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# Examining the extent of repeat and near repeat victimisation of domestic burglaries in Belo Horizonte, Brazil

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## Abstract

Substantial research suggests that a burglary event is a useful predictor of burglaries to the same or nearby properties in the near future. To date, the research that has suggested this predictive quality has been based on studies that have focused on crime patterns in western industrialised countries, such as the UK, USA and Australia. These studies have in turn informed the design of effective burglary reduction programmes that have a specific focus towards counteracting the risk of repeats and near repeats. This current study adds to the existing research knowledge by examining whether patterns of burglary repeats and near repeats are evident in Belo Horizonte, a large Brazilian city. Domestic dwellings in Brazilian cities, as typified by those in Belo Horizonte, are quite different to dwellings in western countries—many city-dwelling Brazilians live in apartments in high rise buildings, most houses and apartment blocks are surrounded by high perimeter fencing, and a reasonable proportion of dwellings are irregular self-constructed houses. As a consequence, a different infrastructure of domestic living may result in differences in patterns of domestic burglary when compared to patterns in western countries. The research identifies that the extent of repeat and near repeat patterns in the city of Belo Horizonte are lower than those in comparable western urban contexts. We discuss the implications of these findings and how they impact on the translating of practice on crime prevention and crime prediction to the urban Latin American context.

**Keywords:** Repeat victimisation, Near repeat victimisation, Crime prediction, Crime prevention, Policing, Burglary, Boost account, Flag account, Foraging theory

## Background

Repeat victimisation is the empirically observed pattern of a person or other target (e.g., a building) being subject to victimisation a number of times (Farrell and Pease 1993; Polvi et al. 1991). Near repeat victimisation is the observed finding that targets near to a recent incident are also at a heightened risk of being victimized (Bowers et al. 2004). These patterns of repeat and near repeat victimisation have been observed for a range of crime types, including domestic burglary (Johnson and Bowers 2004a; Pease 1998; Johnson et al. 2007), vehicle crime (Johnson

et al. 2009), and shootings (Haberman and Ratcliffe 2012; Ratcliffe and Rengert 2008).

The empirical findings from research into the patterns of repeats and near repeats has led some commentators to suggest that recent incidents provide a powerful indicator for predicting where and when crime is likely to take place (Bowers et al. 2004; Johnson and Bowers 2004b; Pease 1998; Skogan 1996). In turn, these observed patterns of repeats and near repeats have resulted in many police agencies designing crime prevention programmes, in particular for burglary, to counter the predicted heightened risk of further incidents following an initial offence with reported successes including reductions in burglary of 27 % in Trafford (UK) (Fielding and Jones 2012) and 66 % in Edmonton (Canada) (UCL 2014). Additionally, several software companies have drawn from the research findings into repeats and near repeats

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to design applications for predicting crime, for example PredPol (2013) and HunchLab (Azavea 2015).

To date, the analysis of repeat and near repeat patterns of crime has been applied in many western countries, including Europe (Bernasco 2008; Bowers and Johnson 2005), the USA (Haberman and Ratcliffe 2012; Ratcliffe and Rengert 2008; Wells et al. 2011), and Australia (Townsend et al. 2003) but has received very little analytical attention in non-western contexts, such as Latin American countries. In this paper we describe research that examined whether patterns of repeat victimisation and near repeat victimisation of domestic burglary are evident in Belo Horizonte, Brazil—a typical Brazilian city. We hypothesise that patterns of burglary repeats and near repeats are evident in Belo Horizonte, but the extent of these patterns are likely to be different to those found in western countries. We consider whether differences in patterns of burglary repeats and near repeats are due to contextual urban infrastructure differences between Latin American countries and western countries. If patterns of burglary repeat and near repeat victimisation are less evident in Latin American countries, this would indicate that crime prediction software tools and police strategies for countering repeats and near repeats that have been developed to suit western contexts may be less suitable in Latin American countries for supporting burglary prevention.

Section “[Repeats, near repeats, theories that underpin their patterns, and crime prevention initiatives designed to counter these patterns](#)” of the paper describes patterns of repeat and near repeat victimisation from a range of studies in western countries to offer a benchmark against which the research findings can be compared. In “[Repeats, near repeats, theories that underpin their patterns, and crime prevention initiatives designed to counter these patterns](#)” section we also describe the theory that underpin the patterns of repeat and near repeat victimisation and describe several burglary prevention programmes that have been designed to counter the risk of repeats and near repeats. In “[Policing, burglary, and crime reporting in Brazil](#)” section we describe burglary patterns in Brazil and consider whether crime reporting and recoding practices for our study area may have an impact on our research findings. Section “[Study area and the domestic living infrastructure in Brazilian cities](#)” describes our study area of Belo Horizonte, including details about the city’s urban infrastructure and typical domestic security arrangements.<sup>1</sup> Section “[Method: data, and spatial-temporal analysis of domestic burglary](#)”

