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Mapping Public Place Reported Crime and Harm Against Women and Girls

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Abstract

There are several seminal moments in policing history that fundamentally alter the way policing is undertaken, and how the public respond to it. The deaths of Sarah Everard, Bibaa Henry and Nicole Smallman, killed by male strangers, one of whom was a serving police officer, created a national outcry for improved public safety of women, causing the UK Government and Police Forces across the Country, to recognise the issue of violence against women and girls (VAWG) as a national priority.

This research analysed one element of this vast agenda, namely VAWG in public spaces, by mapping crime and crime severity against spatial, temporal and victim characteristics. Using four years of historically reported crime against women, in three South London Boroughs, the study responds to the following questions. Does crime volume, or the severity of the harm caused by crimes, concentrate in public space? What, if any, effect does temporal and victim characteristic differences have on these concentrations? What impact does any evidence gained have on future policy and practice?

Results suggest VAWG concentrates significantly in public spaces for both crime count and harm. Using the Cambridge Harm Index, 50% of all harm caused by crime against women and girls, concentrated within just 0.48% of public space. These Concentrations of crime and harm move, when temporal, and victim characteristics are mapped independently. Whilst the risk of victimisation continues to rise to the age of 30, the harm caused by crimes, disproportionately affects children (i.e., <18). Furthermore, harm disproportionately affects women of Asian and Afro-Caribbean ethnic backgrounds. These results have potentially significant implications on how police and other agencies respond to public space VAWG, particularly in identifying more focussed responses to temporal variations and spatial changes to crime and harm concentration and how age and ethnicity of victims feature in improved crime prevention and victim care.

Research Contract

Name: Craig Knight   **Police agency name:** Metropolitan Police

Thesis Title:

Mapping Public Place Reported Crime and Harm Against Women and Girls

Research Question:

- At what locations in South London are public place crime and harm against women and girls concentrated, and how do these locations differ in space or time when controlling variables are applied (Victim characteristics, time of day, day of week and season)?

Sub Research Questions:

- When categorising harm using the Cambridge Crime Harm Index against women and girls by seriousness, what, if any, spatial and temporal patterns can be identified and mapped?

- How do the geospatial and temporal profiles of harm or volume of crime against women differ by age, ethnicity, or another known victim characteristic?

- How does the geospatial and temporal profiles of harm or volume of crime against women differ by time of the day, day of the week, and season?

- What are the implications of such profiles to policy and practice in responding to public place violence against women from this study?

Research Design:

Observational study of reported incidents of street-based violence crime against women and girls, occurring in public spaces, where the suspect is not known to the victim.

Data and Methodology:

Use GIS mapping software to create 27,370 one-hectare sized hexagons as units of analysis. The 27,370 hexagons, each side being 60.04m in length, contain 1 hectare of space, which can be identified

on digital maps for posting incidents of crime. These hexagons form the South Area BCU of the Metropolitan Police in London, England which polices the borders of the three London boroughs of Croydon, Bromley, and Sutton. Use these hexagons to map the volume, density, and harm of 5435 crime occurrences in public spaces, where victim is female, offender is male and unknown to the victim, and victim suffers harm or perceives harm may be suffered against them. Crime occurrences drawn from the Metropolitan (Met) Police's historic crime reporting system (CRIS) from January 2016 to January 2020. The dependent measure of this study being the concentrations of crime and harm in geographic space (hexagons). Analyse these concentrations against the independent variables of victim age, ethnicity, crime type, alcohol consumption and suspect variables of victim or witness defined ethnic appearance and age.

Analytic methods:

Mapping of public space violence incident reports and harm scores, with overlay of variables to identify patterns and associations in space and time, of female victimisation.

Findings:

VAWG concentrates significantly in public spaces for both crime count and harm. 50% of all harm (measured by Cambridge Harm Index) caused by crime against women and girls, concentrated within just 0.48% of public space. These concentrations move when temporal, and victim characteristics are mapped independently. Whilst the risk of victimisation continues to rise to the age of 30, the harm caused by crimes, disproportionately affects children (i.e., <18). Furthermore, harm disproportionately affects women of Asian and Afro-Caribbean ethnic backgrounds.

Policy implications of the findings:

This study is the first of its kind to define and map public space violence against women and girls (VAWG). Results could support police and other agencies in the strategic and tactical response to VAWG in public space, wherever these hotspots are located.

Introduction

On 3rd March 2020, as she walked through Clapham, London, Sarah Everard was kidnapped; she was subsequently raped and murdered. The high-profile police investigation led to her body being found in woodland in Kent, seven days after she was reported missing. The then serving police officer Wayne Couzens, has been convicted of her abduction, rape, and murder (Soterio, 2021). Details of the Everard case were widely reported in the media. Consequently, many women came forward to share the experiences that have significantly impacted on their perception of women's safety in public spaces, and trust in police to protect women from harm.

In response to the widespread outcry for action to improve women's safety, Martin Hewitt QPM (Chairman of the National Police Chiefs Council) called an emergency meeting stating, *"…I will bring all Chief Constables together to discuss what more we can do to help protect women from male violence. We will particularly focus on the role the police can play in the street harassment that's far too common and in improving outcomes for women who report violence and abuse"* (NPCC, 2020). Nationally, each Police Force was tasked with formulating and implementing an urgent plan to prioritise and reduce violence against women and girls. Alongside the Police response, on 21st July 2021, the UK Government published its strategy for dealing with VAWG in all forms; this followed a public call for evidence from the Home Office, to allow women to share their lived experiences of the issue, so that this evidence may inform the strategy. This call for evidence received over 180,000 responses (HM Govt.,2021).

The impact of the fear of victimisation, in public, on women and girls is considerable and highly damaging to society. A study into the fear experienced by women in public demonstrated that 62% [496 of 800] of women surveyed feared using public spaces, that they constantly assessed their surroundings. Almost 10% of the women in this study expressed that they had gone as far as changing their job because of their fears of and experiences in public spaces (Kearl, 2010). Similarly, findings published as part of the 2017-2020 Police and Crime Plan for London, demonstrated that 74% of

female respondents were worried about their safety some or all the time, and that women from minority communities reported more concern for their safety than the white population. This report also identified VAWG as a priority for London, equal in importance to tackling hatred and intolerance in society and of safeguarding children across the city (MOPAC, 2017).

A recent government review into sexual abuse within schools and colleges found that 92% of girls had experienced sexist name calling and had considered it not worth reporting, indicating this behaviour had become normalised to the victims (HM Govt., OFSTED, 2021). A UK government study into victimisation estimated that in England and Wales, only one in five women reports being a victim of serious sexual assault or rape to police (HM Govt., 2018). The study speculates that, as some incidents are considered normal or routine, the extent of under-reporting of wider sexual victimisation may be far greater than initially estimated.

This study will seek to answer five questions:

1. At what locations in South London are public place crime and harm against women and girls concentrated, and how do these locations differ in space or time when controlling variables are applied?

2. When categorising harm (using the Cambridge Crime Harm Index) against women and girls by seriousness, what spatial and temporal patterns can be identified and mapped?

3. How do the geospatial and temporal profiles of harm or volume of crime against women differ by age, ethnicity, or another known victim characteristic in public places?

4. How do the geospatial and temporal profiles of harm or volume of crime against women differ by time of the day, day of the week, and season?

5. What are the implications of such profiles to policy and practice in responding to public place violence against women from this study?

The study will first describe the criminological theory and academic research that underpins VAWG in public spaces and summarise existing literature on the subject. It will then describe the methodology

of mapping historically reported crimes against women and girls, in a manner that allows observations of patterns and trends to be made. The findings of this study will then be outlined graphically using GIS mapping tools, tables, and charts to highlight and evidence any emerging findings. Finally, it will discuss the implications of this research, identify its limitations, discuss conclusions, and make recommendations for future actions.

The research presented in this thesis seeks to further our understanding of the nature of female victimisation in public spaces, committed by male perpetrators not known to their victims, and subsequently reported to police as criminal acts. The context of this study, in terms of the media attention to the topic, the national drive for urgent action to protect women in society, and an evidenced undercurrent of fear of victimisation and under reporting of incidents, makes any evidence that contributes to progress in this field particularly valuable.

Literature Review

This chapter commences by defining the key criminological and methodological theories that underpin this research. It will then consider the existing evidence surrounding the victimisation of women in public spaces, before highlighting the specific studies that have a bearing on this work.

Criminological Theory: Crime in Places

Two independent but complementary theories have emerged, seeking to explain criminal behaviours and decisions to commit crime: Routine Activity Theory (RAT) and Rational Choice Theory (RTC). Whilst RAT considers the impact of suitable targets and capable guardians in a place, RTC considers the same situational context of a crime, from the perspective of an offender's decision-making process (Clarke, 1980). Clarke identified the similarity between psychology and criminology, citing a fundamental concept of psychology that states behaviour is a product of the interaction between behaviour and setting.

RAT proposes that for a crime to occur, three elements must co-exist in space and time: a motivated offender, a suitable victim or target, and the absence of a capable guardian. These three elements existing together allow the criminal act to take place (Cohen & Felson, 1979;1980; Felson, 1998). Rather than focusing on an offenders psychological reasoning for targeting a victim, Cohen and Felson's model, provides a simplified theory to explain crime occurrences at any given point in time. They hypothesized that the rise in post-war crime in America, despite the rising economic and social status of its population, was caused by increased social mobility, rising numbers of women in the workforce causing an absence of active guardians in residences, and a dramatic increase in stealable consumables within and outside of these residences (Cohen & Felson, 1979).

The idea of a motivated offender assumes that they make a conscious decision, after weighing the costs and benefits of doing so, to target a person or property for gain, in the commission of an offence. RCT seeks to identify why this rational choice is made, and is a concept applied to sociological theories

beyond criminal behaviour to explain other human choices (Cornish & Clarke, 1986). RCT is fundamentally associated with RAT, and to criminology more widely, in that it assumes crime prevention can be achieved by changing the environmental factors associated with spaces to affect an offender's rational choice to commit a crime (de Miro, 2014).

Linking RAT and RCT, Crime Pattern Theory (CPT) considers how the spaces people reside in, use, or travel through, influence the frequency of crime in spaces. CPT hypothesises that motivated offenders base their rational choices to commit crime on signals from their environment and the spatial distribution of these signals guides this decision making, playing a pivotal role in controlling criminality. CPT suggests that some environments are crime attractors, providing numerous opportunities for motivated offenders, whilst others are generators of crime, such as crowded places with multiple suitable victims. An understanding of these attracting or generating spaces, alongside those that are crime neutral and as such, have neither attribute, may allow researchers to set a contextual framework to situational crime prevention (Brantingham & Brantingham, 1981;1984;1993;1995).

Considering the identification of victims by offenders through rational choices, researchers describe four elements which are considered by the offender when identifying a target. These are value, inertia, visibility or exposure, and access (Cohen and Felson, 1979; Felson and Clarke, 1998). The value is a simple cost versus benefit of what might be gained by selecting a target. The benefit may be real, such as a watch, or symbolic, such as targeting someone because of hatred. Inertia relates to the size and characteristics of that target. For example, a human may present a threat to the offender, when considering their fitness. Visibility or exposure relates to the circumstances the target is located within and what marks that person or thing as suitable. Finally, access relates to the surroundings in which the offender and target meet, for example, whether a location has suitable escape routes.

The absence, or conversely presence, of a suitable guardian is also factored into the rational choice in the offender's decision to commit crime, based on what the offender perceives as a suitable guardian. Research describes a suitable guardian as someone capable of preventing crime; whose presence

means the crime is not committed, and whose absence makes its commission more probable (Felson,1995). Such guardians, in public spaces, are as likely to be lay bystanders as police officers, or security personnel, including inert guardians such as CCTV (Armitage,2002). The effects of a guardian on the offender's choices are dependent on the type of crime being deterred, and may have no effect at all, as demonstrated in the Kansas patrol experiment. This study of the impact of patrolling on crime and fear of crime in the US, showed random police officer patrols had little or no effect on crime or the public's perceptions of the safety of patrolled spaces (Kelling et al., 1974).

Figure 1 simplifies these collected theories significantly, producing what has become known as the crime triangle (Eck, 1994). This triangle has the three constants of offender, victim, and location at its core, with an outer triangle applying the pressures of guardianship to act as inhibitors to a crime occurrence.

Fig. 1: The Crime Triangle (Eck,1994)

It has been suggested that the rational choices of people are not constant through time or space in these localities, rather they vary according to the ebb and flow of the routine activities of offenders and targets. Rational choices are, therefore, made in a wider context of space and time that begins to describe the temporal, spatial and seasonal variations in criminality, which occurs with or without an increase in offenders in that space (Ratcliffe, 2010).

Crime Concentration

The Pareto principle also termed the 80/20 rule, describes the doctrine that wealth is distributed unevenly in the population (Clementi & Gallegati,2005; Dunford et al.,2014; Sherman,2007). The principle of this uneven distribution has been proven to apply to many other areas of population analysis, including that of places where crime occurs (Clarke & Eck,2007). A study of emergency (i.e., 911; 999) calls in Minneapolis, USA found that just 3.5% of addresses accounted for approximately 50% of all crime-related calls (Sherman et al.,1989), noting that this concentration of crime was echoed across crime types, with all robbery calls, for example, being focussed on 2.2% of the city's addresses. A similar study in Boston, USA found 50% of crime calls related to just 10% of street locations (Spelman,1995).

Research also suggests this concentration of crime to be a constant and stable phenomenon, where 50% of crime incidents occurred at 4.5% of street segments in Seattle, USA over 14 years (Weisburd et al., 2004). Similarly, in a longitudinal study of gun violence in the US, it was found that crimes over a period of 28 years (to 2008), were concentrated on just 5% of street segments (Braga et al., 2011).

The external validity of this theory of crime concentration was tested in a study of five cities in the US, including New York City. Using identical units of spatial analysis across the five cities, it was found that 50% of all crimes were focussed on no more than 6% of the geography of the city. After reinforcing the notion that crime is concentrated into specific localities over time, Weisburd suggested the principle of crime concentration is, in fact, a universal law namely that it applies everywhere and at every time (Weisburd, 2015).

Hot and Harmspots

The hotspot, a phrase used to describe concentrations of crime in space, has been used for over two decades. It is one of few areas of criminology where experiments have been widely shown to support the idea of crime concentration in places. Evidence supports a statistically significant impact of hotspot

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policing on crime occurrence (Sherman et al.,1989; Sherman & Weisburd,1995; Braga & Bond,2008; Braga et al.,2012, Braga et al.,2019). A systematic review of 68 studies of hotspot policing found a small but statistically significant decrease in criminality when police resources were deployed into crime hotspots, without displacement, i.e., a corresponding increase of crime in nearby areas (Braga et al.,2019).

Defining the hotspot, criminology describes it as a place (address, street corner, store, house, or any other small setting) or a location, most of which can be seen by someone standing at its centre (Sherman & Weisburd,1988; Sherman et al.,1989). Whilst Sherman describes the hotspot as a micro-place, limited in size to a specific address, street corner etc., others describe the hotspot more broadly. Researchers suggests that the hotspot can be as large as a cluster of blocks or sections of a city (Block & Block,1995). Scholars also stress the importance of how open spaces are defined within these micro-locations, as they often have no formal address or street intersection (Buerger et al.,1995). The critical elements of any hotspot are the area suffers from an above average amount of crime, harm, or victimisation in comparison to its surroundings, and the scale of mapping these locations is appropriate to the questions posed in the study (Eck et al.,2005).

It is important to recognise the concept of the 'power few' and its relevance to the hotspot. The power few is a simple hypothesis that police and other agencies can be more efficient and effective, if they focus limited resources on the small percentage of places, victims and offenders which generate the highest harm. In his 2007 study, Professor Sherman considered the benefits to organisations of having an evidence-based conversation with the public, both in terms of focussed responses and, importantly, to the value of doing so to the legitimacy of those responses (Sherman,2007). Sherman identified the future potential significant benefits to focussing resources on the few places where society was suffering the most harm from crime. Several studies consider the temporal variation in space of crime (Andresen & Malleson, 2013; Hind & Ruperel, 2007; Lewis & Alford, 1975; Tompson & Townley, 2010). Tompson and Townley in particular, studied the impact of time-of-day changes to

concentrations of crime, establishing that the predictive accuracy of hotspots is enhanced when time of day is considered.

Measuring Harm and the Cambridge Harm Index

The Cambridge Crime Harm Index (CCHI) is used to distinguish and map high harm locations, allowing researchers, practitioners, and the public to contextualise crime in spaces according to how society views the severity of those crimes (Sherman et al.,2016). CCHI weights the crime as a number, to provide a total score of how severely society treats that crime, using the minimum days in prison a guilty offender of that crime can serve and adding these scores up where necessary. For example, in the UK, homicide carries a minimum (served) sentence on first conviction of 15 years in prison; the CCHI converts this into days to identify the harm score for one offence of this type (N=5,475). Using this method, the mapping of volumes of crime can be complemented with weights that indicate the severity of the crime to society. In practical terms, as Sherman and colleagues suggest, this means that not all crimes are equal. Using the CCHI a hotspot of shoplifting offences can be more effectively compared to a hotspot of sexual offences against women, which may be much smaller in volume but represent greater harm, and therefore importance to society, police, and other agencies. A harm index facilitates the focussed targeting of resources to high harm populations or places (Sherman,2013). By responding to severity rather than volumes of incidents, public support, and consent to policing, with a proportionate response to criminality is enhanced (Sherman,2007). Research has also identified the wider societal disadvantage that is present in locations where crime concentrations occur. Studying health outcomes in Baltimore, Maryland, researchers demonstrated health outcomes differed significantly, being lower where crime was concentrated; these findings support the hypothesis that crime contributes or is present when other social and health disadvantage in localities is observed (Ciacci & Tagliafico,2020; Weisburd & White,2019).

Research conducted on victimisation rates for the UK Home Office, found that 1% of people experience 59% of crime by volume (Pease,1998). Researchers agree that using a harm index, such as

the CCHI, is fundamental to determining an evidence-based approach to policing (Etheridge,2015; Pol,2016; Sherman,2013).

In a study of all crime in Dorset, England considering victim characteristics and the harm suffered by them, investigation identified that the age of a victim is a significant contributory factor to the amount of harm caused in incidents; younger victims appeared to suffer more harm. Ranked according to the CCHI, the research found that less than 4% of all victims experienced 85% of all harm, demonstrating harm concentrates in victims, as much as it does locations (Dudfield et al., 2017).

The variety of terminology used for defining crime concentrations in offenders, victims, places, or a mix of these contributory factors, has been recognised as an issue for researchers and practitioners (Farrell,2015). Farrell proposes a singular crime concentration theory drawing these multiple definitions together and introducing an overarching principle of 'Near Repeats'. Whilst not yet used in literature to the same extent as hotspots or similar phrases to describe concentrations, this term recognises the closeness of crimes according to multiple variables, so that spatial and temporal proximity can be discussed alongside similar modus operandi, victim characteristics or other factors. Whether using hotspots of incidents, harmspots of severity, near repeats, or as Sherman suggests, the 'power few' places, the use of these concepts provides the terminology and processes necessary to map volume of incidents and/or harm in geographic space and provides one the capability to interpret the level of severity of these incidents in criminality, according to their concentration.

In a study in Sussex, England, 80% of all harm was caused by four major offence categories: sexual offences, violence against the person, robbery, and theft. The authors identified harmspots are also not evenly spread across time; overnight and weekend crimes caused more harm than those occurring on other days or times of the week (Norton et al.,2018). In the first study of its kind, the spatial distribution of nine crime types in Washington DC, USA were analysed. The study clearly demonstrated a Pareto curve for harm, like that of crime volume, across all crime types examined, and suggested

that crime harm displays different spatial concentrations than those of crime incidents (Fenimore,2019).

