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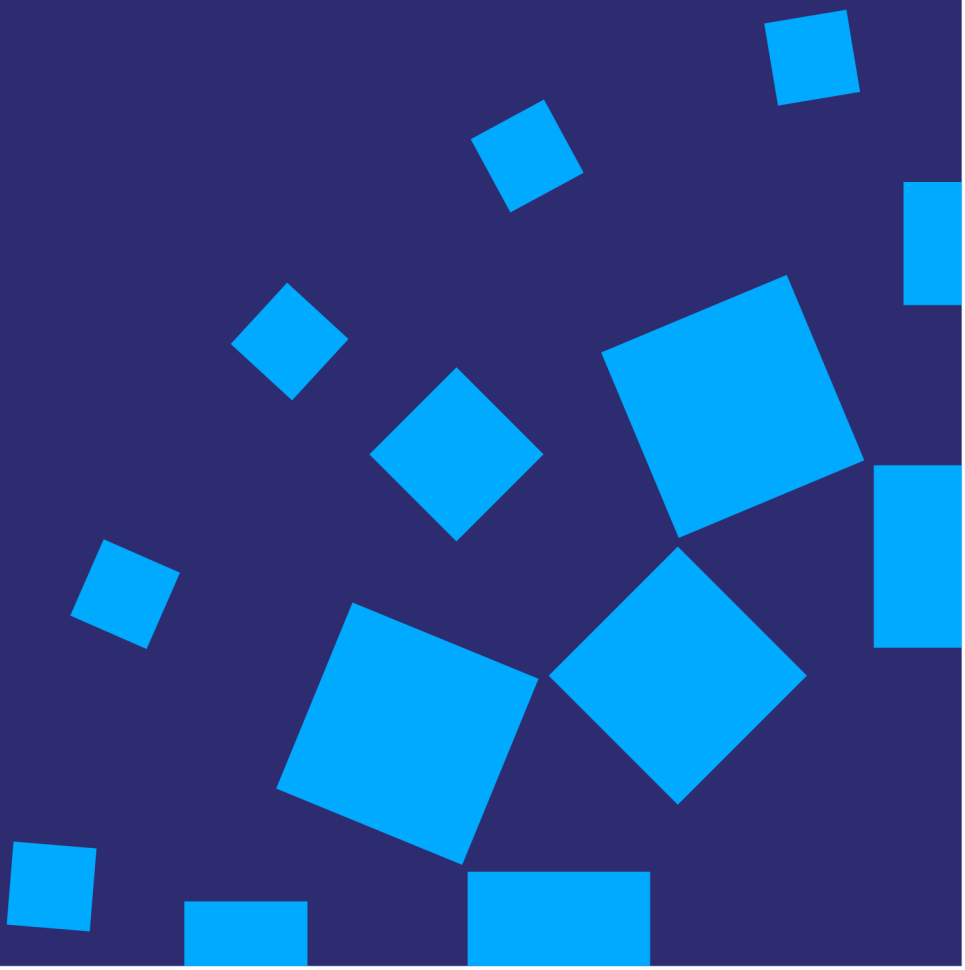
Problem solving violent crime

A guide for analysts

September 2024



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About this guide

Problem solving is a systematic approach for improving police effectiveness. Evidence shows that when done well, problem solving can lead to significant reductions in crime and disorder (Hinkle and others, 2020).

Analysis lies at the heart of effective problem solving. Analysis to identify persistent problems. Analysis to determine how problems are patterned. Analysis to work out the causes of problems. And analysis to assess whether an intervention is effective.

This guide is about problem solving and the analysis of serious violence. It aims to do two things.

- First, this is a guide about **doing** effective analysis. It describes a range of practical tools and techniques that you can use to help better understand and respond to problems of violence.
- Second, this is a guide about **thinking**. Analysis is only ever as good as the quality of data analysed and the questions asked of those data. Critical thinking matters. This guide therefore covers concepts and theories which have proven useful when applying a problem solving approach to violence reduction.

This guide is written primarily for analysts but should be relevant to anyone with an interest in or responsibilities for reducing violent crime.

How this guide is organised

This guide covers topics relevant to problem solving violent crime. We do, however, make two compromises. First, this guide does not provide an introduction to police problem solving. It assumes that you are familiar with problem solving and the SARA problem solving process (scanning, analysis, response and assessment). If you are new to problem solving, then we recommend that you first read the **problem solving resources** listed at the end of this guide. Second, this guide does not review the evidence on what has been shown to work to reduce violent crime. There are now several **online resources** for this exact purpose.