<sup>1</sup> The review of Brazilian urban infrastructure, domestic living and common burglary prevention efforts allows us to draw conclusions from the analysis findings and consider the practical replication of burglary prevention efforts that have been applied in western contexts.

describes the method used for examining the extent of burglary repeat and near repeat victimisation in Belo Horizonte. In “[Results: analysis of repeat victimisation and near repeat victimisation](#)” section the results are described, and in “[Discussion and implications](#)” section the results are discussed, along with the implications of these findings on crime prediction and burglary prevention in Brazil and elsewhere in Latin America. Conclusions from the research are provided in “[Conclusions](#)” section.

## **Repeats, near repeats, theories that underpin their patterns, and crime prevention initiatives designed to counter these patterns**

### **Patterns of repeat and near repeat victimisation**

Repeat victimisation is the concept of a person or building being subject to victimisation a number of times. Research into repeat victimisation has shown that, overall, risk doubles following a victimisation, and that repeats occur swiftly after the initial incident (Farrell and Pease 1993; Polvi et al. 1991). Table 1 shows the extent of burglary repeat victimisation has been recorded to be between 7 and 33 % of all burglaries in several western and developed countries.<sup>2</sup> Interviews with offenders have also supported the empirical observations of patterns of repeat victimisation, with Ericsson (1995), for example, finding that 76 % of offenders interviewed returned to a number of houses to burgle them 2–5 times.

Near repeat victimisation is the observed finding that targets near to a recent incident are at a heightened risk of being victimised. The level of risk to neighbouring targets is lower than the risk of victimisation to the recent victimised target, and decays with distance from this original target. Similar to repeat victimisation, this heightened risk to neighbouring targets decays over time (Bowers et al. 2004). Listed in Table 2 are examples of the extent of burglary near repeat victimisation sourced from police agencies in the UK and New Zealand (from analysis conducted within police agencies)<sup>3</sup> and show, when defined as burglaries committed within 200 m and 7 days of an originator offence, near repeats can account for up to a quarter of all burglaries. Table 2 also shows variation exists between locations, but that in general, near repeats

<sup>2</sup> While the time-window for measuring repeat victimisation is known to have an effect on results (Farrell et al. 2002), the studies selected for illustration in Table 1 all used a 1 year time-window, therefore, enabling comparison. Results from studies at national and local levels are provided in order to illustrate a range of burglary repeat victimisation levels, and to illustrate how levels at the local level may vary when compared to national levels of burglary repeat victimisation.

<sup>3</sup> To date, while many studies have reported statistical evidence of near repeat patterns (for example, Bowers and Johnson 2005; Haberman and Ratcliffe 2012; and Townsend et al. 2003), very few have recorded the extent to which near repeats account for all crime.

**Table 1 The extent of burglary repeat victimisation as reported from a range of studies in western and developed countries**

Location of study and source	Proportion of burglary that was repeat victimisation (%)
Birmingham, England: 2011 (BBC 2012)	30
England and Wales: 2012/13 (ONS 2013)	14
Japan: 1989 (Farrell and Bouloukos 2001)	22
Newcastle, England: 2010 (Safe Newcastle Partnership 2011)	15
Netherlands: 1996 (Farrell and Bouloukos 2001)	21
Northumberland County, England: 2009 (Northumberland Community Safety Partnership, 2009)	7
South Auckland, New Zealand: 2014 (Chainey and Silva 2015)	10
Sweden: 1996 (Farrell and Bouloukos 2001)	13
USA: 1996 (Farrell and Bouloukos 2001)	33

For each study the time measurement window for analysing repeat victimisation was 1 year

**Table 2 The extent of burglary near repeat victimisation as reported from a range of analysis studies conducted by police agencies in the UK and New Zealand**

Measure of near in space and near in time to originator incident, and location of study and source	Proportion of burglary that was near repeat victimisation (%)
Within 200 m and 7 days	14
Within 200 m and 14 days	23
Herefordshire, UK (West Mercia Police 2012)	
Within 300 m and 10 days	16
Kettering, UK (Northamptonshire Police 2013)	
Within 200 m and 7 days	23
Newcastle, UK (Chainey 2014)	
Within 100 m and 1 day	1
Within 100 m and 7 days	5
Within 200 m and 7 days	12
Auckland, New Zealand (New Zealand Police 2014a)	
Within 100 m and 1 day	2
Within 100 m and 7 days	5
Within 200 m and 7 days	12
Wellington, New Zealand (New Zealand Police 2014b)	

For each study, data for 1 year was used to measure the extent of near repeats

within 200 m and 7 days of an originator offence accounted for at least 12 % of all burglaries.