There is a strong argument in research for combining both hotspots of incidents and harm, as the localities where these overlap, represent the most troublesome places in any region or city (Weinborn et al.,2017). In a study across regions of Canada, scholars compared both frequency of crimes, and the harms they cause, as two dimensions of a single problem (Boivin,2014). He suggests the two measurements should be analysed together, in a similar vein to the two dimensions of the degree and nature of offences suggested in "The Measurement of Delinquency". Boivin's study supports previous research on these two sides of the same coin and support the proposal of this study, that both are relevant in understanding VAWG in public spaces (Boivin,2014; Sellin and Wolfgang, 1964).

Theory of Mapping Crime and Concentrations

Crime mapping provides a cartographical representation of any question that is posed, charting the data surrounding spaces to identify issues and trends, and effecting the development of theories towards resolutions (Anselin et al.,2008). The mapping of harm to identify communities suffering the most, and therefore where to prioritise resources, has recently been demonstrated in a study conducted in New Zealand. This study used the New Zealand Crime Harm Index (NZCHI) to map areas of highest harm, according to census units at a macro-level. These census units represented areas of between 3 to 5,000 people in size. They are a similar unit of measurement to the UK lower super output areas (LSOA) which map populations of around 5 to 8,000 but in a more densely populated environment. The NZCHI differs to the CCHI, in that it uses a measure of actual sentences imposed by courts, before being eligible for release, rather than the minimum proscribed sentence in law. The study concluded that focussing on crime volume, or factors such as social deprivation, are unlikely to achieve the desired reductions in crime, in an evidence-based response to harm, without a directed approach to the harm itself. The authors also confirmed that using a harm index allows effective

mapping of harm concentration, allowing the identification of those neighbourhoods most affected, for the greatest effect (Curtis-Ham & Walton,2017).

It has been observed that the type of map used for any depiction of hotspots will greatly influence the usefulness or otherwise of the findings to practitioners (Eck et al.,2005). Although research into this concept of map use and interpretation by users is limited, the data obtained from a study examining the use of crime maps in the US., suggested that the provision of crime maps to police and other agencies does not always improve knowledge of crime in an area (Paulsen,2004). The danger of misinterpretation has been suggested to highlight that incorrect understanding of crime mapping can lead to catastrophic consequences such as falls in house prices, neighbourhood ghettoization or inappropriate responses by authorities (Ratcliffe,2001).

The issue of scale in mapping, and its importance to this interpretation of findings, is discussed in research conducted in Vancouver, Canada. This study evaluated six specific crime types by mapping incidents to identify hotspots and comparing their patterns when mapped to different scales of geographic areas. These scales ranged from census areas, with an average population of 4,000 to dissemination areas with populations of 4-700. It concluded that whilst patterns of crime remain similar across all scales used, the interpretation of these patterns change markedly when considering larger scales of analysis. The authors found a considerable benefit to the use of micro-analysis of street segments to effective understanding of crime concentration in comparison to the use of larger scales (Andreson & Malleson, 2011).

It is recognized that the ability of crime hotspot mapping to predict future crime, or analyse crime patterns, differs between the mapping techniques used and the crime types being studied. The use of Kernel Density Estimation (KDE) as a mapping tool, normally outperforms other techniques (Chainey et al., 2008). KDE plots all data points and creates a curve of the distribution of that data attempting to adduce characteristics from that data. In relation to street crimes, hotspot mapping was consistently better at predicting future events than analysis of census output areas or mapping of grid

squares. Research identifies, the value of any mapping is greatest, when analysing hotspots of crime, when guided by theory and research (Eck et al., 2005).

Gender Based Crime Research

Before considering gender-specific research it is important to identify the varying terminology used in such studies. The term gender has been defined as a classification system to categorize individuals, traits, or institutions according to societal definitions of male and female (Kimmel & Gordon, 2018). In their study of gender violence in Ontario, Canada researchers extended this definition to encompass violence that is committed against anyone based on their gender identity, expression, or perceived gender, and included incidents against an individual which may not, in that jurisdiction, be defined as crimes such as cat calling (Cotter and Savage, 2019). In the study of violence against women and girls, this wider definition allows consideration to be given to those behaviours and actions which are widely defined as street harassments; evidence indicates such harassments are significant contributors to a person's fear of crime or their perception of normalised behaviours in public spaces (Gardner,1995; Kearl,2010; Southgate and Russell, 2018).

The wider definition used within studies of this kind is that of violence against women (VAW), or violence against women and girls (VAWG). The United Nations define violence against women as "any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life" (UN., 1993). This encompasses every form of violence that can be experienced by a person who self identifies as a female, from domestic, intimate partner abuse, through to genital mutilation, homicide, and infanticide, extending to trafficking, violence against street workers and street harassments such as catcalling.

Street harassment behaviours, often described as routine or normalised in studies in this field, have been historically researched. However, these studies of micro-aggressions against women have often been bypassed in the debate between what constitutes criminal behaviour rather than gender biased

anti-social incidents or everyday sexism (Bates,2018; Stanko,1985;1995). In her studies of street harassment and gender-based criminality, Stanko reports that women are three times more fearful of crime than their male counterparts, and that this fear is born from the societal and media norms that treats women as a weaker sex or sensationalizes acts against them when they occur. She suggests that the response to victimisation against women often includes assumption-based crime prevention advice that reinforces the attitude of women being victims, whose actions may contribute to their own victimisation, in a male orientated environment (Stanko,1995). Other research on gender-based crime and victimisation began to identify gender-based violence as an endemic global health issue, and widened the debate, to include gender equality and culture (Heise,1998; Srivastava,2012; Watts & Zimmerman, 2002). This thesis excludes analysis of societal structures or inequalities, focusing only on criminal offences where females are victimized in public space.

Evidence suggests harm caused by crime is disproportionately distributed amongst genders. Aggregate data from the British Crime Survey (BCS) over three years (to 2012) indicated that 2.5% of women and 0.4% of men had been a victim of sexual assault (HM Govt.ONS,2013). This data also showed that males are more likely to suffer stranger violence, 1.2% of men compared to 0.4% of women. However, the weighting of crime severity on the reduced likelihood of being a victim if a female, is important to understand in the data, particularly when considering serious sexual offences (HM.Govt.ONS,2017).

Much of the research that exists on gender-based crime, is culturally specific, or within niche crime types. Studies have been conducted globally, spatially mapping specific issues such as female genital mutilation in Kenya (Achia,2014) or incidents of women and girls braid chopping in India (Wasi et al.,2020), and research conducted in India considered the concentration of 'eve teasing' (street-based victimisation and misogyny) against women and girls in West Bengal (Biswas & Das Chatterjee, 2017). Diswas and Das Chatterjee's study, used analytical techniques to identify statistically significant hotspots which could then target scarce police resources in response.

A study in the Ottawa-Gatineau area of Canada used mapping of address postcodes within Canadian Census Tract Units (CSTU), which are broadly comparable to the UK's use of lower super output areas, to interpret volume-based hotspot concentrations of sexual assaults, analysing 406 victimisation reports from the emergency departments of that area. They found that 70% of victims knew their aggressor, 90% of victims were female, and over 43% of victims were under the age of 24. Findings suggested an association between increased levels of sexual assaults, entertainments districts and lower income neighbourhoods, as well as less prevalent patterns of assaults in higher income, suburban districts (Muldoon et al.,2019).

Research in Kharkiv, Ukraine, identified the benefit of mapping gender-sensitive issues and its relevance to urban planning. Using GIS mapping technology, research considered the quality of urban environments, producing geo-information that could support urban planning decisions specific to gender-based security. Research found a benefit to these techniques in identifying and removing gender inequitable practices in the design of safe spaces, by visually representing data to support decision making (Fesenko et al.,2017). Whilst this study recognised the issue of safety by mapping specific urban characteristics such as street lighting and CCTV, it did not specifically overlay gender-based crime types onto maps.

A study of VAWG issues in urban spaces and its relevance to safety has however been conducted in Rotterdam. Recognising the relevance of urban planning in reducing gender-based crime, researchers mapped sexual violence data with street populations and types of urban space (Miranda & van Nes,2020). The study found a correlation between the types and numbers of people in streets, the spatial features of these spaces and the prevalence of sexual offending against women. For example, non-residential areas with higher flows of people had fewer incidents than commercial urban spaces, but these commercial spaces had higher numbers of incidents at night, possibly because of reduced natural surveillance from shops and business premises. This study focussed on one crime type within the wider VAWG remit, namely sexual assaults. It did however identify and respond to the issue of

underreporting of crime of this type, by including cases of self-reported incidents of sexual harassment data from a study in Rotterdam some three years prior to this work.

In a study of micro-urban environments in Los Angeles, California, researchers found considerable evidence for crime concentration and women's anxiety towards certain urban areas; these included open spaces such as parks, alleyways, and underground passageways as well as the transit routes, which were the focus of the study. The study concluded that there was considerable value in including gender-based considerations when designing or amending the built environment (Loukaitou-Sideris, 2012).

The UK Government called for evidence of the lived experiences of women in relation to VAWG in 2020, allowing the public to inform the strategic response, resulting in over 180,000 returns. The Home Secretary acknowledged publicly that certain crime types disproportionately impact women and girls' safety and fear of victimisation (HM.Govt.,2021). The resulting strategy document, published in July 2021, became a seminal source of research for the resulting plans of the 43 police forces of England and Wales. What is particularly striking is that street-based/public place violence, as a category of VAWG, occupies under half a half page of this strategic report (HM.Govt.,2021). The data used as evidence to support the strategic responses is often aggregated, to include all reported crime in that category of offending. This aggregation removes distinctions in victimisation between public and private spaces which research argues, should be considered separately and in the wider context of the females lived experiences (Davies, 2011). Davies argues there is a need to better understand criminality against women, in the context of the often-weighted media attention towards public place violence, arguing consideration needs to be paid to fully understanding the context of gender crime in public and private realms, and that these two realms should be met with equal attention and vigor.

Her Majesties Inspectorate of Constabularies & Fire and Rescue Services (HMICFRS) recently published a report examining 30 previous inspections of the UK police forces and an audit of police action in relation to VAWG, and considered the published national and local strategies, alongside the data and

evidence in support of these strategies. The report highlighted the importance of consistent and high-quality force level information in responding to VAWG. Authors identified that there were major gaps in local and national information on VAWG, impacting on forces plans for effective oversight and accountability. They also argued strongly for an immediate prioritisation of VAWG in policing, advocating increased actions focused on prevention, victim support and offender disruption (HM. Govt,2021). The report clearly demonstrated an immediate and ongoing need to better understand the context of VAWG, including the spaces in which it occurs, and the need to utilise proper data in responding to trends and patterns of criminality across the UK.

VAWG research is currently limited, and no research has yet attempted to visually represent and map VAWG in public space as a crime classification. This is a gap this study seeks to reduce. This is important, because in better defining and understanding VAWG issues, research can provide an evidenced foundation for informed responses to gender-based crime in society.

Methodology

This chapter describes the context, variables, and approach used to answer the research questions presented above. This ensures the study is reproducible, and allows effective scrutiny of findings, internal validity, and reliability. After describing the geographic and demographic context of the research across three boroughs in South London, the details of the data sources, data management methods and presentation methods utilized are provided. The descriptors for the variables used within the study to facilitate comparisons with crime and other relevant data sets are also outlined.

Geographic Setting of Study

The boroughs of Croydon, Bromley and Sutton are set in the southeast corner of London, bordering Surrey and Kent (***Figure 2, areas in orange***). The boundaries of the three boroughs mark the extent of the South Area Basic Command Unit (BCU); this is the largest of the 12 policing command areas of the Metropolitan Police. From this point, the term BCU will represent the geographic boundary of the area of this study.

Fig. 2*: 32 Boroughs of London, shaded to highlight 12 Police Basic Command Units (BCU).*

The BCU has a resident population of 929,022 (mid-2020 estimate); 478,850 (51.5%) of these residents are female (HM. Govt., 2020).

Figure 3 below, drawn from the 2020 HM Government population data, summarises the age of females in the South Area BCU; this data will be used to analyse victimisation rates and add context to findings.
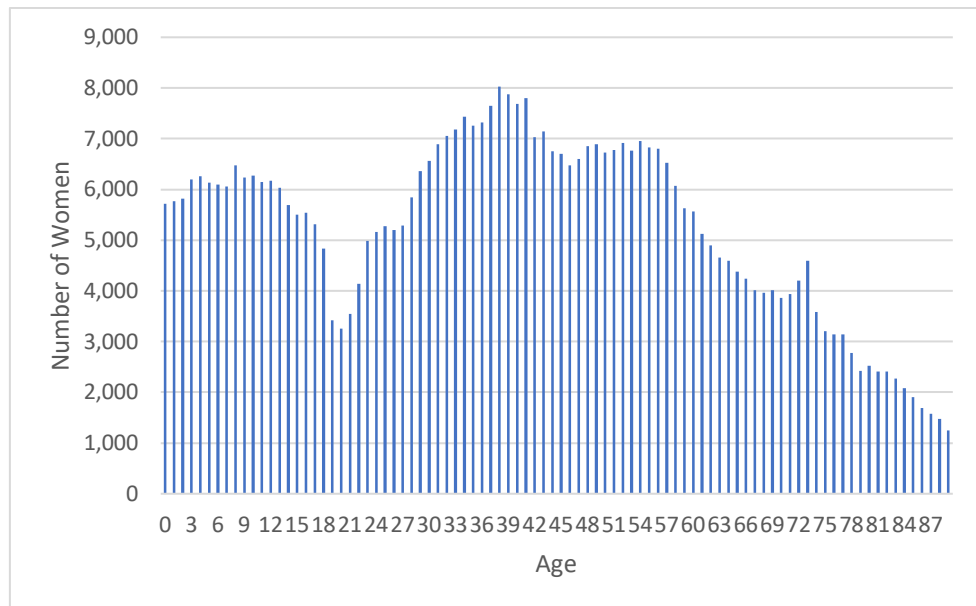
Fig. 3: *Female Age Profile of South Area BCU*.

Whilst the population of the BCU is rising by an estimated 3,600 people per year, excluding immigration, there is a noticeably lower proportion of females between 12 and 23 than one might expect. The Ministry of Housing Communities and Local Government published an index of social deprivation, mapping each Lower Super Output Areas (LSOA) across the UK (MHCLG, 2019). London features heavily as having some of the country's highest areas of deprivation. Two of these maps, overall reported crime (*Figure 4*) and living domains (*Figure 5*) are shown below. The areas of higher deprivation within the BCU also reflect the highest areas of population density. This centralization of crime towards areas of higher population is unsurprising. Research identifies that increased

population movements daily, make monitoring or guardianship problematic and therefore crime is more likely to occur (Brantingham & Brantingham, 1991).
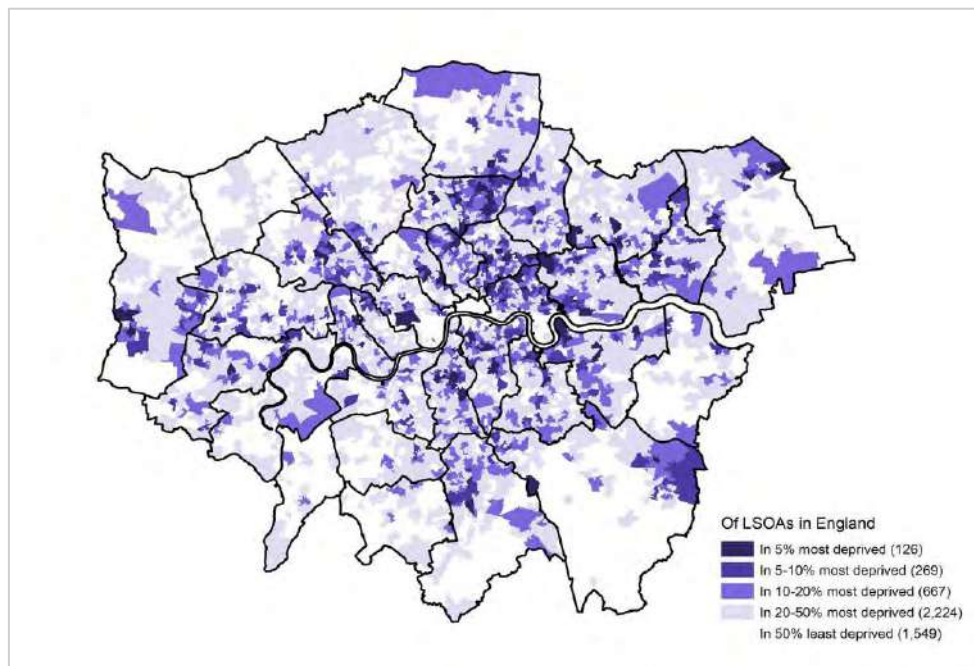
Fig. 4: Overall Reported Crime, 2019 across LSOAs in London (HM.Govt.,2019).
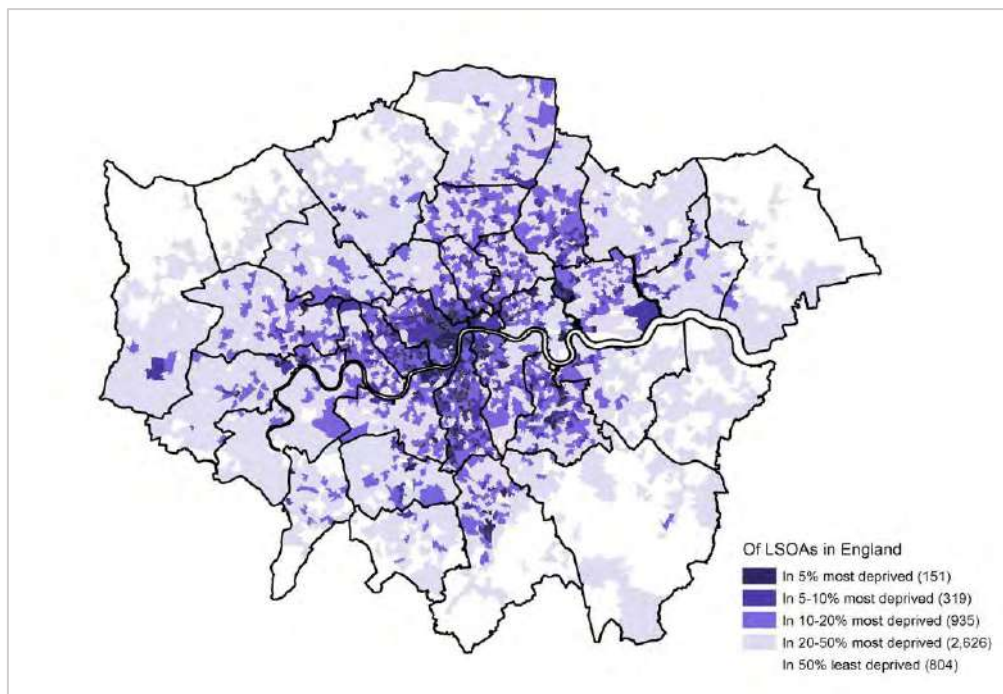
Fig. 5: Living Environment Domain Deprivation. LSOA across London, UK. (HM.Govt,2019)

Data

This study utilises historic crime reporting information drawn from the Metropolitan Police Crime Reporting Information System (CRIS). To obtain the dataset to be analysed, relevant crime reports held on CRIS were identified by employing specific search parameters. The first of these parameters was date; a date range of January 2016 to January 2020 was chosen for this study to ensure a dataset of sufficient size for meaningful analysis was identified; this 4-year period was chosen as sufficient to provide a suitable data set without having to consider changes in sexual offences legislation prior to 2016. The date range was also chosen to avoid the COVID pandemic period; the pandemic had a dramatic effect on reported crime and in particular, public place populations during lockdown periods. Including data from this period would have distorted the findings of the study significantly and was therefore excluded. A geographic search parameter was set as the boundaries of the three boroughs of Sutton, Croydon, and Bromley because these Boroughs represent the entire South Area BCU. The crime characteristic parameters utilized, for the initial search that was undertaken, were crime reports occurring in a public place or street, where the victim is female, the suspect male, and the suspect is unknown to the victim.