The format of this guide draws heavily on Ron Clarke and John Eck's seminal manual, **Become a problem-solving crime analyst: In 55 small steps** (Clarke and

Eck, 2003). It is divided into five sections corresponding to the SARA problem solving model. These sections are:

- Data for problem solving analysis
- Analysis to identify and prioritise problems
- Analysis to determine patterns
- Analysis to evaluate impact
- Presenting analysis effectively

Each section comprises multiple units. Each unit covers three areas:

- the learning objectives of the unit
- a description of why the unit is important when problem solving
- a demonstration, drawing on research and practice, of how the information reported in that unit might assist you in problem solving violence

Each unit ends with signposts to recommended resources and readings.

Different people will read this guide differently. While it is organised to make sense when read cover-to-cover, it is also possible for you to dip into specific sections or units as and when they are relevant.

Finally, this guide forms part of a large body of resources designed to support effective problem solving. This body of work now comprises many hundreds of problem solving case studies from different settings and directed at different problems. There is much to be gained from reading these resources. Important as these resources are, however, it should also be recognised that there is only so much you can learn from reading the work of others. Improvement often comes from trying to put things into practice. And so with problem solving, like with many other skills, there is no substitute for going out and doing it. We hope this guide provides you with the motivation and methods to do so.

Data for problem solving analysis

Unit 1: Data for effective problem solving analysis

Learning objectives

To recognise the value of data for effective problem solving, and know that effective problem solving often involves the use of multiple data sources.

Description

A central premise of successful problem solving is that police activities should be informed by knowledge. Few people would disagree with this statement. It is for this reason that police problem solving has variously been described as ‘not rocket science’ and ‘just plain common sense’ (Read and Tilley, 2000). Even Herman Goldstein, the architect of police problem solving, went as far as to say that a problem-oriented approach is neither controversial, radical nor novel (Goldstein, 2003).

Knowledge, for the purposes of this guide, is defined as ‘a deep theoretical and practical understanding of a subject’ (Ratcliffe, 2022). Knowledge about policing and crime prevention can be acquired in different ways. Knowledge acquired from on-the-job experience. Knowledge imparted from others working in policing. Problem solving is also a process for generating knowledge about:

- recurring problems that the police are expected to handle
- the ways that crimes are patterned
- the effectiveness of strategies to reduce crime

Indeed, it was the accumulation and dissemination of knowledge derived from local problem solving projects which Goldstein argued could usher in a new and more effective way of policing (Goldstein, 2018).

The first section of this guide is all about data, and how data can profitably be used to support effective problem solving (Units 1 to 5).

Police data is the lifeblood of police problem solving (**Unit 2**). Many problem solving projects make use of police data alone. But evidence shows that police data rarely provides a complete picture of crime problems. Consequently, in many problem

solving projects there is much to be gained from drawing on alternative data sources. This could be **primary data** collected for the purposes of a specific problem solving project. Examples of primary data include surveys of the public, site visits to problematic premises or consultations with relevant colleagues and businesses. It could also be **secondary data**, relevant to a selected violence problem but held by partners or other organisations. Indeed, in the recent UK Government's **Serious Violence Duty** (2022), great emphasis was placed on the need for the police service to share data and work collaboratively with local authorities, fire and rescue authorities, and health authorities in the interests of better understanding and responding to serious violence.

But what exactly are the benefits of being data-driven? Why not just rely on opinion, anecdote or experience when deciding how best to combat serious violence? Data matters when problem solving for at least three important reasons.

Data helps to ensure that assumptions are accurate

There is much craft work to policing. Many police officers describe their on-the-job experience and tacit knowledge as invaluable. But assumptions based only on personal experience are always limited, and sometimes can be biased and misleading. Studies show, for example, that data analysis often outperforms professional judgement in identifying current and future crime hot spots (Macbeth and Ariel, 2019). Likewise the crime prevention literature provides many examples of well-intentioned initiatives which were assumed to work but which produced backfire effects, increasing crime or weakening police-community relations (Welsh and Rocque, 2014). It is human to make assumptions, and some of those assumptions will be correct some of the time. But misleading assumptions can have serious consequences in policing and crime prevention. Reliable data provides a useful way of checking our assumptions to help avoid costly decisions.