**Theories that explain the patterns of repeats and near repeats**

The reasons why repeats and near repeats occur can principally be explained by the boost account and optimal foraging theory, and the flag account. The boost account refers to an offender deciding to return to the same location, boosted by the success of previous crime commission (Bowers and Johnson 2004; Pease 1998). This boost principle also applies to near repeats, based on the idea that the offender is boosted to return because of their familiarity with the area (following the initial offence), the means of breaking in and the layout of the neighbouring properties are likely to be similar, and the neighbours are likely to have possessions worth stealing, similar to those stolen in the initial burglary (Chainey 2012).

Optimal foraging theory provides a means of explaining why the boost account occurs (Bowers and Johnson 2004; Johnson et al. 2009). This approach likens offenders to foraging animals. As a forager, an offender makes a trade-off between the rewards of crime commission that are most obvious and immediately available (i.e., returning to commit a repeat), and the effort and risks that will be expended in seeking better opportunities. Once an area has been exhausted of the best theft opportunities, the forager moves on (i.e., seeking to commit burglary elsewhere).

The flag account suggests there is some enduring quality about the target that highlights (flags) its high level of vulnerability to would-be offenders (Pease 1998).<sup>4</sup> Different to the boost account, the flag account suggests a repeat offence is likely to be committed by a different offender than who committed the initial offence. In addition, the flag account suggests the time between an initial offence and a repeat is more likely to be random, rather than following swiftly after an initial incident.

In practice, a combination of boost, optimal foraging and flag theories are likely at play in explaining why repeats and near repeats occur. For instance, the flag characteristics of a property may initially attract an offender because it is seen as an easier target, with the risk of future burglary being boosted following an initial incident. Foraging behaviour then helps explain why an offender may return to the same or nearby locations for a short period after a previous offence to carry out a spate of further offences.

<sup>4</sup> In terms of burglary, these qualities could include the property being situated at the end of a terrace, which has an alley running along the back, and the property appearing to have poor door and window security—all of which are signals for easy property access opportunities to a would-be offender.

### Crime prevention initiatives designed to counter the risk of repeat and near repeat victimisation

The key finding from studies that have examined repeat victimisation is that the risk of a second burglary occurring is substantially higher than the risk of the first burglary, but that this risk of a second burglary decays over time. This finding presents opportunities for crime prevention by attempting to counter the risk of the second and other subsequent burglaries to the same property. One of the first crime prevention initiatives that took advantage to prevent domestic burglary by countering the risk of repeats was the Kirkholt Burglary Prevention Project in Rochdale, UK (Forrester et al. 1988). After an analysis that identified the high level of repeat victimisation on the Kirkholt housing estate, crime prevention efforts, including improvements in dwelling security, were targeted to those properties that had previously experienced burglary repeats. The result was an 80 % reduction in burglary repeat victimisation, which contributed to an overall reduction of 53 % in burglary across the Kirkholt estate (Forrester et al. 1988). Several burglary prevention initiatives that have since followed the Kirkholt experience<sup>5</sup> have similarly focused on preventing the heightened risk of further burglaries occurring (following an initial incident).<sup>6</sup>

The key finding from research into near repeat victimisation is that the risk of burglary to properties near to a recently burgled property is significantly higher than the risk to those properties further away, but that the risk of burglaries to these neighbouring properties decays over time. This finding presents opportunities for burglary prevention by attempting to counter the risk of burglary to nearby properties. One of the first initiatives designed to specifically counter both repeats and near repeats was introduced by Greater Manchester Police in Trafford, UK in 2011. In addition to the targeting of a crime prevention officer to recently burgled properties, officers from the local policing team would conduct door-to-door visits to neighbouring houses on the day after the initial burglary, informing residents about the recent burglary, reassuring them over their likely risk of burglary, and providing practical crime prevention advice to prevent these neighbouring residents being burgled (Fielding and Jones 2012;

Chainey 2012).<sup>7</sup> The impact of the crime prevention initiative to counter burglary repeats and near repeats in Trafford was a reduction in burglaries of 42 % in the areas that were targeted.<sup>8</sup> Similar burglary prevention tactics to those introduced in Trafford have been implemented by other police forces in the UK, USA, and Canada, and have contributed to similar reductions (UCL 2014).<sup>9</sup>

### Policing, burglary, and crime reporting in Brazil

For the twenty-six states in Brazil, each has a Military Police agency (Policia Militar) that acts as both the front line of law enforcement and the agency that responds to incidents of crime. While a militaristic approach to policing, with a focus towards repression and enforcement has tended to be the tradition in Brazilian police practice, in more recent years an appreciation and adoption of prevention-focused, problem-oriented and community policing principles have begun to be adopted by Brazil's Policia Militar (Beato Filho 2008).