An initial search of CRIS with these parameters produced a dataset comprised of 11,794 separate entities, each representing an incident of victimisation across the BCU within the four-year period, with the relevant crime characteristics. A crime type analysis was then conducted on the dataset, whereby the data were filtered by the nature of the offence committed or incident that occurred. For example, sexual assault, robbery, or common assault. The initial search parameters utilized, returned a dataset that included offences that would not, in themselves, be seen by women as reflective of causing personal violence or the fear of such violence against them such as public order offences. Therefore, crime reports that would not necessarily impact on street-based immediate or imminent violence or the fear and anticipation of violence or harm against women and girls were excluded from the data set by crime type. The initial search of crime reports for this study was by opening code for

those offences. An opening code is the initial classification of a crime report at point of first reporting; this ensured the dataset represented the initial allegation of crime, as first reported. Allegations that were subsequently found to be non-crime incidents or that were unsubstantiated were not excluded. This cautious approach ensured that all reports, by anyone who felt a crime had been committed, were included in the dataset, and the later judgements of authorities did not diminish the impact of the incident on the victim and/or informant or the perception by them that a crime had occurred. The detailed lists of crime reports removed and retained can be found in ***table 1***. Serious offences such as rape, murder and kidnapping were included, and the significant impact of these offences on average harm scores will be discussed/accounted for if these offences feature in the study. Online offences, forgery, criminal damage, theft of and from a motor vehicle, bicycle thefts and arsons were amongst those offences excluded from the dataset. This filtered dataset was then cleansed to remove duplicates. This was done by comparing date/time, location, suspect and victim details and removing incorrect entries; for example, one offence identified was incorrectly inputted 16 times. Similarly, 48 crimes occurred outside of the BCU and were therefore excluded from the dataset (*N.B. It is not uncommon for initial responders from neighbouring areas to report an incident on the borders of a BCU, resulting in a crime report with the correct incident location but incorrect BCU report code*).

After cleansing, the dataset consisted of 5,435 entities, each representing a crime reported between, which occurred on the street or in a public place and was perpetrated by a male suspect against a female victim within the confines of the BCU.

DEFINING PUBLIC SPACE VAWG: HO CRIME CLASSIFICATIONS	
INCLUDED	EXCLUDED
Theft (Person)	Burglary (Commercial & Residential
Public Order Offences	Shoplifting
Assault (Common Assault to GBH with Intent)	Theft of/from Motor Vehicle
Homicide	Vehicle Interference
Manslaughter	Blackmail
All Sexual Offences (excluding online/social media)	Other Theft
Robbery	Criminal Damage
Kidnap	Death by Dangerous Driving
Aggravated Vehicle Taking	Aggravated Burglary
Rape	Robbery of Business Premises
Public Decency Offences	Forgery & Counterfeit Offences
Exposure	Possession of Pornographic Images
Violence (with or without injury)	Online/Cyber Offending
Threats to Cause Criminal Damage	Malicious Communications
Assault Emergency Worker	Bicycle Theft
	Arson
Attempts of Above	Attempts of Above

Table 1: Crime Inclusion, Public Place VAWG.

Variables & Data Management

Specific victim and crime characteristics were identified for analysis to provide a deeper understanding of the nature of public place/street-based violence against women and girls. These characteristics are location, age, ethnic appearance, time of the offence, and whether alcohol was a contributory factor to the commission of an offence. These variables were selected for analysis as they represent visible factors, i.e., characteristics a suspect can physically see a victim possesses, and may influence their choice of victim. Sexuality, religious belief, and disabilities (characteristics that would constitute a hate crime) can be invisible to bystanders and offenders, as such, these characteristics are not analysed in this study as they are less likely [than those included] to be a factor in the suspect's decision to offend against a victim.

Age. For this study, all **females aged above 12** have been included; this allows girls who attend secondary education in London to be included in the study. These girls often walk to school or use public transport to travel to/from places of education and may lack the immediate close guardianship of others for the first time.

Ethnicity is self-reported by the victim for the purpose of crime reports on CRIS or defined by the reporting person if this was not the victim and they were not present. There are 18 ethnic codes used by the criminal justice system for purposes of reporting and analysis (HM.Govt.,2018). These take a broad category of ethnicity and sub-divide it; for example, the broad category of "black" has sub-categories of black British, African, Caribbean and any other black background. To reflect the nature of self, police or witness reported "visible characteristics" as employed in the analysis, this study simplifies this list of 18 to the following: Afro-Caribbean, Arabian/Egyptian, Asian, Dark European, Oriental, White European and unknown/unspecified. These classifications allow the study to simplify findings and retain categories that may be visibly assumed by a third party, including offenders (e.g., whilst it may be visibly apparent that a person is white, the observer may not be able to tell if they are white British or White Irish). The study excludes reported definitions that may not be instantly visible to third parties for example black British or mixed heritage.

Frequency of offences. Temporal analysis of the dataset has also been conducted; in this study considers hour of day, day of week, and daylight or nighttime hours (*N.B. this is set automatically by CRIS, with the time between sunset and sunrise being defined as nighttime*).

Offender characteristics were also drawn down from reported crimes in the study. Any offender characteristic is as defined by the reporting person or a witness at the time of reporting, not taken from any subsequent investigative notes or custody data. Reporting persons and/or victims were asked to describe appearance including sex, age, and ethnic background alongside distinguishing features such as clothing and accents. Only males, age and ethnic appearance are subject characteristics of this research.

Finally, **alcohol as a factor within the commission of the offence is** defined as whether this is mentioned as contributory within the report. The reporting person may mention alcohol as contributory, or a reporting officer may identify alcohol as contributory to the offence. The government identifies alcohol as a prevalent factor in violent incidents between strangers (HM.Govt.,2015), and as such it is important to understand its context in this study of public place VAWG. For the purposes of this study, one of three alcohol related flags must be present within the CRIS system; namely, "alcohol consumed by the suspect", "Suspect had been drinking prior to committing the offence", and "Victim had been drinking prior to offence". The alcohol flag does not relate to the offence location being a licensed premise. The study will assume alcohol as contributory if flagged and not analyse individual flags in any findings.

All data sourced from CRIS was be extracted to Microsoft Excel, where the data will be managed and stored securely within police systems. The data relates to sensitive personal information; relevant permissions were sought from the data controller and the thesis was considered and accepted by the Metropolitan Police Ethics Committee.

Location. When crime is reported, the address search allows for automatic location finding. Latitude and longitude are added whenever an address is entered. Where the address is added by street intersection rather than house number and postcode, it is this intersection that forms the position set. This latitude and longitude position allows mapping on GIS software systems.

Data Mapping

All reported crimes and their exact locations were mapped to explore possible concentrations in specific areas. Mapping and presentation of data will be done using the programme ARC-GIS, a software mapping tool owned by Esri, USA (Esri Products,2019). This system is a commercially available mapping and analysis tool. The research will use kernel density mapping techniques within the ARC-GIS system. Kernel density tools calculate the density of features in each area. For example, a location may have multiple crimes and cannot be treated as a single point on a map. The three

Boroughs of Croydon, Bromley and Sutton will be segmented for the study into 27,370 unique hexagons each with sides of 60.04 metres. Each hexagon representing a total geographic area of one hectare. Analysis of each hexagon must be undertaken in the context of the publicly accessible space within that hectare and will vary in each hexagon. Presentation of mapping will use a standardized 5-scale, graduated mapping system. For example, if the highest data point in the mapping is 50, 5 equal scales of 10 will be shown on the map. Any hexagons within maps where there is a Zero rating of data recorded (i.e., no reported incidents or harm score) these will be represented as clear on mapping and therefore the underlying map will be visible, without shading or hexagons overlayed.
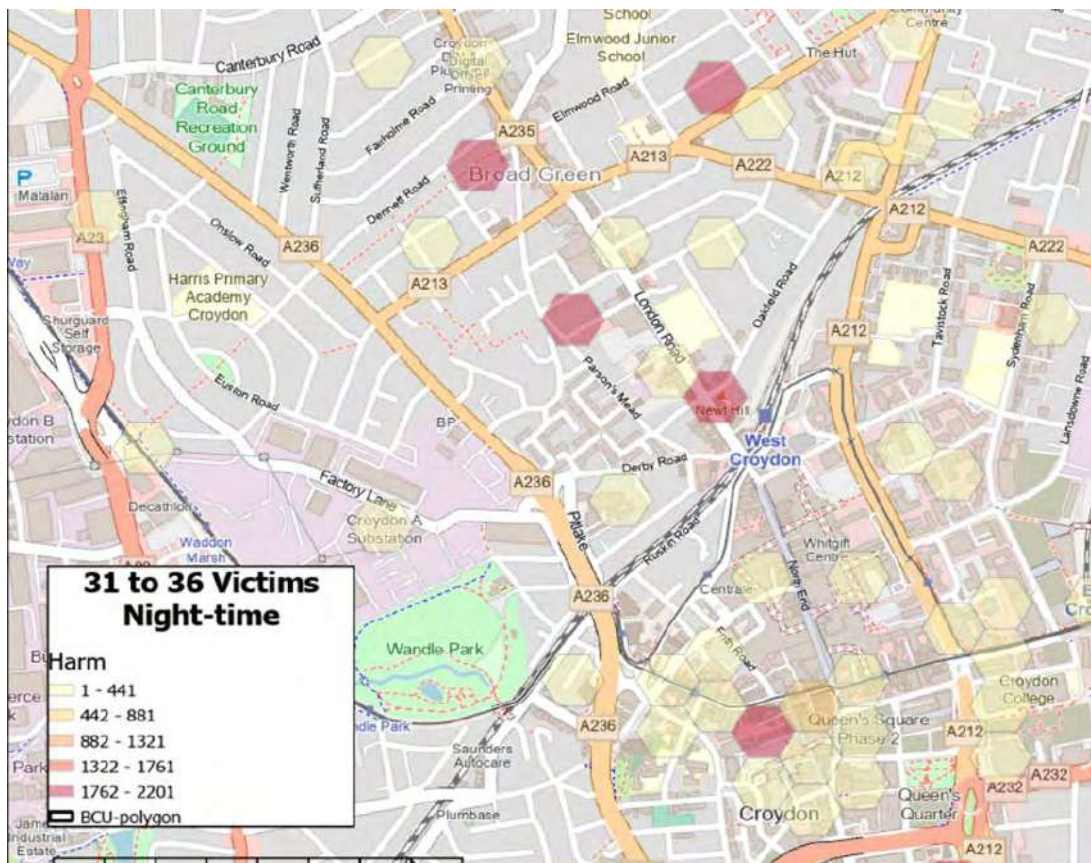
Fig. 6: Example density mapping variation.

Defining Hot and Harmspots

The need to identify the scale and intensity of a hot or harmspot, is important to an effective and efficient response to the research questions and any interpretation of findings. This study does not

define how many incidents or how much harm create a hot or harmspot. By graduating the values in mapping to 5 scales, the darker shading of the top ranked localities become more visible and will be regarded as hot or harmspots. The darkest shading of each map will represent the top 20% of incidents or harm, therefore becoming the hotspots, mapped in deep red on maps, regardless of their ultimate values (*Figure 6*). A harmspot is specific in size in this study to the mapped hexagons of 1 hectare per hot or harmspot or hexagon but the actual space the hotspot physically occupies within a hexagon will vary as stated above. Any hexagon that does not include any incidents or harm will be invisible on the map and the full underlying geography will be visible.

Defining Public Space

Defining a public space is highly dependent on a persons' contextual setting. Clearly the wilderness of Scotland is a public space but is rarely to have the associated factors suitable that contribute to a crime occurring within it. This research is set in the context of three boroughs of South London, with a resident population of almost one million people. In this study, a public space will include any place where people interact freely, pass by, socialise, or meet (Ceccato, 2020). The place will not be a private space where a person must pay or demonstrate some special membership criteria. These spaces are normally in the open air, such as parks or streets but can include station platforms but exclude spaces inside licensed premises, sports stadia, and cinemas etc. as these represent areas occupied and controlled by organisations. (Costmagna, 2019; Magnanipour, 1996).

Data Limitations

Only one in five women may report being a victim of serious sexual assault, and fewer still may report less serious offences according to crime survey data (HM Govt., 2018.B). In a study focussed almost entirely on incidents of reported crime, there may be hidden hotspots, harmspots or statistical variances in actual crime within this research, in comparison to the reported crimes, in localities as identified by CRIS recording systems.

Crime reporting is also subject to error, and by its very nature subject to scrutiny of honesty and accuracy. An inspection of the Metropolitan Police's crime recording in 2018 rated the Force as 'good' in its recording standards and processes (HM. Govt., HMICFRS, 2018). However, the report also identified under-reporting of some crimes including public order and violent crime. The inspection noted that some 80.6% of all crime is reported in a manner auditable to inspections. Of these estimated 800,000 crimes across London, 89.5% were recorded, rising to 91% for reports of sexual offences. This HMICFRS report was conducted in year three of the four years of crime data used in this study. Whilst the number of crimes unreported in the 4 years studied, within 3 of 32 Boroughs across London under examination, will be small, the findings of the HMICFRS should be noted for transparency of this research.

There is also data that is missing from the 5,435 incidents that must be acknowledged. Victims may have chosen to not provide responses to some questions asked, or those reporting may have failed to ask or document some questions. This is particularly relevant in the self-defined ethnic backgrounds of victims. Within the dataset, 948 victims show unknown or missing ethnicity data on the crime report. Analysis of data is, therefore, limited to those whose ethnicity is known.

Findings

Using the research questions as sub-headings to facilitate ease of navigation, this chapter presents the results of conducted data analysis, and mapping of that data. Data of crime and harm is considered in isolation first, and then shown with controlling variables applied to answer the questions posed in this study.

At what locations are public place crime and harm against women and girls concentrated?

Of the 27,370 unique hexagons in the study area, used for the analysis of crime data; 2,470 hexagons had an incident of public space VAWG committed within it, in the four-year period to January 2020; equating to 9% of the total study area. 91% of the total space within the three boroughs was devoid of any incidents in the studied period of time. *Figure 7* shows these locations by their hexagons.
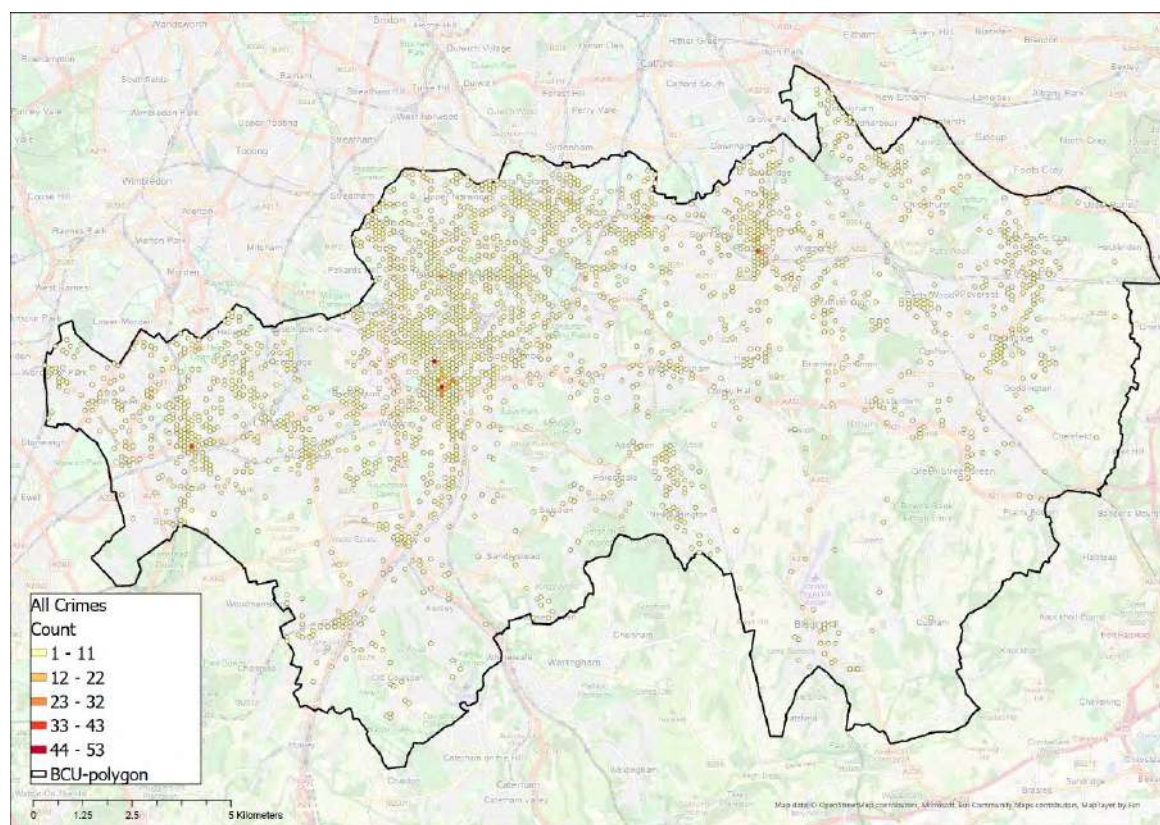
Fig. 7: Crime Concentration by Incident Count.

There are visible concentrations of incidents in the areas representing the three main urban centres of each borough, particularly in town centres (red hexagons). These centres are the main hubs for shopping, entertainment, and licensed premises. To the north of Croydon town centre, incidents are clustered in the areas of higher densities of population. This is also the case for Sutton and Bromley Boroughs, with higher concentrations of incidents occurring in the more densely populated areas. This clustering of incidents is also observable in isolated communities surrounding the urban centres. For example, Addington to the Southeast of Croydon, St. Mary's Cray and St. Paul's Cray in Bromley and Wallington in Sutton. Within the 2,470 hexagons studied, incidents are far from evenly distributed and are highly concentrated into small areas. These dense concentrations of incidents echo the research findings of previous research (Braga et al.,2011; Clarke & Eck,2007; Sherman et al.,1989; Weisburd,2015). 50% of all incidents are concentrated into 408 hexagons and 25% into just 97. Of all hexagons where any incident occurred, 25% of all crimes are concentrated into just 3.9% of these spaces.
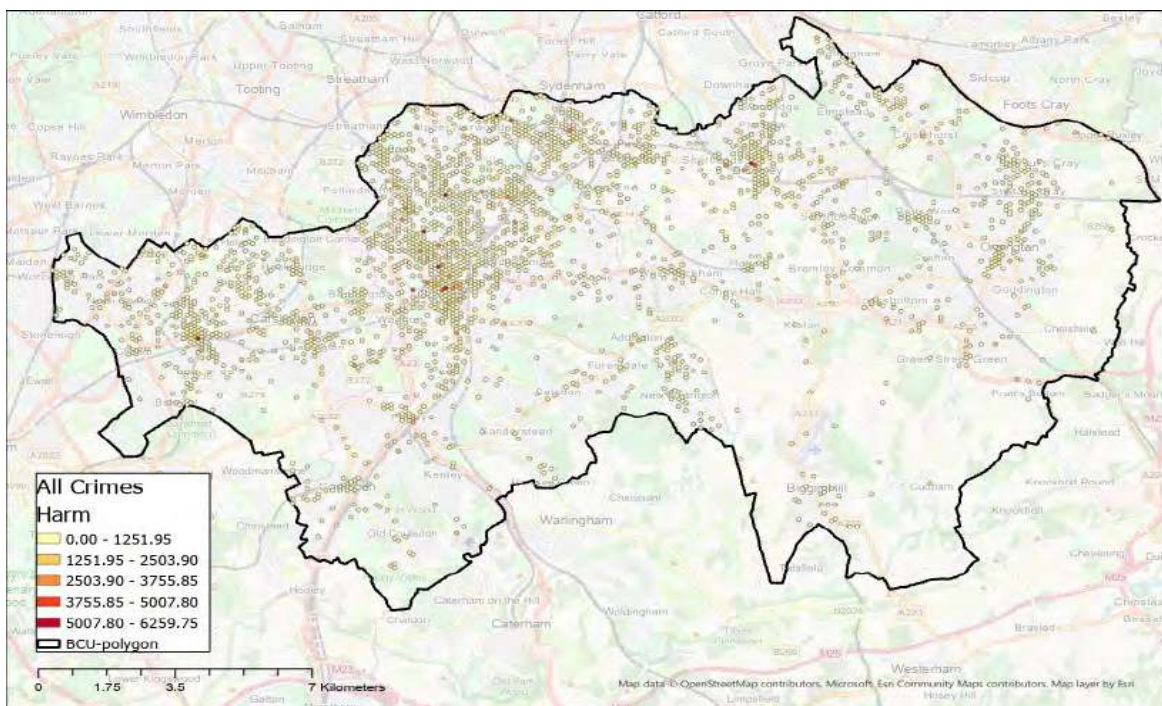
Fig. 8: Crime Concentration by accumulated (CHI) Harm.

