40(1), 94–100. <https://doi.org/https://doi.org/10.1016/j.amepre.2010.09.034>

- Sampson, R. J. (2013). The place of context: A theory and strategy for criminology's hard problems. *Criminology*, 51(1), 1–31. <https://doi.org/https://doi.org/10.1111/1745-9125.12002>
- Shand, F. L., Degenhardt, L., Slade, T., & Nelson, E. C. (2010). Sex differences amongst dependent heroin users: Histories, clinical characteristics and predictors of other substance dependence. *Addictive Behaviors*, 36(1), 27–36. <https://doi.org/10.1016/j.addbeh.2010.08.008>
- St. Jean, P. (2007). *Pockets of Crime: Broken Windows, Collective Efficacy, and the Criminal Point of View*. University of Chicago Press. <https://doi.org/https://chicago.universitypressscholarship.com/view/10.7208/chicago/9780226775005.001.0001/upso-9780226774985>
- Stickle, B., & Felson, M. (2020). Crime Rates in a Pandemic: the Largest Criminological Experiment in History. *American Journal of Criminal Justice*, 45(4), 525–536. <https://doi.org/10.1007/s12103-020-09546-0>
- Taniguchi, T. A., Rengert, G. F., & McCord, E. S. (2009). Where size matters: Agglomeration economies of illegal drug markets in philadelphia. *Justice Quarterly*, 26(4), 670–694. <https://doi.org/10.1080/07418820802593378>
- Tarkhanyan, L. (2014). Spatial perspectives on illegal drug markets. In G. Bruinsma & D. Weisburd (Eds.), *Encyclopedia of criminology and criminal justice* (pp. 4997–5007). Springer New York. https://doi.org/10.1007/978-1-4614-5690-2_300
- United Nations Office on Drugs and Crime. (2016). World drug report.
- United Nations Office on Drugs and Crime. (2020). World drug report.
- Vandeviver, C. (2014). Applying google maps and google street view in criminological research. *Crime Science*, 3(1), 13. <https://doi.org/10.1186/s40163-014-0013-2>
- Vincent, L. (2007). Taking online maps down to street level. *Computer*, 40(12), 118–120.
- Weatherburn, D. (2000). Performance indicators for drug law enforcement. *Crime and Justice Bulletin*, (48), 1–10.
- Weisburd, D., Wyckoff, L. A., Ready, J., Eck, J. E., Hinkle, J. C., & Gajewski, F. (2006). Does crime just move around the corner? A controlled study of spatial displacement and diffusion of crime control benefits. *Criminology: An Interdisciplinary Journal*, 44(3), 549–592. <https://doi.org/10.1111/j.1745-9125.2006.00057.x>
- Willits, D., Broidy, L. M., & Denman, K. (2015). Schools and Drug Markets: Examining the Relationship Between Schools and Neighborhood Drug Crime. *Youth Society*, 47(5), 634–658. <https://doi.org/10.1177/0044118x13506448>
- Windle, J., & Farrell, G. (2012). Popping the Balloon Effect: Assessing Drug Law Enforcement in Terms of Displacement, Diffusion, and the Containment Hypothesis. *Substance Use Misuse*, 47(8-9), 868–876. <https://doi.org/10.3109/10826084.2012.663274>
- Wood, E., Spittal, P. M., Small, W., Kerr, T., Li, K., Hogg, R. S., Tyndall, M. W., Montaner, J. S., & Schechter, M. T. (2004). Displacement of Canada's largest public illicit drug market in response to a police crackdown. *Cmaj*, 170(10), 1551–1556.
- Wood, S. N. (2021). Inferring UK COVID-19 fatal infection trajectories from daily mortality data: Were infections already in decline before the UK lockdowns? *Biometrics*, n/a(n/a). <https://doi.org/https://doi.org/10.1111/biom.13462>
- Worthington, B. (2020a). Billions of dollars pumped into coronavirus-hit economy in bid to stave off recession, scott morrison announces.
- Worthington, B. (2020b). Government's \$66 billion coronavirus stimulus package seeks to keep businesses afloat and workers employed.
- Worthington, B. (2020c). People urged to go home as lines form around centrelink offices due to coronavirus, stuart robert admits not anticipating mygov demand.
- Young, A. (2021). The limits of the city: Atmospheres of lockdown [PMC7929277[pmcid]]. *The British Journal of Criminology*, azab001. <https://doi.org/10.1093/bjc/azab001>

Figure 1: Brisbane Local Government Area (LGA)

Source: Queensland Government Open Data Portal - Computer file

Figure 2: Generalised Additive Model outcomes - Drug Offence Detection Counts, Fortitude Valley SA2

Main effects	Specification	b	s.e	p
Year	(linear; 1-4)	0.01	0.03	0.74
Season 1 (Jan-Mar)	ref	--	--	--
Season 2 (Apr-Jun)	(dummy; 0/1)	0.16	0.09	0.06
Season 3 (Jul-Sept)	(dummy; 0/1)	0.14	0.09	0.13
Season 4 (Oct-Dec)	(dummy; 0/1)	0.2	0.09	0.03
Constant/intercept	--	0.35	0.1	0.00
GAM estimated smoothed effects		EDF	p	
Spatial Spline (longitude, latitude)		68	0.00	
Model fit diagnostics				
N			1275	
Negative Binomial Scale			1.94	
REML			2457	
Adjusted R ²			0.7	
AIC			4757.96	

Notes: EDF = estimated degrees of freedom, REML = Restricted Maximum Likelihood, AIC = Aikaike Informaiton Criteria

Source: Queensland Government Open Data Portal

Figure 3: Visual representation of a GAM estimated geospatial thin-plate spline / tensor product (Drug Detections, Fortitude Valley SA2)

Source: Queensland Government Open Data Portal [computer file]

Figure 4: Monthly drug detection rate (count) Fortitude Valley SA2, (April 2016 - June 2020)

Source: Queensland Government Open Data Portal [computer file]

Figure 5: Quarterly drug offence detection numbers pre- and during lockdown, Fortitude Valley SA2

Source: Queensland Government Open Data Portal [computer file]

Figure 6: Locations of potential nearby and distal displacement, Fortitude Valley SA2

Source: Queensland Government Open Data Portal [computer file]

Note: Shaded meshblocks indicate areas where the number of drug offence detections fell beyond the GAM estimated 95% prediction interval.