Although violent crime is of a particular concern in Brazil with rates exceeding those of many western countries,<sup>10</sup> Brazil experiences relatively low levels of domestic burglary. In 2012, the recorded domestic burglary rate in Brazil was 11 burglaries per 100,000 population, compared to the United States (494 per 100,000 population), Australia (659 per 100,000 population), New Zealand (886 per 100,000 population), and England and Wales (402 per 100,000 population) (UNODC 2014). The low domestic burglary rate in Brazil is though comparable to most rates experienced in other Latin American countries such as Colombia (47 burglaries per 100,000 population), Mexico (95 per 100,000 population), Panama (9 per 100,000 population), and Paraguay (28.5 per 100,000 population) (UNODC 2014).

Like in western countries, the under-reporting of crime is a problem in Brazil. Results from the 2010 Brazil Victimization Survey<sup>11</sup> state that only 33 % of burglary vic-

<sup>5</sup> In a systematic review of repeat victimisation prevention, Grove et al. (2012) further identified the promising opportunities for burglary prevention by indicating that initiatives that were designed to prevent repeats experienced an average reduction in burglary of 22 %.

<sup>6</sup> A commonly used prevention tactic involves the deployment of crime prevention officers to burgled homes within 24 h of the burglary occurring (Chainey, 2012). The tactic of deploying a crime prevention officer to a recently burgled property aims to respond in a manner that is timely to when the risk of a repeat incident is at its highest, and that any immediate improvements in security and requests for residents to be extra vigilant will resonate for several days after the visit of the crime prevention officer.

<sup>7</sup> The timing of the visits to nearby properties was chosen to coincide with when the previous burglary took place, acting as a possible deterrent (through the presence of a police officer in high visibility uniform) to any returning offender.

<sup>8</sup> The overall burglary reduction across Trafford was 27 % (Chainey 2012).

<sup>9</sup> West Yorkshire Police in Leeds modelled a burglary prevention initiative on the practice from Trafford and experienced a 48 % reduction in burglary (Professional Security 2012).

<sup>10</sup> Crime and violence are among the main concerns of Brazilians (CNT/ SENSUS 2010). The issue of violence is also reflected in changes in the homicide rate in Brazil, increasing from 12 homicides per 100,000 inhabitants in 1980 to 30 homicides per 100,000 inhabitants in 2012 (SIM/DataSUS 2014). In the most recent Brazilian Victimization Survey, 60 % of respondents stated that safety and crime problems were becoming worse in the country, affecting their sense of security and increasing their fear of crime (Silva and Beato Filho 2013).

<sup>11</sup> The Brazil Victimization Survey is completed by visiting residents in their home. The sample unit of the survey is the individual, conducted on persons aged 16 or over and resident in a town of over 15,000 inhabitants. The survey involved conducting 78,008 interviews and was considered representative of Brazil to a confidence level of 95 and 0.4 % margin of error.

tims reported the crime to the police (Silva and Beato Filho 2013). This is, however, comparable to a reporting rate for domestic burglary of 36 % in England and Wales (ONS 2015),<sup>12</sup> and, therefore, suggests comparisons between patterns observed in police recorded burglary data between Brazil and western countries (in particular the UK) are feasible. While additionally there are some concerns over the quality and completeness of crime data recorded by the state police agencies in Brazil (as noted by Murray et al. 2013), the crime data we use in the present study is for the state of Minas Gerais which is rated as having high quality police recorded crime data (Fórum Brasileiro de Segurança Pública 2011).

### Study area and the domestic living infrastructure in Brazilian cities

The city of Belo Horizonte in Brazil was the chosen area of study. This is because recorded crime data required for the analysis were available, the authors' knowledge of the city, and because Belo Horizonte is a city that is representative of urban living in Brazil. Belo Horizonte is in the southeastern region of Brazil, is capital of the state of Minas Gerais, and is Brazil's third largest metropolitan area with a population of 5.5 million (Brookings 2012).

An important contextual difference between Brazilian cities and many cities in western countries relates to urban living. In Brazil, eight of the country's cities feature in the top fifty cities in the world with the most high rise buildings, many of which are for residential purposes. In contrast, only New York City and Chicago are the two US cities included and only London is included as the single UK city in the same top 50. Belo Horizonte is ranked 15th in the world for cities with the most high rise buildings (Emporis 2015).