Mapping harm using the Cambridge Harm Index appears to demonstrate hotspots move or change when harm is measured instead of volume (Etheridge,2015; Fenimore,2019; Weinborn et al.,2017). *Figure 8* shows how these harmspots are plotted geographically. Despite the three town centres being identified as areas of high harm, there is also a noticeable geographic movement of these harmspot hexagons away from the town centres and into outlying areas of the boroughs. This represents just 1.9% of all hexagons with any harm identified. 50% of harm is focussed into 134 of these hexagons. This means that half of all harm identified in this study is concentrated inside less than 1% of the total space across three boroughs (0.48%) or 5.4% of any hexagon where harm is identified.

Figures 4 and *5, displayed in the previous chapter* suggested a general trend for higher deprivation areas to be in central London but identify multiple LSOA within the geographic boundaries of the BCU, particularly North Croydon and East Bromley. These areas of higher deprivation broadly map within the concentrations of crime volume identified in *figure 7* and are even more apparent when visually compared to the concentration of harm in *figure 8.*

Are VAWG Concentrations the Same as Other Violent Crimes?

There is considerable variance in hot and harmspot locations as crime types, and in particular, harm scores of these crime types are applied to data. **Table 2** shows the top 20 ranked hotspots (i.e., counting of crimes) and harmspots (i.e., the weighting of crime by harm severity to the victims). Alongside this ranking in the table, is whether this hot/harmspot of VAWG offending features as a wide violence against person concentration. The table thus compares VAWG concentrations in space with concentrations of all violent crime classifications regardless of gender. Whilst 70% of hotspots of crime count, match ranked hotspots of all violence against person crimes, only 20% of harmspots of VAWG overlap with all violence against person concentrations of harm. When the two VAWG tables of count and harm are compared, 70% of the top crime count hotspots are not ranked at all in the top 20 for harm. Therefore, 16 of the top 20 harmspot hexagons, including those ranked first and second for all VAWG harm, are in different localities to any of the top 20 hotspots for VAWG crime count, and

14 of the crime count hotspots do not measure sufficient harm, to rank in the overall violence harm top 20 table. These findings are consistent with previous research identifying crime count and harm concentrations often differ in location (Weinborn et al.,2017). This finding is particularly important when the frequency of incidents of VAWG is considered within these hotspots. The top five hotspots for crime occurrence account for just 205 offences over the four years (1461 days, 2016 was a leap year) of study. A uniformed officer would need to spend 7.1 days on average in one of these hotspots to proactively prevent an offence. Even extending this preventative presence to the 564 offences in the top 20 hotspots, each officer could potentially prevent a crime every 2.6 days on patrol.

VAWG (Count)				VAWG (Harm)			
VAWG Hex Ranking	Hexagon	Count of VAWG Offences	VAP Hotspot? (If so, ranking shown)	VAWG Hex Ranking	Hexagon	Harm Score of VAWG Offences	VAP Hotspot? (If so, ranking shown)
1	DE-77	53	1	1	CY-61	6259.75	#N/A
2	DC-71	48	2	2	GK-42	6211.25	#N/A
3	GM-45	38	18	3	DE-51	5824.25	#N/A
4	AO-91	34	9	4	DC-71	5699	2
5	DE-51	32	8	5	AO-91	5369.75	15
6	DD-78	30	3	6	DE-77	5354	5
7	DE-79	30	5	7	GL-43	4475.5	#N/A
8	DH-76	28	10	8	DD-78	4382	1
9	DE-78	25	4	9	DW-30	4205	#N/A
10	DD-76	23	7	10	CV-78	4016	#N/A
11	FI-37	22	14	11	GD-43	3668.75	#N/A
12	EN-34	21	#N/A	12	DC-65	3655	#N/A
13	GL-43	20	#N/A	13	DX-59	3651	#N/A
14	ER-52	20	#N/A	14	EM-33	3407.25	#N/A
15	DF-78	19	17	15	DF-74	3323.75	#N/A
16	DI-76	19	6	16	DH-90	3307	#N/A
17	DD-72	19	#N/A	17	GI-44	3285	#N/A
18	GM-42	18	#N/A	18	CS-58	3285	#N/A
19	DG-76	18	15	19	CF-99	3285	#N/A
20	DF-77	17	#N/A	20	DV-52	2959.75	#N/A

Table 2: Hotspot and Harmspot Top 20 Ranking and Comparison to all Violence Against Person

Crime/Harm.

There is strong evidence for crime to concentrate and for this concentration to be evident regardless of crime type (Clarke & Eck,2007; Sherman et al.,1989; Weisburd,2015). This concentration of crime appears acutely evident in the case of public space VAWG. *Figure 9* describes this concentration in a Pareto curve. Vilfredo Pareto postulated, in 1897, a law suggesting how wealth was distributed, and that 80% of this wealth, was focussed into 20% of the wealthiest people (Dunford et al.,2014). This rule of concentration has been shown by researchers as relevant to crime, as much as wealth or land

ownership as postulated by Pareto (Clementi & Gallegati,2005; Sherman, 2007). The graph visually represents the crime harm, measured by the CCHI, against the 27,370 hexagons across the study area. As stated above, half of all crime harm is focussed on less than 0.48% of the available space, which creates an almost vertical line in the Pareto curve (*figure 8*). Even when considering the volume of incidents, represented by the dashed line in the graph, this crime concentration remains evident, given there is no harm or incidents in 91% of all hexagons mapped, for the four years of the study.
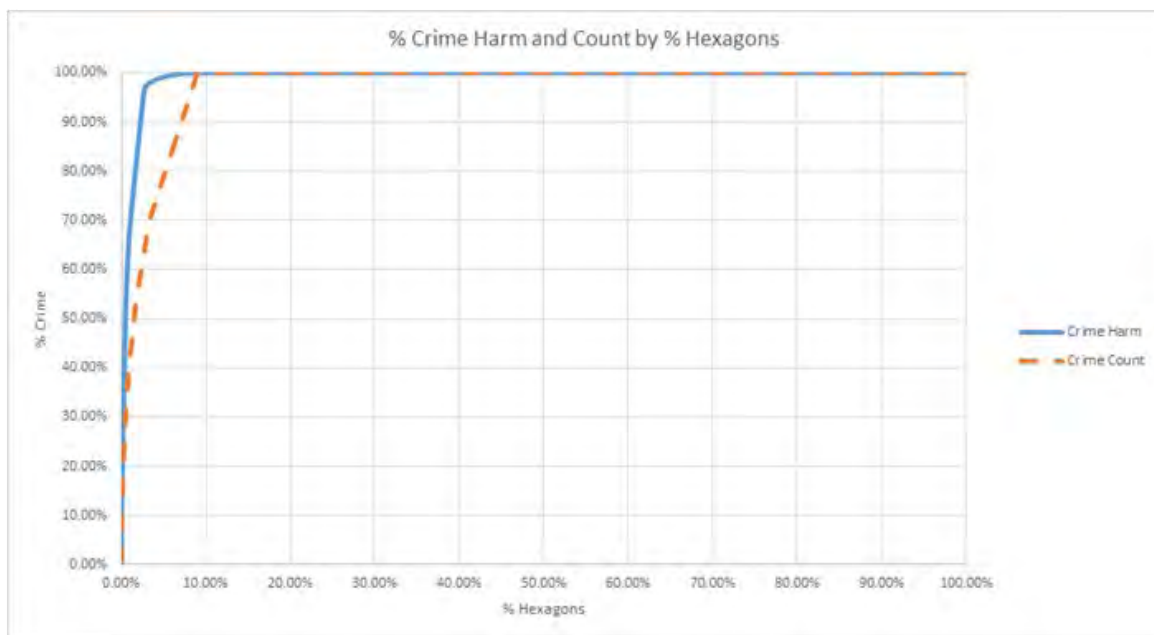
Fig. 9: Pareto Curve. Crime Harm measured against all hexagon spaces.

Even when crime and harm are measured within the hexagons where any incident occurs, the Pareto curve of concentration into space is visible. *Figure 10* shows all 2,470 hexagons of space where any incident of reported crime has occurred [x-axis] against the harm score (CHI) and volume of incidents within these spaces [y-axis]. The graph shows a more classical curve and the almost perfect visualisation of the Pareto 80/20 rule. 80% of the harm is focussed in 20% of all spaces where any harm occurs for reported public space VAWG. The crime count curve is less acute than harm in both figures. This is consistent with previous research identifying higher concentrations of harm in comparison to crime count (Weinborn et al.,2017).
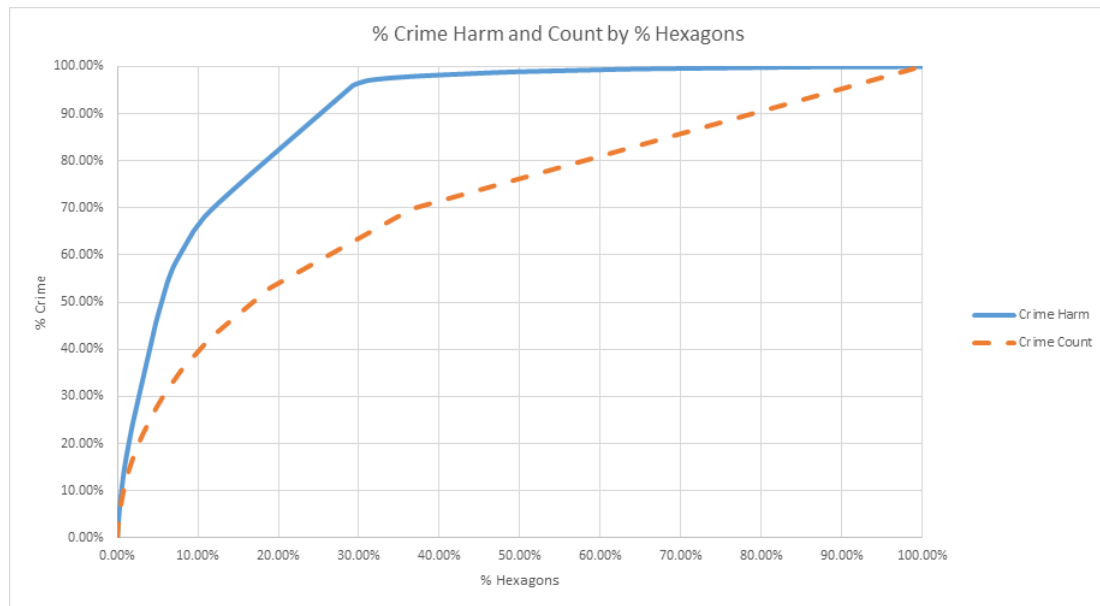
Fig. 10: *Pareto Curve of harm and incidents in hexagons where any incident occurs.*

Do these concentrations differ in space or time when controlling variables are applied?

It is acknowledged that an individual's risk of victimisation varies by the time of day and day of week (Sherman, 1992) and this risk can also be seasonal in nature (Hind & Ruperel, 2007). Victimisation is also dependent on factors surrounding the context of the victim in space as well as time (Ratcliffe, 2010). The findings of this study suggest strong similarities to this previous research. *Figure 11* shows all public space VAWG crime occurring during daylight hours (dawn to dusk) and *Figure 12* shows all crime count by night-time hours (dusk to dawn).
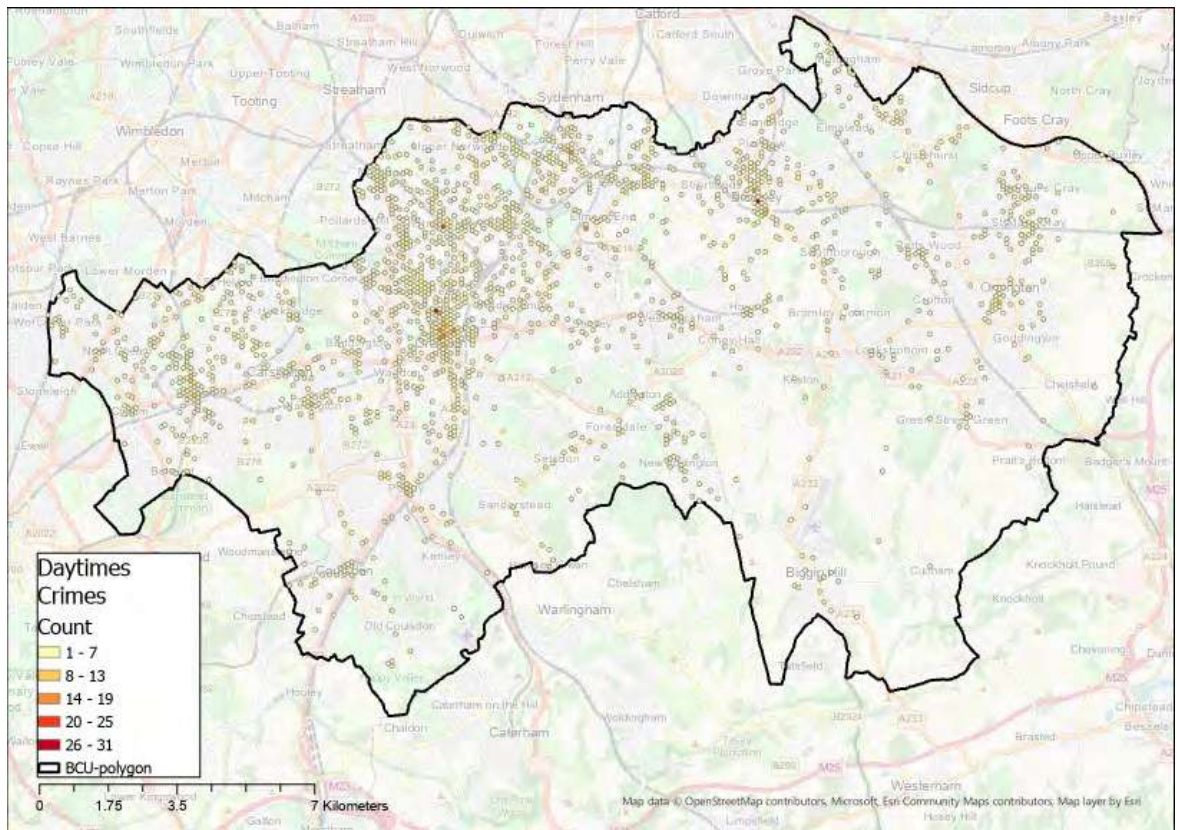
Fig.11: *Daytime Crime by Count.*
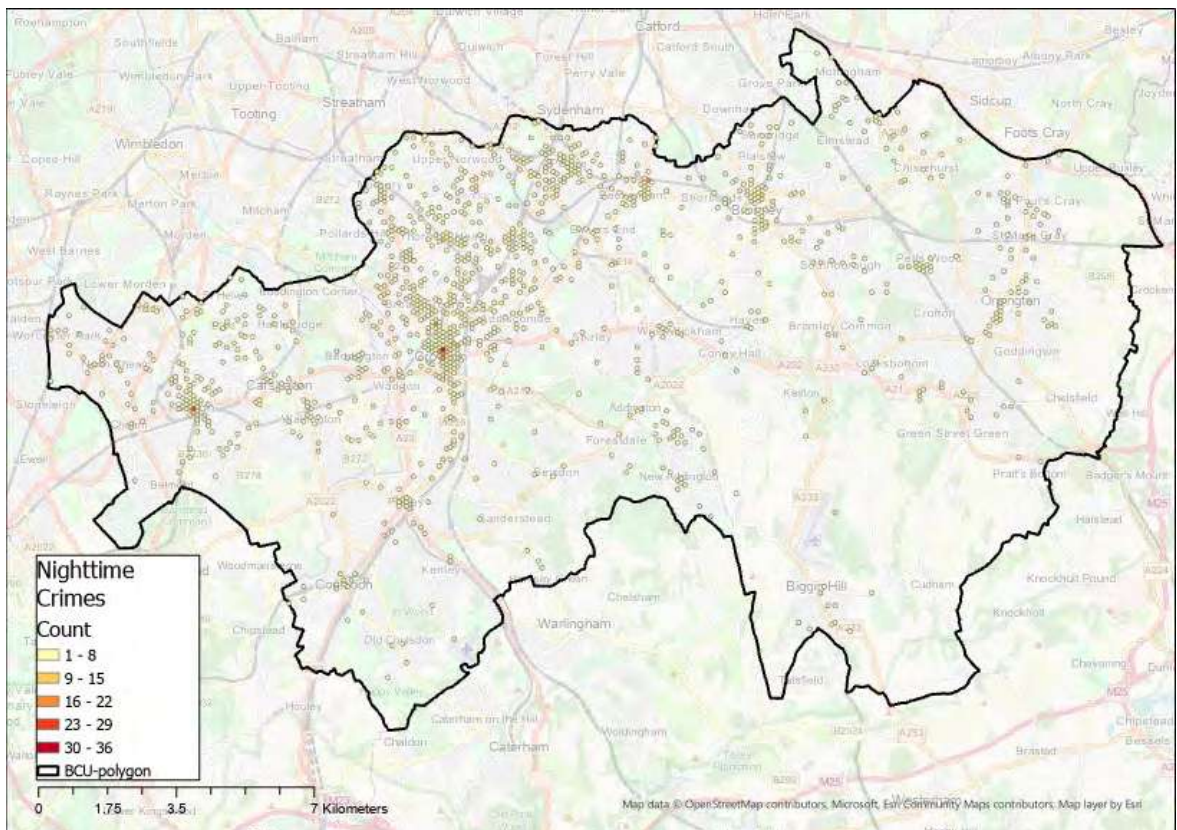
Fig.12: *Night-time Crime by Count*

What is evident from the volume of incidents is they are focussed predominantly into urban centres, and this is even more accentuated at night. However, when harm is mapped, there are different spatial profiles in concentrations of harm, away from town centres. The night-time harm of all VAWG crime is mapped in *Figure 13* demonstrating this move of harm away from the centre to the north of Croydon and highlighted in *Figure 13*, box **A**.
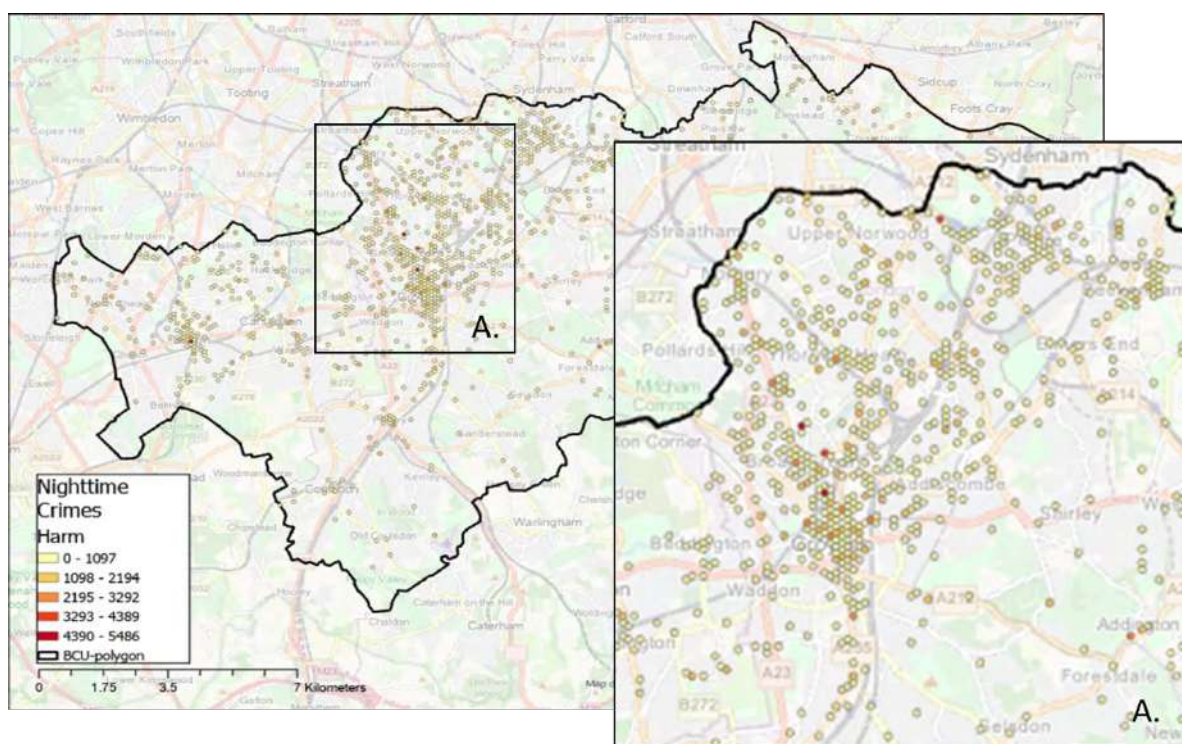
Fig.13: Night-time Harm (CCHI)

The risk of victimisation appears to change with variations in time. This phenonemnon has been previously explored and is partially explained, by adding the routine activities undertaken in these spaces, alongside findings of when crimes or harm are most likely (Brantingham & Brantingham,1991; Ratcliffe,2010). *Figure 14* identifies the temporal changes of risk of victimisation across the 24hr period. The data is split into age categories to identify any temporal differences that may be apparent. What is evident is the rise in offences across all adults in the early hours of the morning. Also visible in the demand curve is a spike in offences that occurs during the afternoon and early evening peaking at 1300 and 1500 for 25-30 age ranges and around 1500 for 12-18 ages. All ages show a decline in

overall victimisation rates from around 1800hrs, rising again for victims over 18 to age 35 from 2100hrs onwards.
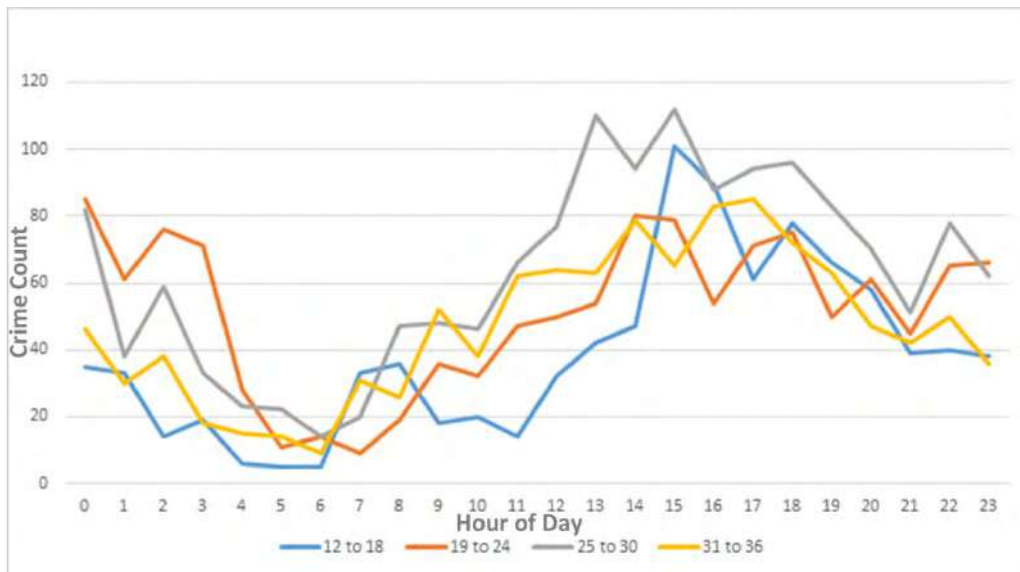
Fig.14: Temporal Changes over 24hrs by Age Banding (Offence Count).

Mapping crime harm in a similar way, over 24hrs, shows a different distribution of harm over time compared to offence incidence. ***Figure 15*** shows how harm peaks around midnight for all ages, with rises in harm through the early hours until 0500hrs for adults between 18 and 30. What is also evident is a steady rise in harm amongst those aged 12-18 rising from 0800hrs to a peak at 1800hrs. This contrasts with the lower harms suffered by those aged 18 plus in the study across that time.
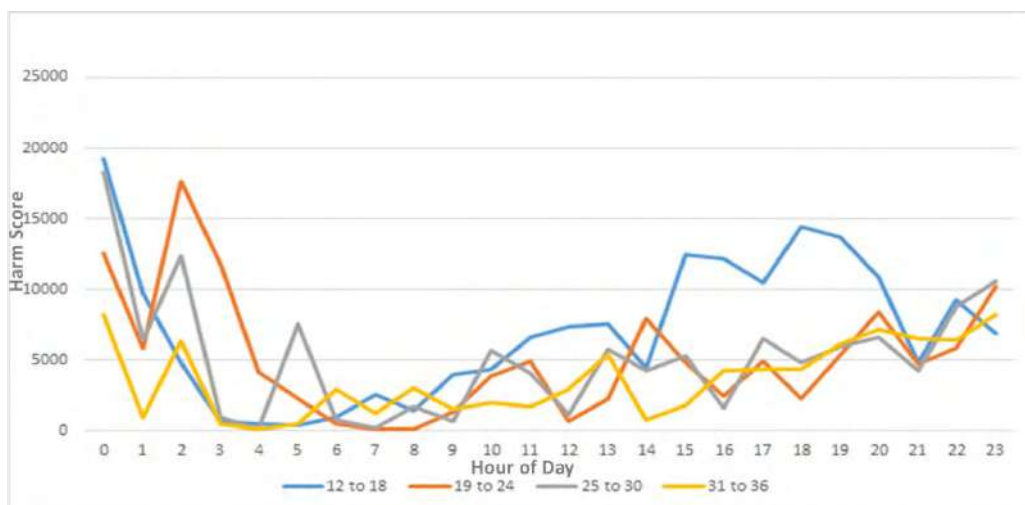
Fig.15: Temporal Change over 24hrs by Age Banding (CHI Harm).

The days of week, represented against these same age bands demonstrate similar findings again to those of previous research studies, mentioned above. What becomes evident when age banding is applied to VAWG data is that the victimisation risk changes not only by the day of the week but by age of victim considerably (*Figure 16*). The highest numbers of incidents, across most days of the week, occur to those aged between 19-30. The pattern of victimisation across all ages is broadly the same from Monday to Thursday. Friday, Saturday, and Sunday show marked difference when viewed through the lens of age bandings of victims. The greatest number of offences occurs on Friday and Saturday to those aged between 25-30, which is the case across all days apart from Sunday. There is a marked fall in crime incidents to 12–18-year-old women on Sunday, whilst those aged 19-24 show the highest numbers of overall offences over the whole weekend.
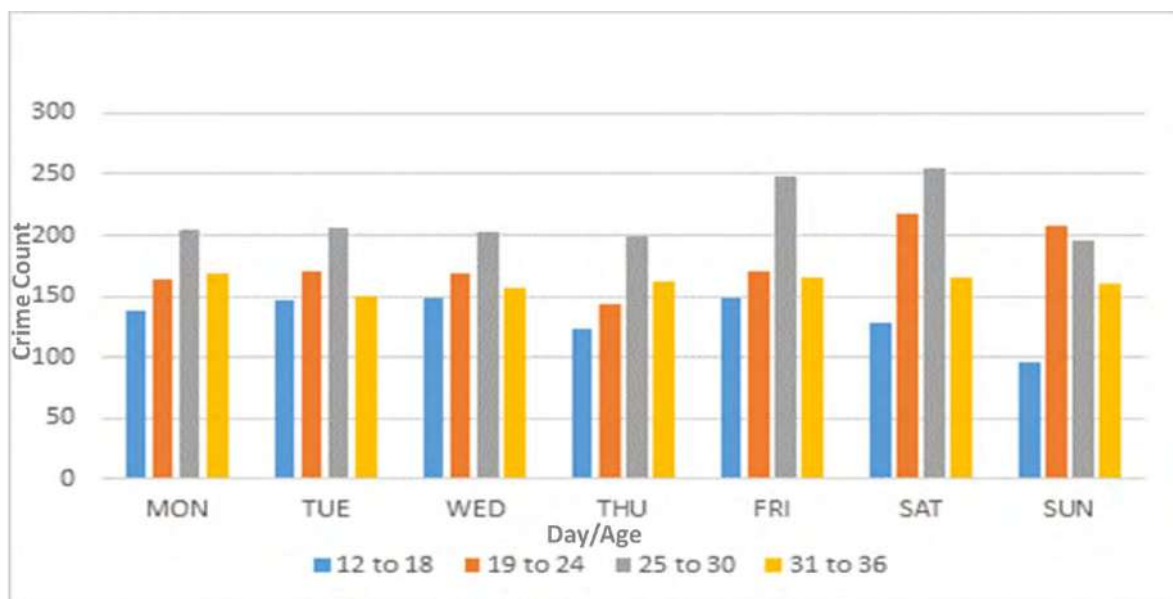
Fig.16: Total Crime Count (Age Banded) by Day of Week

Note: Figures 16 & 17 have not included those victims aged above 36. This is because the overall risk of victimisation falls sharply at age 36 and continues to do so throughout the remainder of a woman's life.
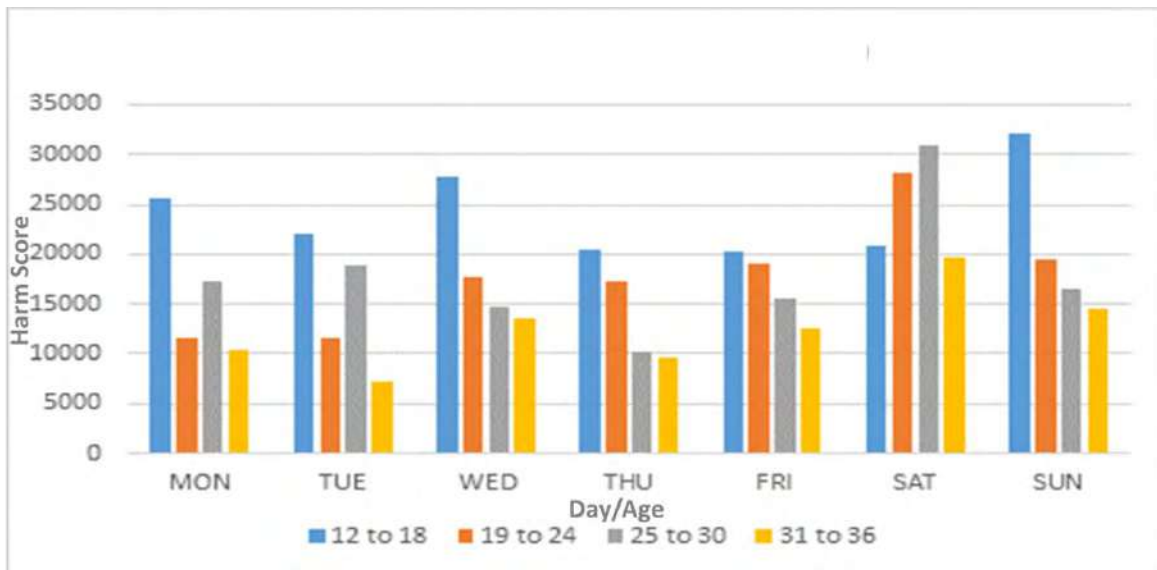
Fig.17: *Total Harm (Age Banded) by Day of Week.*

When harm is applied to days of the week, the findings are markedly different to that of count (***Figure 17***). Patterns of harm differ by age according to the day of week. Children to age 18 appear to suffer more harm on weekdays and Sundays to any other age grouping, suffering more the total harm caused to those aged from 31-36 on five days of the week. Across all seven days, the overall harm caused to 12–18-year-old women in the study is only surpassed on a Saturday, by anyone over 19 years old.

The degree of harm appears to change with season. ***Figure 18*** shows this variation as an overall harm count, according to seasonal changes and suggests the impact that alcohol may have on this seasonal variation. Three alcohol markers are used within the CRIS crime reporting system. Flags are added by the reporting person according to questions posed to witnesses or comments of a reporting officer at scene/investigating onto CRIS and identify alcohol present or used at time of commission, alcohol consumed by victim and alcohol consumed by suspect.

Of interest, only 13.85% of all harm caused in the study is shown occurring when alcohol is flagged within the crime report, either consumed by the victim or suspected to be associated with the offender having consumed it. This figure is also stable between seasons with alcohol being identified

in 11.9% of winter harm and 13.82% of summer harm overall. **Table 3** Displays the numerical values of this harm by season as displayed in the graph above it.
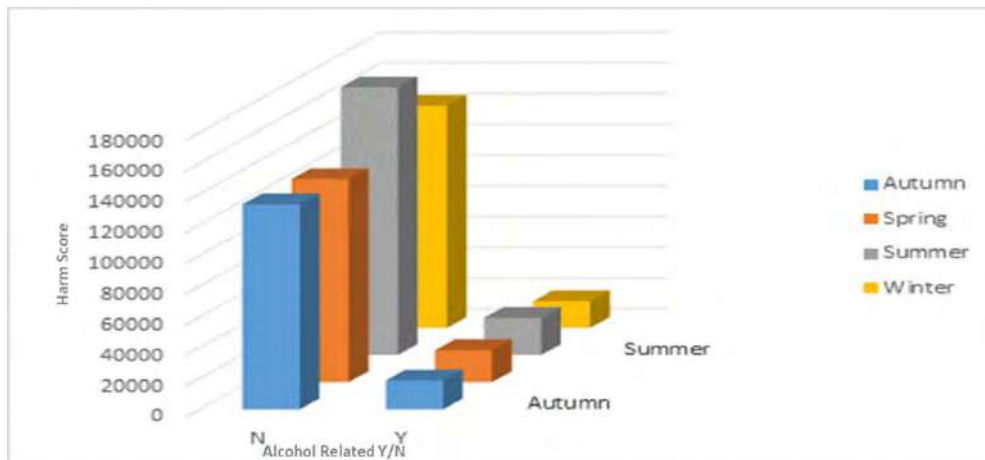
Fig.18: Harm by Season and Where Alcohol is a Factor.

Sum of Harm Score	Season				
Alcohol-related?	Autumn	Spring	Summer	Winter	Grand Total
N	133333	132049.25	174027.25	144315.75	583725.25
Y	18773.25	20802.5	24060	17206.75	80842.5
Grand Total	152106.25	152851.75	198087.25	161522.5	664567.75

*Table 3: Numerical Values of Harm by Season (see **Fig.18**).*

This seasonal increase in harm during summer months is consistent with the findings of other studies, who identify variations in violent crime offending rates, occur at the point increased numbers of people appear outside for various reasons, including that of more temperate weather, prolonged school holidays and other factors (Andresen & Malleson,2013; Hind & Ruperel,2007; Lewis & Alford,1975).

Mapping this seasonal variation **Figure 19** provides example maps for the harmspots of central and North Croydon, demonstrating how these are impacted in space as seasons change. What is evident

is that the harmspots are distributed away from town centres as summer regresses and the number of incidents reduce.
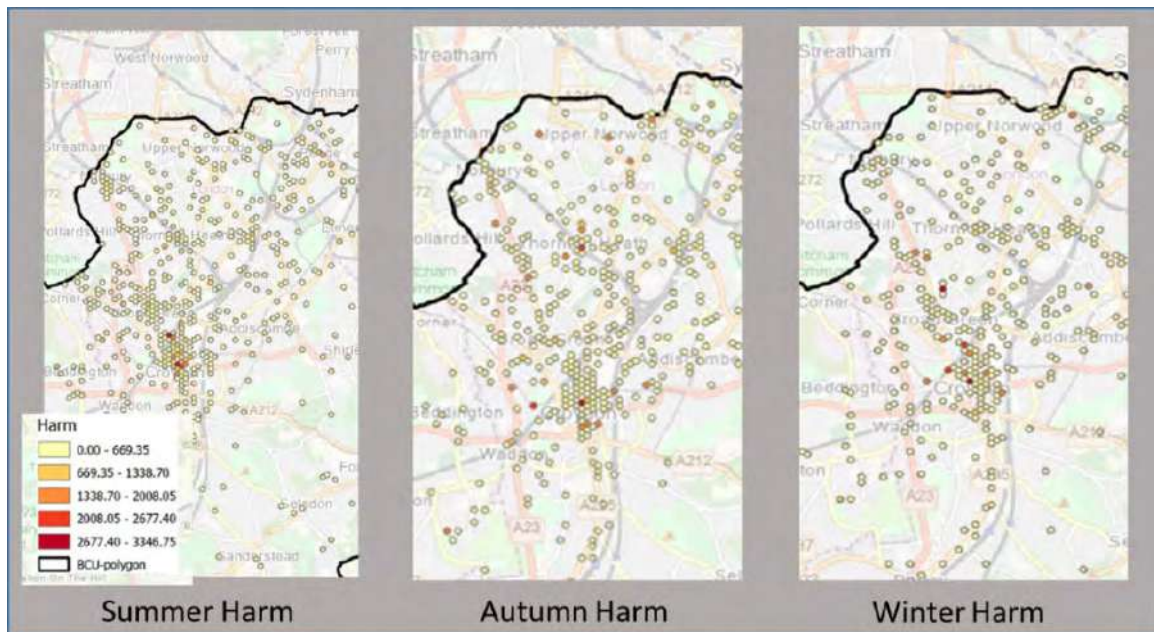
Fig.19: Seasonal Harmspot Changes. Central & North Croydon Borough.

The data shows broad similarity between years for overall count of offences. The mean offence count per year being less than 100 offences from any yearly count (N=1358.75). Overall harm shows greater variance between years, with a rise in year 2 and 3 of the study before falling in year 4. *Figure 20* demonstrates this yearly fluctuation.

Year	Harm	Count
2016	134543.8	1386
2017	182579.3	1394
2018	185450.8	1379
2019	161994	1276
Total	664567.8	5435
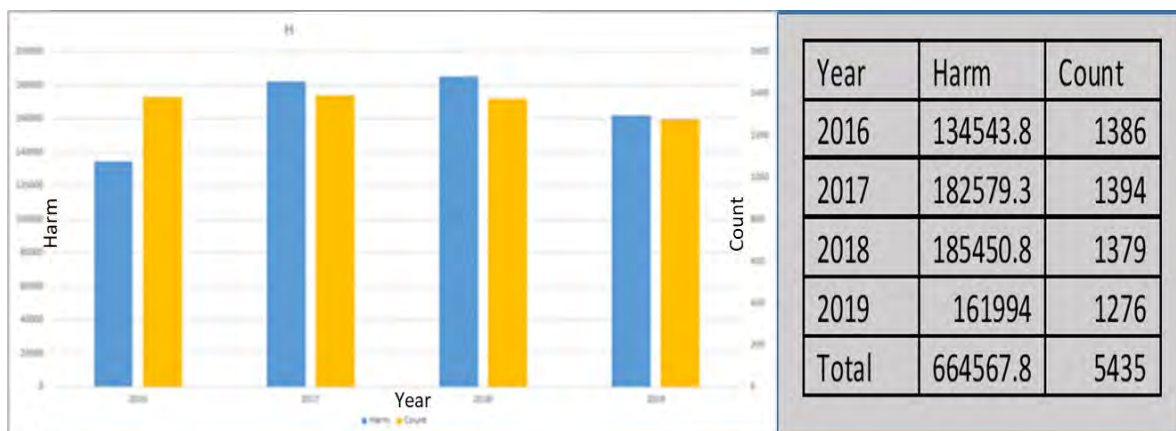
Fig.20: Crime Count and Harm. Four Year Comparison.