A third of the population of Belo Horizonte live in apartments (in high rise buildings), 9 % of the city's inhabitants live in favelas (irregular settlements), with the remainder mainly living in semi-detached or detached houses (IBGE 2010). In addition to the differences in housing context are the security features that are common to homes in Brazilian cities, typified in Belo Horizonte. Results from the 2010 Brazil Victimization Survey showed that over 55 % of respondents use security mechanisms in their homes, such as reinforced bars, guard dogs and high fences in order to increase protection against domestic burglary (CRISP/Datafolha/Ministério da Justiça 2011). The fortification of domestic properties includes fencing around apartment blocks as well as around semi-detached and detached properties (Caldeira

2000; Paixão 1991). Indeed, results from a recent victimisation survey conducted in Belo Horizonte revealed that more than a half of respondents stated that their homes or apartments had high walls or fences over two metres high, and that 14 % had installed electric fences. 42 % of respondents from the survey also stated they had metal bars installed across the windows of their residence, 37 % reported having extra locks on doors and locks on their windows, and 13 % had installed a burglar alarm in their homes (CRISP 2006).

In addition to the physical security features that are built into many Brazilian homes to help protect residents from burglary, many apartment blocks in Brazil have a security guard stationed at the entrance to the building, for all hours of the day. This is a feature that is not exclusive to just apartment blocks that house the wealthy, but is common to all types of apartment blocks. 31 % of respondents to the Belo Horizonte victimisation survey also stated they had seen the presence of private security in their neighbourhood (CRISP 2006). In addition to the presence of security officers is the presence of domestic staff in Brazilian homes. Most residents with at least an average level of income in Brazil, particularly families, employ at least one domestic helper (Brazil Business 2014). This means that when the home owners are at work during the day, these trusted domestic staff occupy their home, and in-doing-so provide informal security through their presence.<sup>13</sup>

### Method: data, and spatial-temporal analysis of domestic burglary

#### Recorded crime data

Recorded crime data on domestic burglary for 2012 to 2014 were provided by the Policia Militar de Minas Gerais (PMMG) for the city of Belo Horizonte. The crime data included the address of the home that had been burgled, and the date and time of the offence. Between 2012 and 2014 there were 19453 recorded domestic burglaries in Belo Horizonte.

PMMG employ a robust geocoding process to pinpoint within a computer-based mapping environment the exact location of the offence.<sup>14</sup> An assessment of the geocoding accuracy of the domestic burglary data determined the

<sup>12</sup> Based on an estimated 560,000 incidents of domestic burglary in a dwelling determined by the Crime Survey of England and Wales and 204,136 domestic burglaries recorded by police forces in England and Wales, for the year ending September 2014 (ONS 2015).

<sup>13</sup> 13 % of women working in the metropolitan region of Belo Horizonte are employed as domestic servants (DIEESE 2013).

<sup>14</sup> The geocoding process utilises the address as recorded in the crime record to determine the spatial coordinates for the offence. In addition, PMMG use Global Positioning System technology and satellite imagery to help locate the position of a burglary offence occurred when committed to homes in favelas.

data to be at least 95 % accurate<sup>15</sup> and sufficient in quality for the purposes of the research.

**Measuring repeat victimisation**

Repeat incidents of burglary were identified using a two stage approach. The first stage identified repeats by selecting those records where the geographic coordinates for the burglary were the same as that for another offence. The address details for each of these offences were then checked to determine that each offence corresponded to the same dwelling, and to remove any that did not (e.g., where the same geographic coordinates referred to two different apartments within a high rise building). The second stage identified repeats based on the same text string recorded in the address field of the crime record. This allowed for addresses to be corroborated between the two selection approaches. The combination of the two approaches resulted in a list of all recorded burglaries at addresses where more than one burglary had occurred.

The list of repeat incidents of burglaries was then analysed to determine the number of addresses that had experienced more than one burglary, the number of repeats (not including the first incident), and the proportion of repeats against the total number of burglaries. The analysis of burglary repeats was conducted for the whole 3 year dataset and for each 1 year period over the 3 years.<sup>16</sup> Further analysis was conducted to determine if the pattern of repeats was statistically significant, using the Near Repeat Calculator (Ratcliffe 2009).

**Measuring near repeat victimisation**

Near repeats were measured using the Near Repeat Calculator (Ratcliffe 2009). This near repeat analysis involved examining the distance and time between burglaries to determine if the pattern of near repeats was statistically significant. The spatial bandwidth in the Near Repeat Calculator was set to 100 m and five bands were applied. The temporal bandwidth in the Near Repeat Calculator was set to 7 days and four bands were applied. Analysis was also conducted to determine the number of offences committed within 100 m and 7 days, within 200 m and 7 days, and within 300 m and 7 days of an originator offence. The spatial and temporal bandwidths and the number of bands were chosen as they provided a means for comparing the extent of near repeats in Belo Horizonte to several

of the results from near repeat victimisation studies for other areas in the world (as reported in Table 2).

**Results: analysis of repeat victimisation and near repeat victimisation**

**Repeat victimisation**

Table 3 shows that during the 2012 to 2014 period, 1226 homes were known to have experienced more than one burglary, and accounted for 2894 burglaries in total, equivalent to 14.9 % of all recorded domestic burglaries in Belo Horizonte. There were 1668 repeat domestic burglaries in Belo Horizonte between 2012 and 2014, equating to 8.6 % of all recorded domestic burglaries during this period.

In any 1 year, 201 to 341 repeat burglaries occurred in Belo Horizonte, accounting for 5.4 % of all recorded domestic burglaries in 2012, 4.8 % in 2013 and 3.2 % in 2014 (see Table 3c). This level of burglary repeats experienced in Belo Horizonte was lower than levels of burglary repeats in western countries reported in Table 1 (where the range of repeat victimisation from these previous studies was 7–33 %).

An analysis of the statistical significance of repeat burglaries (see Table 4) revealed that for each year, the pattern of repeat victimisation was significant ( $p = 0.05$ ) within 0–7 days of an originator burglary offence. The

**Table 3 The extent of domestic burglary repeat victimisation in Belo Horizonte, Brazil**

	2012–2014	2012	2013	2014
<i>(a) Number of locations that experienced a repeat burglary</i>				
n locations	1226	295	293	189
<i>(b) Proportion of burglary that took place at locations that experienced more than one burglary</i>				
n	2894	636	620	390
%	14.9	10.0	9.0	6.2
All burglary	19453	6349	6854	6250
<i>(c) Proportion of burglaries that were repeats</i>				
n	1668	341	327	201
%	8.6	5.4	4.8	3.2

**Table 4 The statistical significance of burglary repeat victimisation in Belo Horizonte, Brazil**

	2012	2013	2014
0–7 days	$p \leq 0.05$	$p \leq 0.05$	$p \leq 0.05$
8–14 days	$p \leq 0.05$	$p \leq 0.05$	n.s.
15–21 days	n.s.	n.s.	$p \leq 0.05$
22–28 days	$p \leq 0.05$	n.s.	n.s.

$p = 0.05$ . Temporal bandwidth 7 days, four bands

<sup>15</sup> Following the geocoding accuracy measurement process described by Chainey and Ratcliffe 2005.

<sup>16</sup> This analysis approach allowed for the effects of the time-window for measuring repeats to be assessed for its impact on the extent of repeat victimisation in Belo Horizonte, and to allow comparison to the levels of repeat victimisation reported in Table 1 where each study was based on measuring repeats using one year of crime data.

pattern of repeat victimisation was not statistically significant ( $p = 0.05$ ) for each year between 8–14, 15–21 and 22–28 days of an originator burglary. These results indicate that in Belo Horizonte, a repeat burglary is more likely to occur swiftly after (and within 7 days) of a previous burglary offence, rather than at any other time.

**Near repeat victimisation**

Table 5 shows the pattern of near repeats in Belo Horizonte was statistically significant ( $p \leq 0.05$ ) for fourteen of the twenty different spatial and temporal bands. All of the six bands within 0 to 21 days and within 1 to 200 m of originator incidents were statistically significant and displayed the highest levels of risk in comparison to other bands.

Table 6 shows the number and proportion of near repeats (of all domestic burglary) for different spatial and temporal bands. Although the pattern of near repeats was statistically significant for most of the spatial and temporal bands that were closest (in space and time) to originator incidents, less than 6 % of all recorded domestic burglaries were near repeats within 200 m and 7 days of an originator offence. These levels of near repeat burglaries experienced in Belo Horizonte were much lower than levels of near repeat burglaries found from analysis in the UK and New Zealand (as reported in Table 2),

**Table 5 Spatial and temporal bands for which near repeats of burglaries were statistically significant in Belo Horizonte, Brazil**

	0–7 days	8–14 days	15–21 days	22–28 days
1–100 m	1.42 $p \leq 0.05$	1.18 $p \leq 0.05$	1.21 $p \leq 0.05$	n.s.
101–200 m	1.24 $p \leq 0.05$	1.18 $p \leq 0.05$	1.11 $p \leq 0.05$	n.s.
201–300 m	1.15 $p \leq 0.05$	n.s.	n.s.	1.09 $p \leq 0.05$
301–400 m	1.11 $p \leq 0.05$	1.11 $p \leq 0.05$	1.07 $p \leq 0.05$	n.s.
401–500 m	1.18 $p \leq 0.05$	1.09 $p \leq 0.05$	1.07 $p \leq 0.05$	n.s.