What is the Impact of Crime Categorization on Volume and Harm Patterns?

VAWG occurs in distinct offence categories. The categories of public order, assault with and without injury, robbery, and sexual offences account for the majority of incidents in the study. Whilst other incidents occur such as aggravated vehicle taking, and racially motivated abuse against women, these are rare. *Figure 21* graphically represents the number of these incidents and the harm that they cause. The line graph overlaid on this chart, demonstrates the disproportionate harm caused by some offence types in public space VAWG. For example, the harm score rises noticeably in comparison to the number of rape incidents in the study.

The personal trauma attached to these offences is revealed, to a large extent, within the sentencing guidelines and as such is reflected within the scores of the Cambridge Harm Index (Sherman et al.,2016). This severity of harm is shown in the diagram with rape, robbery, violence with injury and other sexual offences. The largest number of incidents of VAWG are associated with violence without injury and public order offences such as causing harassment alarm or distress. This finding is consistent with the body of evidence that suggests a cumulative impact of ongoing trauma caused by micro-aggressions against women in public (Di Leanardo, 1981; Fairchild & Rudman, 2008; Fileborn, 2013; Johnson & Bennett,2015).
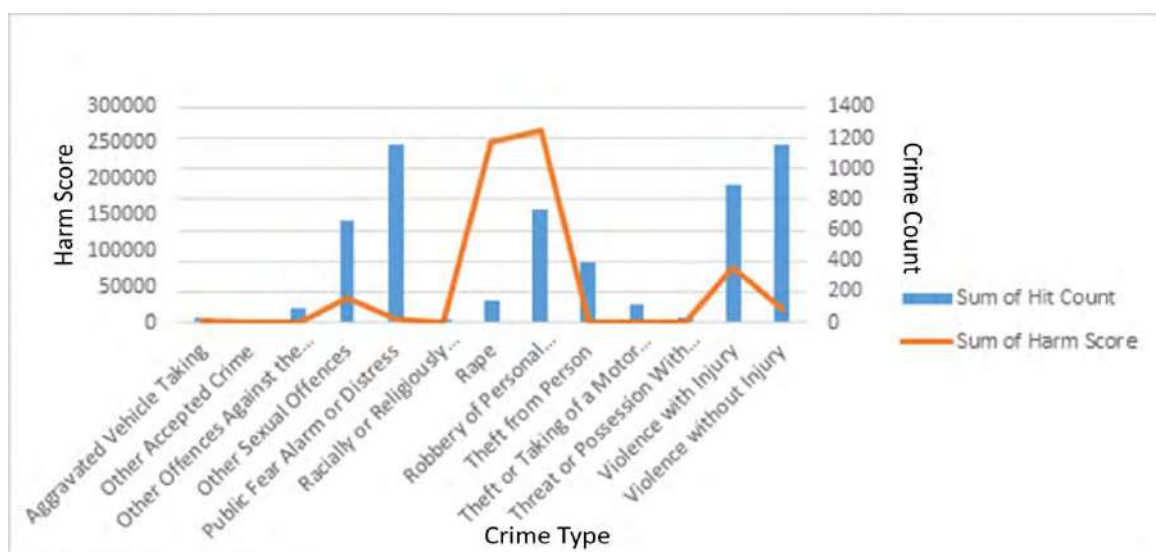
Fig.21: Offence Categories Measured Against crime count and Harm.

Small numbers of crime types account for most of the total harm experienced by victimisation of women and girls in public space. *Figure 22* shows the harm of VAWG across broad offence categories. The three offence categories of violence against the person, sexual offences, and robbery accounting for 99% of all harm to women and girls in public places.
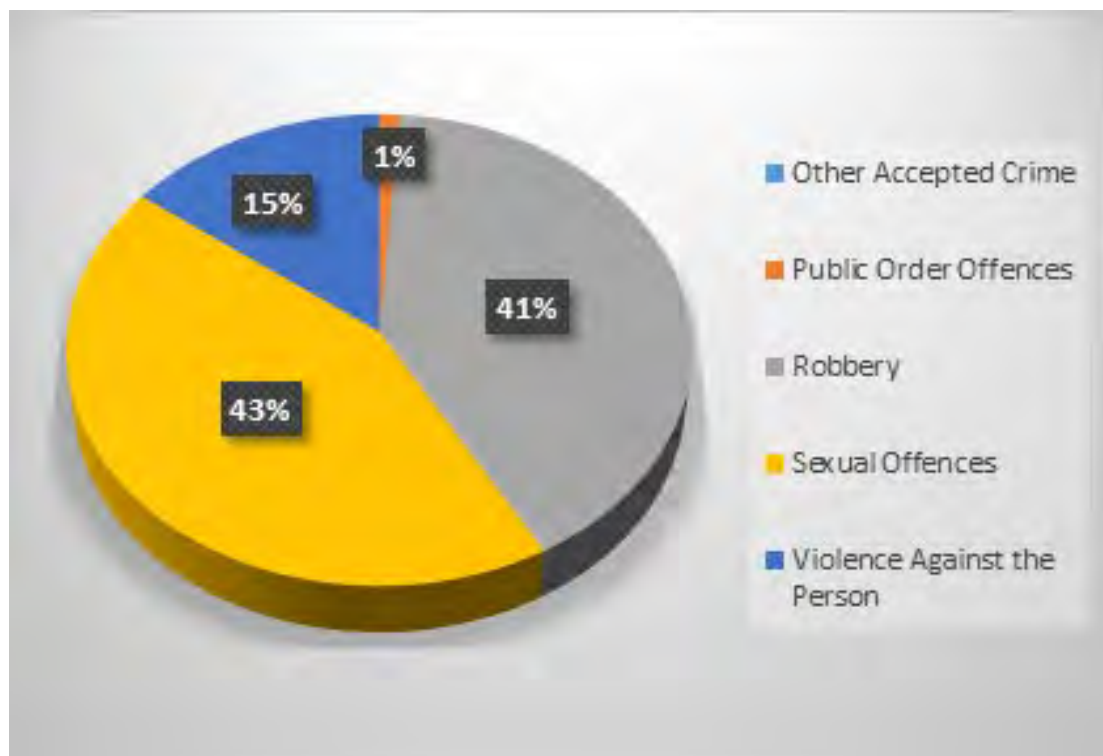
Fig.22: Harm by Main Offence Category Open Space VAWG using CCHI.

Does the geo-spatial and temporal harm or volume of crimes against women differ by age, ethnicity, or another known victim characteristic in public places?

As has been demonstrated above the victimisation of women appears highly dependent on age. There is a clear rise in the number of overall offences against women as the age of the female increases, to the age of 30. After that time the likelihood of being a victim of an offence reduces (*Figure 23*).
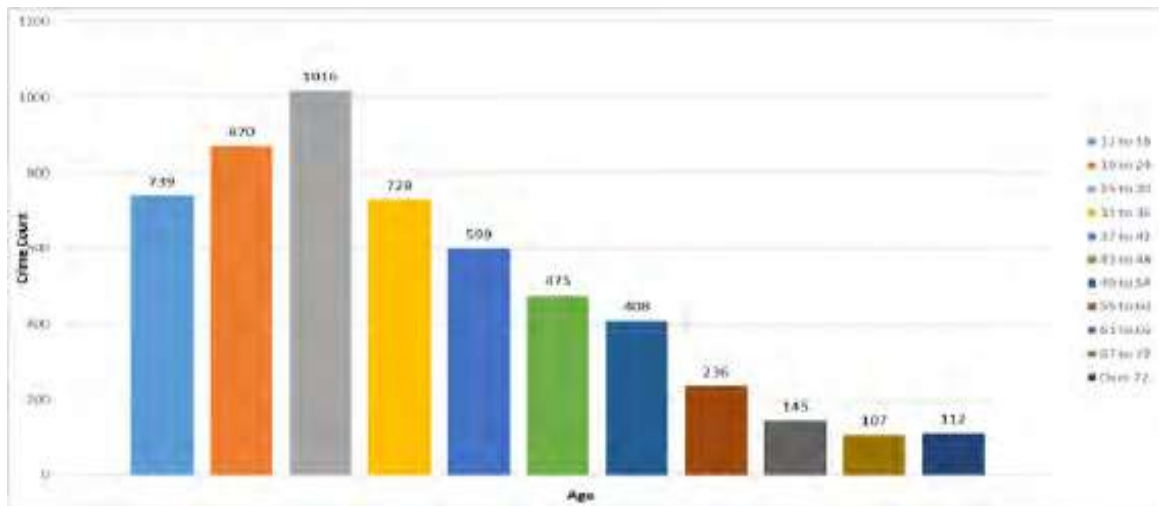
Fig.23: Total Crime (Count) by Victim Age Banding.

In comparing harm, **Figure 24** shows that the harm caused to these victims is greatest to the age of 18 before falling as age increases.
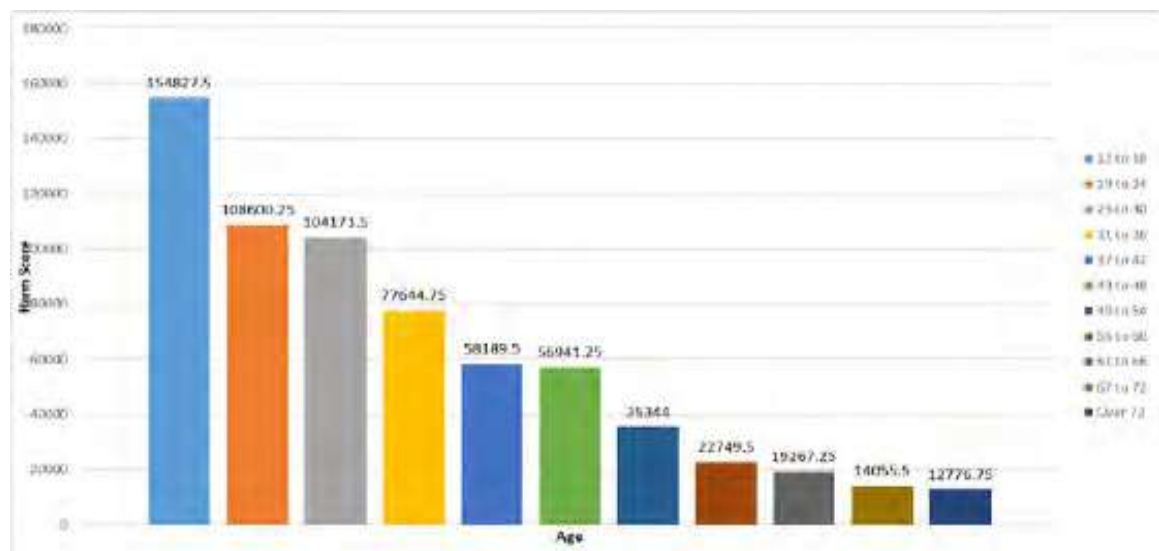
Fig.24: Total Crime (Harm) by Age Banding.

Table 4 shows the relative harm and offence count by age and measures this victimisation against the static population of the three Boroughs, according to estimated female population of women and girls, over the age of 12 within the study area. The population data shown is for the residential population and may not represent a true picture of street populations of women, which would include commuters for example. Notwithstanding this limitation, the data suggests that the risk of being a victim in the

three boroughs is less for those aged 12-18 than older residents to age 30. 1.89% of the 2020 residential population of women aged 12-18 may have been victimized over 4 years, compared to 3.55% of those aged 19-24 and 2.94% of those aged 25-30. The relative risk of victimisation therefore appears to increase with age to 30, even when accounting for estimated population sizes in those age groups. When considering the harm suffered by this victimisation however, 23.3% of all harm incurred to victims of public place VAWG is caused to those aged 12-18.

Static Population Age banding and Victimization of VAWG in Public Places							
Age Banding	Crime Count	% of Crime Count	Crime Harm	% of Crime Harm	Est. Resident Pop. (2020)	% of Population	% of Population Victimized
12 to 18 (7 yrs)	739	13.60%	154827.5	23.30%	39088	9.64%	1.89%
19 to 24	870	16.01%	108600.25	16.34%	24508	6.04%	3.55%
25 to 30	1016	18.69%	104171.5	15.68%	34528	8.51%	2.94%
31 to 36	728	13.39%	77644.75	11.68%	43143	10.63%	1.69%
37 to 42	599	11.02%	58189.5	8.76%	46055	11.35%	1.30%
43 to 48	475	8.74%	56941.25	8.57%	40528	9.99%	1.17%
49 to 54	408	7.51%	35344	5.32%	41034	10.11%	0.99%
55 to 60	236	4.34%	22749.5	3.42%	37432	9.23%	0.63%
61 to 66	145	2.67%	19267.25	2.90%	27903	6.88%	0.52%
67 to 72	107	1.97%	14055.5	2.11%	23987	5.91%	0.45%
Over 72	112	2.06%	12776.75	1.92%	47474	11.70%	0.24%
Total	5435	100.00%	664567.75	100.00%	405680	100.00%	1.34%

Table 4: *Victimisation risk/harm by age banding relative to residential population estimates. Source of population data (HM. Govt,2020).*

At the opposite end of the victimisation scale. Risk of victimisation and therefore any harm being caused, falls sharply once women are aged over 43. Of all women in the study area, over 12 years old, those aged over 43 represent 53.82% of the population but only 27.29% of all the victims in the study over 4 years. Once over 72 the relative risk of harm reduces even further. The 112 incidents recorded against this age group accounted for 1.92% of the total harm caused. However, this age group account for 11.7% of the total female population, aged over 12, in the study area.

In categorizing ages for this study, a conscious decision to create an age banding of 12-18 was made to encompass girls of secondary school age. In doing so the data may have been affected by those aged 18 who are adults, able to partake in the night-time economy, drink alcohol legally, and have a greater independence in law than those under the age of 18. **Table 5** identifies the impact of including those aged 18 on the overall crime count and harm caused to those under 18 and classified as children in law. Whilst the overall crime count shows that those aged 18 account for 174 crimes in the overall study, children under 18 account for 79.4% of the overall count of incidents in this age banding.

Age	Count	%		Age	Harm	%
	174	**20.6%**		17	35254.25	21.4%
17	142	16.8%		16	26249.5	16.0%
16	126	14.9%		15	24733.75	15.0%
14	116	13.7%			**22255.5**	**13.5%**
15	105	12.4%		14	22201.75	13.5%
13	96	11.3%		13	16975.25	10.3%
12	87	10.3%		12	16802.25	10.2%
Total	846	100.0%		Total	164472.3	100.0%

Table 5: Breakdown of Crime Count and Harm for Ages 12-18.

Significant to this research, girls aged 14 suffer the same proportion of harm to adults aged 18-years of age in public place VAWG, despite a victimisation rate 33% less that than 18-year-olds. Children aged 15, 16 and 17 suffered, on average, more harm per incident, than those aged 18 years old in this age band.

Another notable finding in this study is that 67% of all harm and 61.79% of all occurrences of VAWG in public places occurred to women under 37 years of age.

The evidence within this study suggests that whilst there are hotspots and harmspots that are shared across ages, there are also distinct outlier localities of harm and incidents that are age specific. The data identifies multiple hotspots for victimisation common across age bandings, particularly at night. An example is shown in **Figure 25**, which identifies an area of Croydon town centre as a hotspot for

multiple ages. The area shown is one of the epicentres of the borough's licensed premises and night-time economy as well as being a focus for shopping and other activities. *Figure 26* identifies one of the many hot and harmspot variances that appear, specific to age bandings. This example appears only to the age banding of 12-18 as a harmspot and is situated in a residential area, away from the town centre but within an area of multiple walkways and footpaths, close to a public park.

*Fig.25: Example of Hotspots for VAWG, Across Multiple Age Bandings.*

Fig.26: Example Age Specific Harmspot, Age 12-18 Only.

In comparing hotspots and harmspots according to age, the findings of this study support research that shows the risk of victimisation changes according to the context of the victim in that space (Ratcliffe,2010), and that there is variance in space between hotspots and harmspots (Fenimore,2019).

It is also apparent from findings that there is variance between ages in harm and space that deserve specific attention. ***Figure 27*** shows these differing harmspots by age of victim, by overlaying markers onto identified concentrations of harm. Patterns emerge that vary between age bandings. This study's findings echo those of previous research in identifying increased harm for younger victims and provides evidence of spatial variation of that harm by age in addition to its proportions in localities (Dudfield et al.,2017).
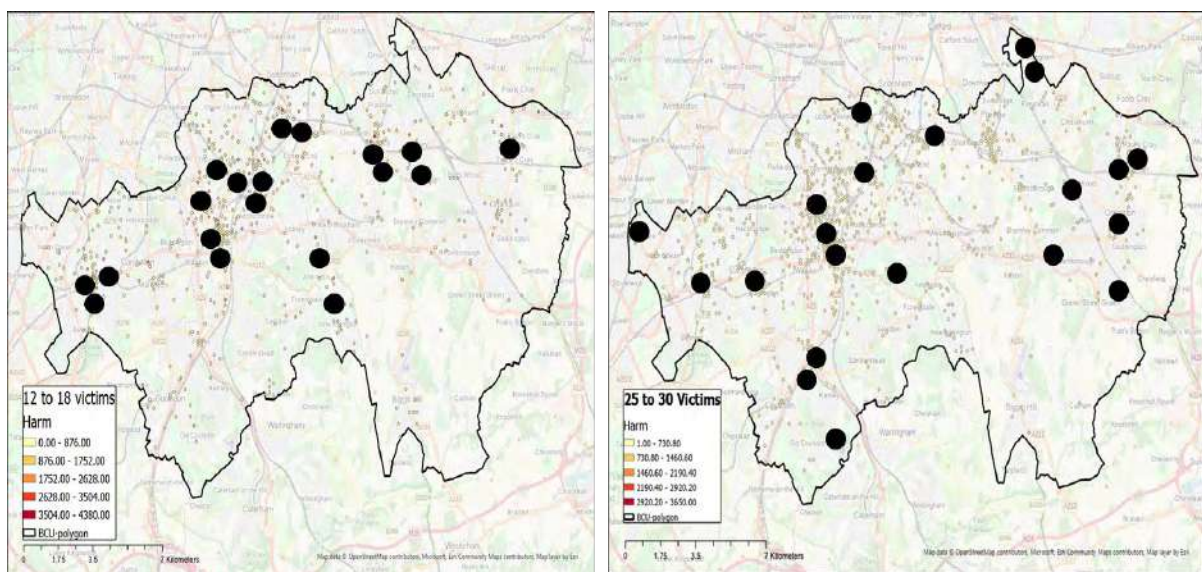
Fig.27: *Spatial Variation in Harm between 12-18 and 25-30 Age Bandings. (Note: marker dots are not representative of harmspot size)*

Ethnicity

NB. *When considering victimisation data against self-defined ethnicity in the recorded crime, it is important to highlight the large number of omissions within the crime recording system, that may impact the validity of any findings. These omissions are entered as unknown for the purposes of analysis (N=948, 17.44%).*

The data in ***table 6*** shows the self-defined ethnicity of victims. 55.46% of victims of public place violence against women are white Europeans (N=3014). This cohort of white victims account for 53.88% of all victim harm. Afro-Caribbean victims account for 15.8% (N=825) of victimisation and

19.47% of harm. Asian women are victimized in 8.02% (N=436) of all occurrences and suffer 13.03% of all harm. The findings demonstrate that whilst white European women are 3.6 times more likely than Afro-Caribbean women, and 6.9 times more likely than Asian women to be a victim in the study, the harm likely to be caused to minority victims is greater by proportion. Taking an average of the harm score of victimisation by ethnic group, Asian women suffer 67% more harm than white European women in public space VAWG incidents. Afro-Caribbean women also suffer more harm than their white counterparts, with an average harm score 32% above that of white Europeans. Dark European and Arabian women appear to suffer the least harm, comparing this against all recorded crime. These two ethnic groups suffer less than the average overall harm per victim and less than any other identified ethnic group in the study.