**Table 6 The proportion of near repeats for three different definitions of near in space and near in time**

Near repeat definition	Number of near repeats and proportion of all burglary
Within 100 m and 7 days	242 (2.2 %)
Within 200 m and 7 days	657 (5.8 %)
Within 300 m and 7 days	1430 (12.7 %)

where the comparable levels (for burglaries within 200 m and 7 days of an originator offence) were between 12 and 23 % of all domestic burglaries.

**Discussion and implications**

The analysis of burglary for the city of Belo Horizonte has revealed that patterns of repeat and near repeat victimisation are statistically significant, with these patterns following the common typology of the greater level of risk being soon after an initial burglary offence, and additionally for near repeats, the highest level of risk being to those properties that are closest to where the previous burglary offence took place. However, the analysis has also revealed that levels of burglary repeats and near repeats were much lower than those found from studies in western countries. For example, the level of burglary repeats in Belo Horizonte in 2014 was half of that measured in the rural UK county of Northumberland and a ninth of the levels of repeats for the city of Birmingham (UK). Similarly, the extent of burglary near repeats in Belo Horizonte was no more than half the levels of those found from studies in the UK and New Zealand.

An initial indication of differences between experiences of domestic burglary in Brazil and experiences of domestic burglary in the UK, USA and other western countries was illustrated by the differences in domestic burglary rates between these countries. The under-reporting of crime is an issue in Brazil, like it is in many other western countries, however, the similarity in crime reporting levels between Brazil and England and Wales suggests the under-reporting of crime in Brazil is unlikely to fully explain the differences in domestic burglary rates. In addition, the assessment of the police crime recording standards of the data used in the research suggests that confidence can be placed in the findings, and that a real difference does exist in the levels of repeats and near repeats experienced in Belo Horizonte in comparison to similar studies in western countries.

The domestic housing infrastructure in Brazilian cities is very different to that in many western countries. Many more domestic properties in Brazil have situational prevention measures, such as perimeter fences and security guards, implemented as standard to improve domestic safety. While the current research study has not statistically examined the relationship between differences in housing infrastructure in Belo Horizonte and western countries, we offer a theoretical reason for explaining the differences in repeats and near repeats in relation to these international contextual differences in housing infrastructure.

The primary theories that explain repeat and near repeat victimisation are the boost account and foraging theory, and the flag account. For a property to be singled

out by an offender as a suitable target for an initial burglary requires that property to typically display some enduring characteristic that makes it more vulnerable than others. In Belo Horizonte, the opportunities to commit burglary are considered to be lower due to the higher levels of in-built situational crime prevention that fortify homes from would-be offenders. In addition, within favelas, the close proximity of dwellings and an often high level of social capital can ward off burglars (Villareal and Silva 2006). Furthermore, the common style of living in high rise apartment blocks in Brazilian cities such as Belo Horizonte, may also act in naturally limiting the opportunities for burglary. For instance, it is anticipated to be more difficult for an offender to determine if a home is unoccupied (and, therefore, a potential target for burglary) if it is on a level above the ground floor. It is, therefore, likely that the combination of a greater level of situational crime prevention and more high rise apartments in a Brazilian urban setting results in a lower prevalence of flag account opportunities that explain burglary offending, and as a result lower levels of burglary repeat victimisation that are associated with the flag account explanation.

In Brazil, when a home is burgled it has typically required the offender to overcome the perimeter fencing that is present, the metal bars across doors and windows, the security guard at the entrance to the apartment block or domestic staff who are present in the dwelling, both on entry and exit. This comes with risks and extra effort to overcome, and although an offender may have escaped undetected after committing an initial offence, the experience of this recent offence is likely to increase the vigilance of the home owners and the other people who are present (i.e., security and domestic staff) in preventing a repeat offence from occurring soon. This suggests that the boost account for explaining burglary repeats is likely to be less prevalent in the Brazilian context. Foraging behaviour, involving seeking additional nearby opportunities, may also be limited due to the risks and efforts required to overcome the in-built situational crime prevention measures that are present at the nearby properties. Combined, if the limited opportunities in utilizing boosts and further foraging following the commission of a previous burglary offence influences offender decision-making, then it is likely that fewer repeats and near repeats will occur swiftly after an initial offence.

Impressive results in crime reduction quickly gain interest across the international police community. However, the sharing of good practice on what has worked to reduce crime requires not only an understanding of the tactics and initiatives that were applied, but also an appreciation of whether the context in which replication is to take place is likely to produce similar results. This

means that tactics and strategies that have been used elsewhere to predict and prevent domestic burglary by countering patterns of repeats and near repeats will only have a high level of impact if the extent of repeats and near repeats account for a large proportion of all domestic burglaries.

Effective burglary prevention programmes such as those in Manchester and Edmonton displayed high levels of burglary repeats and near repeats prior to the implementation of the initiatives to counter the risk of repeats and near repeats. In areas where the levels of repeats and near repeats are not as high, the impact of the same tactics and strategies are likely to have less impact (i.e., there are fewer burglaries that can be countered using tactics to prevent repeats and near repeats). This means that burglary prevention programmes that focus on reducing repeat and near repeat victimisation are likely to have less of an impact in reducing burglary in Belo Horizonte and in other Latin American cities where levels of repeats and near repeats are low. As an estimate for Belo Horizonte, taking the example of 2014 where burglary repeat victimisation and near repeat victimisation accounted for 3.2 and 5.8 % respectively of all burglaries, a crime prevention programme designed specifically to counter repeats and near repeats may only yield an overall burglary reduction of 9 %. In addition, the results from Belo Horizonte also suggest that predictive policing software that includes algorithms for predicting burglary based on the patterns of repeats and near repeats may not be as effective in Latin American countries where domestic living and housing infrastructure differ greatly to the western cities on which the software has been designed.

At present, victimisation surveys in Brazil do not probe on experiences of repeat victimisation, so little else is available other than recorded crime data that allows for analysis of the extent of these experiences. Also, to date, research in Brazil has not been conducted that has involved interviewing offenders about their decision-making in selecting properties to burgle and whether the concepts of the boost and flag accounts feature in this decision-making. This type of questioning of offenders is an obvious area for future research that will allow the examination of whether these contextual differences between Brazil (and other Latin American countries) and western countries influence offender decision-making.<sup>17</sup> Additional areas for future research could involve

<sup>17</sup> In particular, little is known about the differences in the levels of attempted burglary between Latin American and western countries, and the impact a failed attempt at committing a burglary has on boosting the offender to return to the same property or seek other burglary opportunities nearby. In the Latin American context where the successful commission of burglary may be lower, examining the impact of failed attempts to commit burglary on how it then influences future offending behavior would benefit from further research.

analysis of burglary near repeat patterns in relation to differences in burglary rates, housing density and housing type, and research that aims to distinguish whether it is the preponderance of high rise buildings, or whether the presence of situational domestic security (such as perimeter fencing, security guards, or the presence of domestic staff) are the reasons for lower rates of burglary and lower levels of repeat and near repeat victimisation in Brazilian cities.

## Conclusions

Policing agencies often draw from the successful practice of others, and apply this practice to the crime problems they experience. However, rather than just applying what has worked for someone else in reducing crime, police decision-makers must also determine how the practice works and if it is applicable to their context. Patterns of repeat victimisation and near repeat victimisation have been observed in many studies conducted in western countries, with these patterns considered to provide a practical means for police agencies to predict and prevent further burglaries from occurring.

This research has shown that the extent of burglary repeat and near repeat victimisation in Belo Horizonte was much lower than observed in similar studies in cities in western countries. The lower rates of burglary in Brazil, and the lower levels of burglary repeats and near repeats in Belo Horizonte suggest there is an important contextual difference between the commission of and opportunities for burglary in Brazil when compared to western countries. We argue that this contextual difference is likely to be due to differences in domestic living and housing infrastructure, with dwellings in Brazil tending to be designed or purposefully adapted to provide higher levels of situational domestic security when compared to dwellings in cities in western countries. While further research into understanding how differences in the domestic living infrastructure in Brazil influences offender decision-making would be useful, the study illustrates the importance of examining whether the crime patterns on which successful crime prevention practice is based are similarly present where this practice is being considered for replication. In terms of applying the prevention practice for reducing burglary by predicting where burglaries are likely to occur (based on patterns of repeat and near repeat victimisation), the current study shows that in a Brazilian urban context the same practice will likely yield lower levels of burglary reduction.

## Authors' contributions

Spencer Chainey is the lead author of this article. Spencer conceived the idea of the research, planned its design, conducted the majority of the analysis and drafted the manuscript. Bráulio Silva sourced the recorded crime data,

provided comment on the research results, and drafted sections relating to the contextual characteristics of Brazil and Belo Horizonte. Spencer has visited Belo Horizonte on several occasions, met with the Polícia Militar of Minas Gerais (with Bráulio) to support the research and discuss the results. Bráulio has approved the final version of the article. We are accountable for all aspects of the work and ensure that questions related to the accuracy or integrity of any part of the work will be appropriately investigated and resolved. Both authors read and approved the final manuscript.

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## Competing interests

The authors declare that they have no competing interests.

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