Ethnicity and Harm. VAWG in Open Spaces					
Ethnicity	Number of Victims	% of Victims	Sum of Harm	% of Harm	Average Harm Score Per Person
Afro Carribean	825	15.18%	129422	19.47%	156.88
Arabian	23	0.42%	2279	0.34%	99.09
Asian	436	8.02%	86583.75	13.03%	198.59
Dark European	129	2.37%	10445	1.57%	80.97
Oriental	60	1.10%	6153.5	0.93%	102.56
White European	3014	55.46%	358066.5	53.88%	118.80
Unknown/Unclassified	948	17.44%	71618	10.78%	75.55
All Victims	5435	100.00%	664567.75	100.00%	122.28

Table 6: *Self Defined Ethnicity of Victim.*

Perpetrators of Public Space VAWG.

Figure 28 identifies the offenders apparent age, as described by the victim at the point of reporting. Given the data set used excludes all offenders known to the victim, it is unsurprising that this information is vague, and that most crimes recorded show as unknown, the age of the offender. What is apparent however is the clear, five-year banding trend on the ages of suspects described. From age 15 there are identified peaks in the graph every 5 years to age 60. This generalization of age, where

victims identify a factor of 5 or 10 to round up or down estimated offender ages, becomes even more pronounced as the suspects apparent age increases, with a marked difference identifiable for those victims who believe suspects are 40 compared to ages either side of that mark.
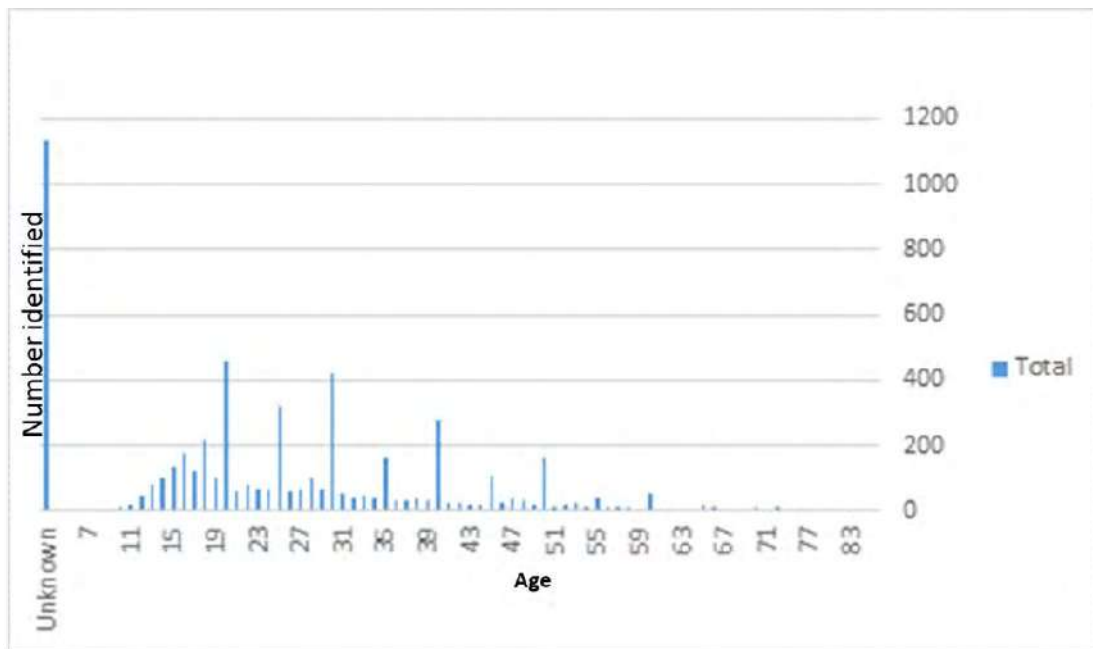
Fig.28: *Victim Estimated Offender Ages.*

When these offender age descriptions are mapped into the age bandings used to analyse victim characteristics, a pattern emerges. ***Figure 29*** shows the suspect age banding by crime count and harm caused. It clearly shows both volume and harm are concentrated in younger offenders and that the majority of offences committed and harm cause is perpetrated by offenders under age 30. The highest number of offences, and most harm caused, is by offenders aged 18 or under.
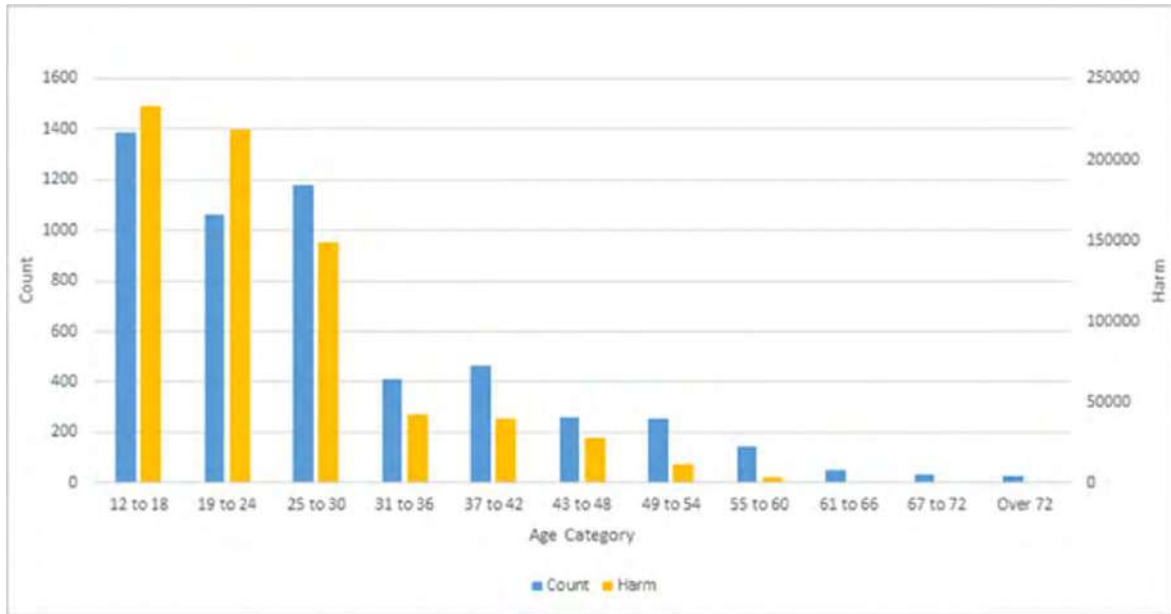
Fig.29: *Suspect Age Descriptions Banded to Identify Crime Count and Harm Trends.*

Table 7 shows 12-18 aged offenders (estimated age by victim) overall crime counts and harm caused. The data shows that whilst 18-year-old offenders account for marginally more crime incidents than those under 18, more harm per incident is caused by offenders aged 16. Even accounting for victim error in age classification, there is an interesting similarity between the age of victims, those identified by them as responsible, and the high harm and volumes attributed to children in this study.

Age	Count	%		Age	Harm	%
18	318	23.0%		16	67555	28.9%
16	278	20.1%		18	51621.25	22.1%
15	224	16.2%		15	42189.5	18.1%
17	187	13.5%		17	36873.75	15.8%
14	160	11.6%		14	18971	8.1%
13	140	10.1%		13	13286	5.7%
12	78	5.6%		12	3108.75	1.3%
Total	1385	100.0%		Total	233605.3	100.0%

Table 7: *Count/Harm Variation between Offenders Aged 12-18.*

Ethnicity of offenders when described by the victim is highest within two categories, which appear broadly equal in volume of offences committed over the 4-year study, namely White European and Afro-Caribbean offenders. It is interesting to note in ***figure 30***, the slight variance in volume ranking between these two categories changes between day and night offending albeit only marginally. What is notable in the findings, is the distinct difference in the harm caused by offenders of different ethnicity.
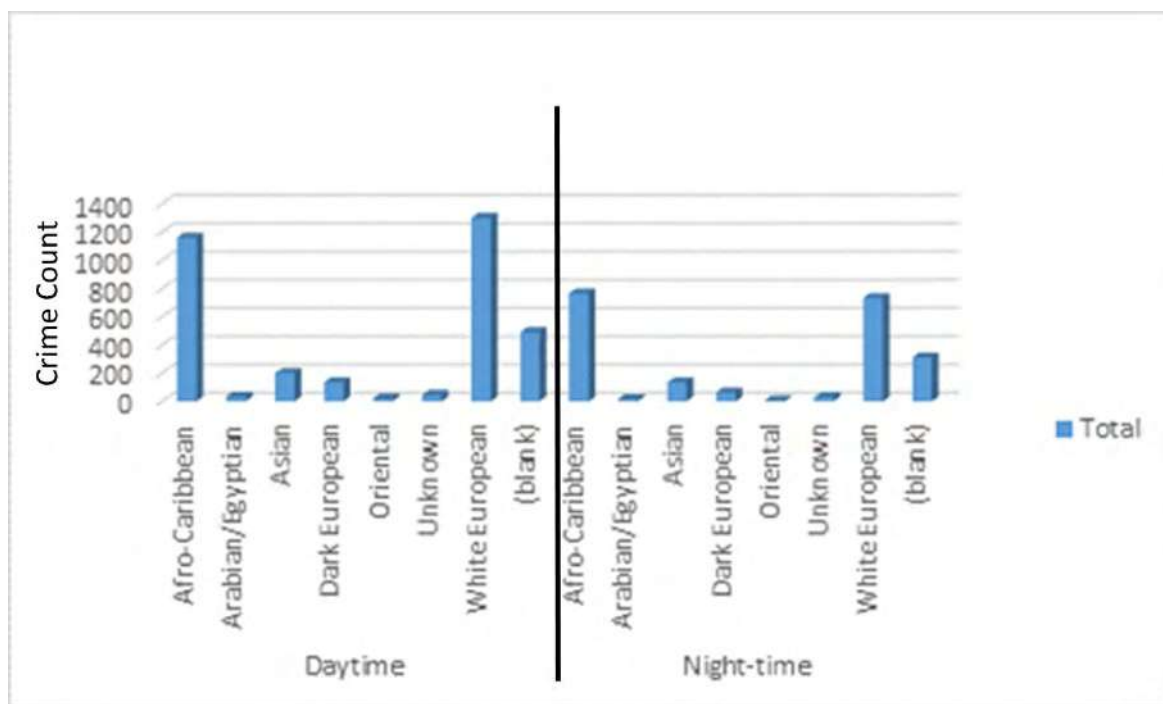
Fig.30: *Victim Described Offender Ethnicity (Offence Count).*

Figure 31, overleaf***,*** highlights this difference, suggesting that Afro-Caribbean offenders may cause more harm per offence than other ethnic groups. This might be explained by the demographic makeup of the three boroughs and the impact of high harm offences such as robbery on the population and further research is needed to effectively interpret this finding. The data is also incomplete with notable numbers of offenders shown of unknown ethnicity.
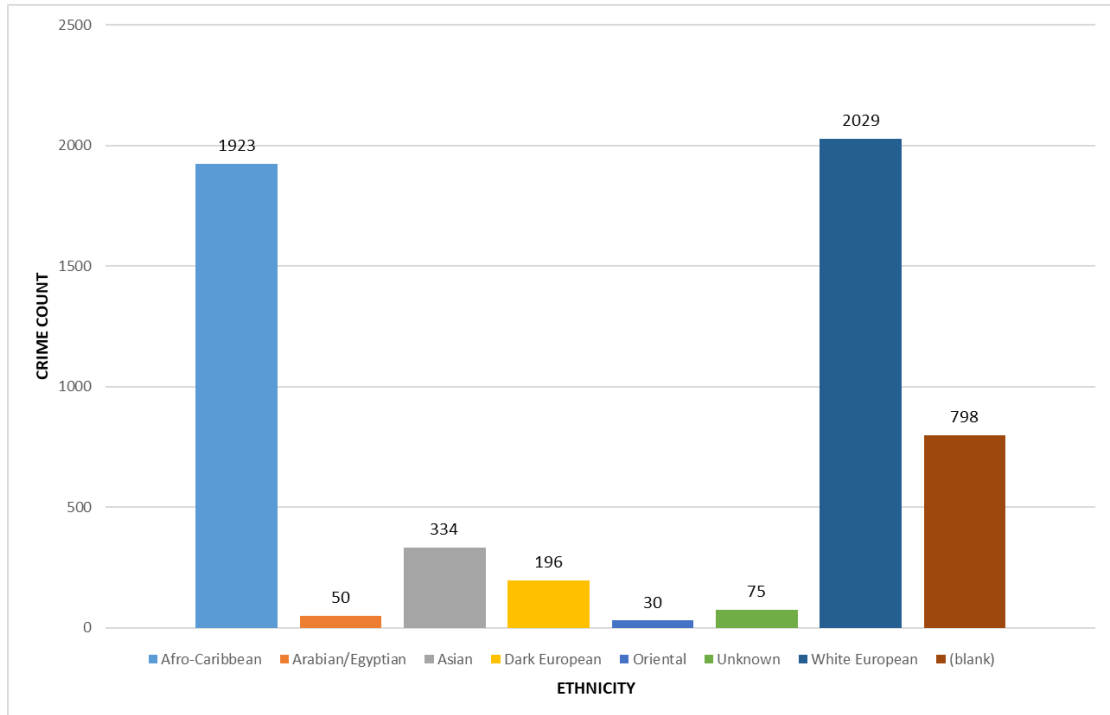
Fig.31: *Harm, Mapped by Ethnicity of Suspect.*

Discussion & Implications

This section discusses the implications of the findings of this study to policy, research and practice, and the limitations that must be considered in interpreting these results.

The tragic cases of Sarah Everard, sisters Nicole Smallman and Bibaa Henry, who were murdered in a North London Park in June 2020, and the further 81 women murdered in the UK since Sarah (Smith,2021), have acted as a catalyst for urgent public debate, legislative change and improved societal responses in protecting women and girls from violence. Deputy Chief Constable Maggie Blythe, who leads the co-ordination role for VAWG on behalf of the 43 Police Forces in England and Wales, declared VAWG as a national critical incident in December 2021 (HM.Govt. COP, 2021). There is now a recognised priority by Police and UK Government to respond to violence against women with more vigour; one that has due regard to gender specific crime and disorder in society (HM.Govt., 2021).

The issues that contribute to VAWG are influenced by a complex set of socio-economic factors, all of which contribute to women's safety to varying degrees. Consequently, there is no "one-size fits all" approach to tackling VAWG. For example, improving women's safety in the home, in the context of domestic abuse, requires a different strategy to that of improving safety in public from strangers to drink spiking, street robbery and generalised misogynistic behaviours or micro-aggressions against women. Whilst it is widely accepted that authorities must respond with proportionate and appropriate strategies and tactics in dealing with VAWG, the facts and evidence surrounding the actual victimisation characteristics of VAWG are often lost in generalized reported statistics. For example, in 2020 the UK Office of National Statistics estimated there had been approximately 618,000 sexual offences perpetrated against women (ONS,2020). This survey, conducted via telephone as part of the Crime Survey of England and Wales (CSEW), estimated sexual offence victimisation using public responses to surveys, not actual allegations reported to police. The number of crimes of a sexual

nature, reported to police in this time (162,963), was significantly lower than the estimated amount, and included incidents where the victim was male (ONS,2020). Without the detail surrounding the data being present, it is impossible to focus a suitable response.

This study identified some 5,435 offences which have impacted women and girls directly in public spaces over 4 years to January 2020, mapping spaces in which they occurred to hectare sized hexagons within three boroughs of South London. The mapping of crime in this space formed the foundation of this study from which other controlling variables were considered, to provide this more detailed contextual analysis of public space VAWG.

The frequency of incidents in the dataset of this study is such that this equates to an average 3.72 offences of VAWG in public spaces, in any 24hr period, across the four years of the study. These offences occurred in an area with a static population of women aged over 12 years of 405,680. The concentration of crime against women and girls in public spaces into harmspots and whether this differs to concentrations of reported incidents (hotspots), has a significant bearing in responding to VAWG. If crime density, severity, and location of crime against women and girls differs by severity, victim characteristic, temporal variance or other factors and these locations can be identified, mapped, and interpreted correctly, then more effective, proportionate, tailored and crucially legitimate multi-agency responses may be possible.

The evidence obtained in this study strongly supports the hypothesis that public space VAWG is highly concentrated in space. 91% of the total space of the three boroughs, had no incidents of reported public space VAWG crime, in the four years studied. Consistent with previous research, public space VAWG harm, as measured by the CCHI, is three times more condensed in space that crime count (Weinborn et al.,2017). Of the 27,370 hexagons mapped, 408 of these hexagons contained 50% of all crime count, just 1.5% of all space. 134 mapped hexagons contained 50% of all harm. Just 0.48% of all space across three boroughs, contained half of all public space VAWG harm. The overall concentration

of harm in space is even more pronounced than that of count alone, identical to findings of previous studies (Norton et al.,2018). 25% of all harm mapped in this study is concentrated in just 48 hexagons.

Research identifies that around 80% of all harm is caused by four major offence categories sexual offences, violence against the person, robbery, and theft (Norton et al.,2018). The Findings of this study support this research. 84% of all harm caused in public space VAWG is caused by sexual offences and robbery in this study. Including violence against the person increases this percentage to 99% of all harm.

Acknowledging that the overall likelihood of an individual being a victim of harm is, in general, low in this study, the clear concentration of both harm and volume allows for the practical application of tactics to prevent and detect public space VAWG more effectively. However, focussing police or partner agency responses solely on VAWG hot and harmspots may not be efficient, given the low number of incidents. The frequency of VAWG offending in hotspots makes dedicated police guardianship unlikely to demonstrate noticeable changes in offending behaviours without significant investment. Research supports a multi-faceted response to these concentrated locations. The Campbell systematic review of hotspot policing identified a small, but statistically significant, reduction in crime using hotspot interventions across the 65 studies included in the review (Braga et al.,2019). This research identified the cumulative additional benefits in using both focussed patrol and problem-solving techniques, when targeting hotspots to reduce ongoing risk. The use of problem orientated policing has been widely studied. Evidence from systematic reviews of this policing strategy highlights some prodigious effects (Weisburd et al.,2010). It should be feasible to utilize the hotspots and harmspots for VAWG, overlapping other public space crimes such as all violence against persons, to provide a directed patrol that is semi-tailored to the spaces they occupy, and for these tactics to be supplemented with dedicated problem solving to increase the effectiveness of harm reduction measures long-term, alongside tactical deployments to supress immediate risk.

What is evident from this study, is that whilst public space violence against women is highly concentrated, not all incidents of VAWG in public spaces have the same impact, particularly when considering the age of victims. Hot and harmspot mapping normally treats the population within that space as equally likely to be a victim of a given crime type, to predict future offending, or tactically respond to issues in that space (Hope,2012). Any certainty in the likelihood of future offending, based on broad information statements about a potential victim population, are undermined by the probability of the event not happening at all. If police and partners can narrow the focus of any response and future prediction, using the characteristics of victims and offenders, and a temporal understanding of that crime type, in that space, this prediction of future events and consequently all responses to them, become more concrete and effective.

Secondly, evidence from this study suggests that alcohol is not a significant contributory factor in predicting VAWG victimisation in public places. Only 13.85% of all harm involved alcohol in some way and this figure reduces slightly in the winter months. The overall impact of existing licensing measures and safeguards to women, in and around licensed premises and the night-time economy of town centres, such as additional policing and CCTV, appear to demonstrate a controlling measure to the impact of alcohol on stranger victimisation in public spaces.

There is evidence within this study to support the notion that hotspots and harmspots change when temporal factors are applied. This is particularly evident between day and night, but the victimisation of women in public varies by time of day and day of week. The temporal analysis of crime incidents and harm across the 24hr period demonstrate the impact of the night-time economy, but also show rises in crime count around lunchtime for women aged 25-30. Harm patterns across the 24hr period demonstrate that the highest amount of harm occurs to girls aged 12-18 years between 1400hrs and 1800hrs. This is consistent with evidence from previous research into the impact of temporal changes to hotspots of street crime counts in London (Tompson & Townsley, 2010). Seasonal changes to hot

and harmspots that are also apparent in this study, are consistent with research (Andresen & Malleson,2013; Hind & Ruperel,2007; Lewis & Alford,1975).

Evidence also suggests it is important for temporal variation awareness to feature in police and partner strategies, to maximise the potential effectiveness of any interventions. This may be true, not only of VAWG, but of all crime types. The categorization of crime in a locality, an understanding of crime counts and harm alongside the temporal patterns associated with it, can then be considered in planning effective strategies to deter, or detect them. Currently hot and harmspot mapping for the deployment of police resources appears to lack this level of detail. This may materially affect the likelihood of preventing or detecting offending in public spaces as locations differ when season, day, and time impact on the density and prevalence of that hot or harmspot.

What is particularly striking from this research is the impact of the age of the victim, both to the risk of victimisation and to the potential harm caused to that victim. It is clear from the findings presented here that the risk of victimisation rises steadily with age to 30 years, after which the likelihood of victimisation declines steadily. This study demonstrates that you are most likely to be a victim of public place VAWG if aged between 18 and 30 years. However, the harm caused by victimisation in public place VAWG, is highest up to the age of 18 years. Harm is highest when the victim is a child and declines as they adulthood. This has significant implications to safeguarding, not only to police, but to all agencies with a moral or legal obligation to protect children. Harm is over 30% higher than other age groups for 12-18yr olds on three days of the week: Monday, Wednesday, and Sunday. The temporal peak in harm for this age group is between 1500hrs and 1800hrs and may evidence the impact of the end of school time to victimisation of adolescent girls. In short, this study demonstrates that public space violence against women and girls disproportionately impacts girls between 12-18 years of age.

The implications of this finding extend beyond police and partner agency street interventions. There is a sound argument, made by the evidence presented, to consider how best to utilise all public bodies in informing and educating young people of the issues surrounding VAWG and impacting on the

attitudes of young people towards violence and risk. Regulatory bodies such as OFSTED could be encouraged to utilise inspection regimes to establish minimum standards and monitor activity to reduce the risk and impact of VAWG, as well as inspecting the wider footprints of a school community regarding safe routes to and from schools and the impact of crime on the school community. Alongside the implications to education, the evidence also supports the need to review the activity and remit of school officers, safeguarding teams, social services, recreation and shopping facilities, charities, community safety teams and youth service providers. Supporting these agencies with an evidence-based framework, like that being formulated by the College of Policing, supplemented with tailored evidence of risk of harm in their localities, may greatly enhance the potential of these agencies to protect young women from victimisation and educate young men as to the cultural and societal changes needed in creating a safe community for all.

When considering perpetrators, evidence supports the harm caused by them is highest when they are similarly youthful, with the highest harm and volume inflicted by teenage boys/men in this study. The risk of being victimised by older men falls away sharply when perpetrators reach 30 years of age. Evidence from the study also suggests the harm caused by offences is higher when the perpetrator is of Afro-Caribbean ethnicity. This finding may be a simple arithmetic example of the modus operandi of robbery offences within the South London area studied and the impact on harm scores of this offence. Further research is required to understand the implications of offender characteristics to public space VAWG before any conclusions can be drawn.

Finally, the ethnicity of the female has a significant impact on the average harm caused to the victim. Asian and Afro-Caribbean women and girls suffer proportionately more harm per victimisation than white European or Arabic females. This has implications for policy, but further research is needed. There is only limited current, gender specific ethnicity data in population surveys, particularly when measured at street level or in micro-places as small as the hectare sized hot and harmspots within this study. Therefore, the actual risk of victimisation cannot be accurately identified, albeit the findings

point to an interesting area for future scrutiny. It is important this new data includes the age breakdowns of populations according to ethnicity as well as gender in these spaces. There is also more research required regarding the street-based populations in study areas. It has not been possible outside of broad population mapping comparisons, to identify many victim characteristics. For example, the economic status of victims may be significant as a risk factor, or at the very least difficult to disentangle from the rich picture of public place VAWG understanding (Croall,2007). There may be cultural, demographic, or other factors which increase the impact and risks alongside ethnicity and age, as a characteristic of victimisation in specific areas. This is an important area for future research.

In late December,2021 the National Police Chiefs Council announced that every Police Force will be measured against a performance framework for tackling VAWG (NPCC,2021). Each of the 43 Police Forces of England and Wales must articulate their local plans for tackling the issue and protecting women from harm. By 31st March 2022, the NPCC and College of Policing will produce an outcomes and performance agenda, developed in consultation with strategic partners that will stipulate expected outcomes. The framework calls for a fundamental shift in culture, prioritising VAWG related crime. This framework recognises the need to respond to offenders, victims and places in a manner that best protects women in society.

This research suggests that an evidenced based approach to the targeting of place, can be significantly enhanced with a deeper understanding of the crime type, victim characteristics and offenders associated with that space. This can be further supplemented with insight into the temporal nature of that crime type and how the concentrations of offending change in time and space. Current VAWG plans have distinct portfolios of activity associated with victim, offender, and location. This is well documented in the existing inspection regimes of these plans. (HM.Govt,2021) What may be needed is a new approach to these strategies, with evidence at its heart and based on the contextual understanding of crime categories being targeted. This overarching strategy for crime would base any response on a deeper understanding of that crime type and what works to impact it, considering the

three sides of the problem-solving triangle as of equal weighting, in a strategic plan to tackle that crime type. This places evidence at the centre of any response and establishes the ethos of effective problem resolution with police and other agencies. In the case of public space VAWG, this study suggests further research is needed in several areas to better respond to this category of offending. It is the context of that offending rather than the crime itself that may provide solutions. For example, future research is needed to consider the impact of hotspot policing on detection rates for public space VAWG. A linked strategic response to the offender, place, and victim alongside the context of the crimes being targeted, is likely to be more efficient and effective when strong evidence supports it.

Evidence from this study establishes a foundation for evidence-based decision making in several areas. Firstly, to target resources and a multi-agency response towards teenage girls between 12-18, primarily of school age and their male counterparts, towards a cultural and societal shift in how women are safeguarded. This should include a police response alongside other agencies, not least education, and potential policy changes to support a statutory framework for future service delivery in safeguarding these young people from VAWG. This could sit alongside the framework for VAWG delivery, published by the College of Policing, as well as within the inspection of educational establishments through OFSTED (HM. Govt, COP,2021). This need for a truly multi-disciplined response to VAWG is born out in previous research where the crime concentrations reflected wider social and health disadvantage in localities and a need to broaden the response beyond simply crime prevention and detection (Ciacci & Tagliafico,2020; Weisburd & White,2019).

Secondly, the harm caused to you if you are a victim is also greater, by proportion, if you are Asian or Afro-Caribbean in appearance. Further research is needed regarding the issues of victim ethnicity and the disproportionate harm in public place VAWG suffered by Asian and Afro-Caribbean victims. A study in the US, found similar disproportionate victimisation between Black, White, and Latino communities (Lauritsen & White,2006). The findings of this study suggest there is more to learn

regarding this issue and has implications for how victims are best supported, and funds for victim care are allocated to this task.

There is also a need to review how crime is recorded, classified, and segmented for police and agency responses. This study attempted to define how historic police crime records could be classified, interpreted, and mapped according to a broad definition of public space violence against women. The detail gained from moving away from a specific study of rape or robbery, or one focussed on offenders to a wider study of the context of harm and behaviours against specific victims in a spatial and temporal context, in this case public space violence against women, has drawn considerable benefit and new insights into possible areas for future action. It would be interesting to extend this approach to other areas of victimisation such as hate crime, gang violence or domestic abuse. The apparent rounding up, or down, of victim/witness defined offender ages, may present an area of future research. Namely how best to identify and record the most accurate information at point of recording, to improve potential detection of crimes.

This study is a foundation stone only. Wider exploration is necessary to test the research validity and ensure these findings are applicable elsewhere. This can be achieved quickly with a strong willingness to duplicate and test this study. There are also several future research questions which can be postulated, as a result of this study. For example, in relation to the benefits of defining crime categories more effectively, formalising definitions more accurately such as VAWG, public and private space to improve analysis, validity of studies and comparison. The benefit of establishing a foundation of reported crime by defined category also allows the future overlay of other variables such as fear of crime, educational standards, street harassments of women, social deprivation, or health outcomes as studied by Weisburd and White.

Finally, this study has identified the benefit in ensuring victimisation traits are effectively recorded. The understanding of victimisation characteristics in crime analysis is often missing from problem solving, strategic planning or tactical discussions. Current analysis of crime problems may lack

considerable and important detail which may significantly impede the effectiveness of existing responses.

Research Limitations

As discussed in data limitations above, hotspots and harmspots are identified through historic crime or incident reporting to police. It is recognised that crime reporting varies according to multiple factors and may vary significantly in localities with lower levels of confidence in police responses, whether through cultural difference, economic disadvantage, or other factors (Buil-Gil et al.,2021). Research also identifies the risk in allocating resources without consideration to this under-reporting, which has been described as the 'dark figure' of crime (Skogan, 1977). Gender based crime should be considered in the wider context of the cultural norms of society and how normalised behaviours against women, by men, may create a reluctance from an early age to report matters which, in the minds of the victims, will be seen as routine or not taken seriously by authorities. There is strong evidence supporting this presumption of under reporting by women. In 2016 Nottinghamshire Police trialled the reporting of Misogyny as a hate crime. The trial reported 174 incidents. However, following this trial, surveys identified 64.5% of 600 respondents had not reported a misogyny incident they have experienced (Mullany & Trickett, 2018). The Office for National Statistics has also recognised the issue of under reporting. In its study of sexual assaults against women, it was estimated that only one fifth of victims reported their serious sexual assault or rape (HM Govt., 2018). The data presented in the study must be seen in the wider context of that dark figure of under reporting violence against women and girls, which may hide hotspots and harmspots of public space VAWG. However, contrary to this under-reporting risk, there is some evidence that reported crimes against women, and those for violent crimes committed by strangers, are reported more than other crime types and therefore the more serious crimes suffer less from under-reporting of incidents (Hart & Rennison, 2003).

Academics recognise the issue of under-reporting could be made worse by using generalised crime mapping techniques to identify hotspots for police responses (Brantingham, 2018). The nature of the crime mapping used for this study may also present limitations to research. The scale of the mapping systems used must be appropriate to the nature of the study (Eck et al., 2005). This scale is limited by

the systems used in interpreting that data or available to the researcher. The smallest scale currently available within ARC-GIS mapping is 60 metres per side hexagons. The proportion of open public space within these hectare sized hexagons, may vary significantly between each of them. This may limit the capacity to interpret street intersections or specific issues within open spaces within those hexagons and therefore hinder effective responses.

It is also not currently possible to overlay social deprivation data to the hexagons used to interpret hotspots, as the technology is not available to create accurate mapping overlays with data used by the Ministry of Housing Communities and Local Government (MHCLG, 2019). It will be necessary for future research to map social deprivation against crime and harm in more detail, to better understand the implications of this issue to gender-based victimisation. The inclusion of the maps within the methodology above such as social deprivation, provide useful foundations for future analysis of the findings. These maps of deprivation and overall reported crime in 2019 are included in **Figure 4** and **5** above to allow a visual comparison.

A further limitation in the GIS mapping of data, exists within the human component of data entries. The traumatic circumstances surrounding being a victim or witness to crime, and any delay in reporting, may confuse the informant as to the exact location of the offence (Chainey and Ratcliffe, 2005). As such there may be unintended human error at point of report. This can be exacerbated by the data installer, normally the reporting officer or member of staff. In identifying an address for the crime reporting system, the address may be entered as close to a known location or within proximity to a nearby street intersection. This may impact on the tight geographic boundaries that exist in micro-place hot-spot identification and thereby influence findings.

This study maps crime against the backdrop of a police basic command unit (BCU), this boundary is one that circles three political boundaries, namely boroughs in South London. The data could also be mapped specific to these boroughs, wards, LSOA, NHS trusts or any other physical or political boundary. The choice of boundary borders of the study impacts on scale, interpretation of data and

buy in of alternative stakeholders. The decisions in this study, of a BCU mapped at the micro-locality of one-hectare hexagons, was a balanced choice based on the current working practices of police and partners. This choice considered mapping software availability to police and partners, the future practical application and use of the data and findings, as well as post academic analysis. The decisions made allow the strategic leaders of the Metropolitan Police and statutory partner agencies to use the data immediately, if released.

It is also problematic to assume the female residents of the BCU represent the entire research population of the study. The female population of the BCU, estimated in 2020 by age classifications, is used to examine some of the research findings in relation to the risks of victimisation in localities. The street-based populations of urban spaces, however, vary considerably. This is particularly the case in urban centres and is dependent on the routine activities of people in those places. There will also be considerable temporal variance in street populations. Studying street crimes alongside the actual street populations over time, using mobile phone user location data, researchers established a large difference between temporal crime occurrence, particularly between day and night (Hanauka,2018). This study does not use specific street population data as this is not available, and this may impact research validity, as the sampling framework is not formally established and understood. This is important when targeting resources into hot or harmspots, as doing so when there are few offenders or potential targets has a limited effect. If other active guardians are in that space, a police response may also be unnecessary. As accurate data from the 2021 census is yet to be published, this research can only rely on available estimates of static, residential populaces as its base measure for the research population of the study.

Data is used in this study from January 2016 to January 2020. As a result, the research may fail to map the potential variances in street populations and routine activities of people, caused by the covid pandemic lockdowns and the dramatic media attention to offences against women and girls in the last two years. The research may not account for the new rational choice behaviours of people in a post-

covid world. Behaviours may have significantly changed, and as a result, the victimisation characteristics of this post-covid, post Sarah Everard world may vary. Research is required to understand the sociological impact of both the pandemic and public opinion surrounding gender-based crime, to recognise any impact these may have had on criminality.

As a last point to interpretation, the operational definitions adopted for this study may not reflect those of other historic, or future, academic or applied research. The definition published for VAWG differs between the United Nations definition, The UK Government's VAWG Strategy from July 2021, the College of Policing VAWG framework, December 2021, and this study, seeking to define public space VAWG. This decision may hinder any direct comparison with other research. In addition, if this study is replicated, any alternative definitions adopted, may affect external validity. This limitation points towards a need to define these definitions carefully within any VAWG strategic or tactical response to allow any effective comparison.

Conclusion

This study seeks to analyse historic reports of crimes, directed at women and girls in public spaces, across three boroughs of South London between 2016 and 2020. In doing this it answers five research questions to improve our understanding of public space VAWG:

1. At what locations in South London are public place crime and harm against women and girls concentrated, and how do these locations differ in space or time when controlling variables are applied (Victim characteristics, time of day, day of week and season)?

2. When categorising harm using the Cambridge Crime Harm Index against women and girls by seriousness, what, if any, spatial and temporal patterns can be identified and mapped?

3. How do the geospatial and temporal profiles of harm or volume of crime against women differ by age, ethnicity, or another known victim characteristic?

4. How does the geospatial and temporal profiles of harm or volume of crime against women differ by time of the day, day of the week, and season?

5. What are the implications of such profiles to policy and practice in responding to public place violence against women and girls from this study?

These questions were posed in response to, and in the context of, what has become a multi-national call to arms, to the issue of violence against women and girls in society. This study has uncovered insights into the characterization of victimisation of women in public with potential significant implications for future policy and practice. These findings, in summary, are:

- Public Space VAWG is highly concentrated into small geographic areas. These spatial hot and harmspots change when temporal factors are applied.

- Overlaying victim characteristics, particularly age of victim, also changes hotspot and harmspot locations, often away from town centres and into suburban areas.

- The frequency of offending specifically to VAWG means that these localities may not directly benefit from police interventions. A longer-term, problem-solving approach involving multiple

agencies or alternative interventions, may be necessary alongside the targeting of VAWG in conjunction with the wider hotspot tactical responses to wider public space violence.

- There is considerable concentration of both harm and volume of offences towards younger women in public places.

- This victimisation of younger women is particularly evident in women between the ages of 12 to 18 years. This finding has significant implications for safeguarding children, deemed most vulnerable in society. Temporal analysis suggests these young people are more at risk at times that reflect pre and post school times.

- The harm caused by VAWG in public spaces, disproportionately effects women of Black or Asian origin although white European women are statistically more likely to be victims.

- There appears to be significant benefit to improving crime recording mechanisms, intelligence analysis and standardising definitions for both research and practice.

- Findings are consistent with previous research on crime and harm concentrations in space, temporal analysis studies and research on the influence of time on these concentrations.

In identifying specific victimisation risks to certain categories of women, this study opens a wider debate on the need to understand and respond to the issues of gender-based crime more specifically, according to formal definitions of crime types, such as public space VAWG. The College of Policing have partly recognised this in their previously cited framework document, which outlines an intention to better define VAWG for the purpose of improving police responses (HM.Govt.,COP,2021). This study outlines a strong argument for a truly multi-discipline, evidence-based approach to strategies and solutions for VAWG. Current responses may not be effective or efficient, missing those agencies most impactful to the problem and misdirecting valuable police resources. Current actions may be missing opportunities for successful interventions, ultimately failing to identify and protect those women most vulnerable to harm.

Enormous amounts of resources are being used and efforts made in responding to what has become a national priority for society. Plans are in place across all 43 Police Forces of England and Wales, and work is being undertaken to establish a national framework for service delivery by the College of Policing, that can be tracked against performance indicators of success and allow direct comparison of these plans.

Diverting resources towards victim prevention and care, targeted towards those most at risk (young people and victims of specific ethnicities), may have long term benefits to society and to the public satisfaction levels in any authorities' responses. Education and youth services must feature heavily in responses to tackling VAWG, given the evidence that presents itself here. The need to identify and problem solve the specific issues associated with public space, hot and harmspots, can be made more effective if interventions for specific categories of women and girls can be targeted.

Ultimately, this research evidences a need to think differently about public space VAWG and supports wider analysis and further research in developing a richer understanding to inform strategies for intervention. Improved prevention, investigation, and detection of violence against women and girls will have a multiplying effect on the legitimacy of policing activity in this country. At a time when gender-based violence is in the public eye, to such an extent that media attention on cases can significantly impact public confidence, the stakes in responding effectively could not be higher. What is also clear, is a need for this response to be done in co-operation with other agencies. A truly multi-disciplined response to VAWG, based on evidence of where and when to target resources and interventions with surgical precision, has the potential to yield greater results at reduced cost. A statutory framework that ensures these agencies share information, support victims, and respond to identified patterns of criminality effectively may be essential to future success. The College of Policing have commenced this framework for police interventions. This study provides an academic and analytical framework for further action, within just one category of criminal behaviour, namely that of public space VAWG, but it also points towards further research requirements, against other aspects

of criminality for both academics and practitioners, that has implications for any response to victim, offender, and location in achieving a truly evidence-based approach to situational crime prevention.

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