Data helps to identify patterns

Arguably the central lesson from decades of crime analysis is that crime is highly patterned. It concentrates at particular places, at particular times, on particular people and so on. As is repeated throughout this guide, effective problem solving often involves looking for problem patterns, and using these patterns as the foundation on which to devise tailored responses. But problem patterns are not

always self-evident. Repeat victimisation is a case in point (**Unit 14**). The under-reporting of crime and inconsistencies in crime recording have led some to dismiss the idea of repeat victimisation. It took sustained research activity and artful data analysis to demonstrate that repeat victimisation is widespread and ubiquitous – it should not be dismissed (Pease, Ignatans and Batty, 2018).

Data helps to support effective crime prevention

The police invariably exhibit a ‘can-do’ attitude. They see a problem and they want to solve it. This is one of the great attributes of the police service. But the temptation to go directly to response is a common pitfall when problem solving. It is a pitfall because responses, absent any scanning and analysis, often amount to little more than generic, enforcement-focused police tactics, and evidence suggests that responses tend to be more effective when they are tailored to and targeted at particular problems. In this sense, drawing on data can help both better understand problems of violence and develop suitable violence interventions.

Demonstration

The value of data in combination with experience can be seen in the ongoing debate around the police use of stop and search. Use of stop and search powers to reduce crime is a common but controversial police activity (for an excellent review of the rationale, impact and politics of police use of stop and search in Chicago, see Skogan, 2022). Some officers swear by its effectiveness. Others less so, often expressing concern about racial disparities and the erosion of police-community relations. Opinions abound. But what does the data tell us?

In 2023, Kevin Petersen and colleagues reviewed the evidence on police stops as a method to reduce crime, particularly violent crime. Synthesising evidence from 40 high-quality research studies, mainly conducted in the US, they concluded that police stops were, on average, associated with a 13% reduction in crime. Advocates for police stop and search would likely cite this statistic as evidence for its continued use. But the synthesised data painted a more complex picture. While stop and search was found to produce positive area-level effects (reductions in crime), at the individual-level, the authors found that people who were stopped by the police were significantly more likely to exhibit physical health issues, mental health issues and

display more negative attitudes towards the police. As with many aspects of policing and crime prevention, there is devil in the detail, which is important to consider in discussions about the (continued) use of police powers. Data helps to surface those devils. Doing so is important to move towards a more effective, efficient and legitimate model of policing.

Further resources

Petersen K and others. (2023). ‘Police stops to reduce crime: A systematic review and meta-analysis’. Campbell Systematic Reviews, volume 19, e1302

Unit 2: Police data

Learning objectives

To describe some of the ways in which police data can be used to enhance problem solving analysis.

Description

Police data consists of information about crime and interactions with the public. These include reported crimes and incidents, calls for service, use of police powers (such as stop and search), arrests and criminal intelligence submissions. Most problem solving projects use police data, particularly recorded crime and incident data (Sidebottom and others, 2020b). This data can be used to determine trends and to help build a picture about the who, what, when, where, why and how of a selected problem.

Police data has several well-known limitations. Not all violence is reported to the police. Data ‘flags’ are often applied inconsistently. Police data can also reflect police activity, such as patterns of arrests and use of police stop and search powers. Awareness of these limitations is an important part of problem solving. It will help you determine what level of confidence you can place in analysis using police data. It will also help you work out whether other data sources are needed to better understand a particular problem.

Police data is seldom in a format that is amenable to problem analysis. Data cleaning and recoding is often necessary, and can be time consuming. Here we describe two common methods for organising police data in ways that might enable better problem analysis.

Top-down theming

Top-down theming is a process to help identify and organise, in meaningful ways, clusters of similar crime events. It usually involves using crime and incident data on person, event and/or place characteristics. It could include determining the number of assailants in a given crime, the presence of weapons or alcohol or the relationship between offenders and victims. These variables can be added as numerical,

categorical or logical (True or False) columns to your dataset, which can then be used to filter or quantify relevant themes.

Bottom-up theming

Bottom-up theming describes a different approach to handling police data. This process involves extracting insights from free-text fields contained in crime reports. This involves reading reports and adding new variable columns to denote the presence of key features. This approach is often useful when seeking to establish how and why crimes occurred. For lower volume crime problems, such as homicide or shootings, bottom-up theming can be carried out fairly quickly. For higher volume problems, such as robberies, giving priority to identified hot spots or sampling those crime events with the most complete records can speed up the process. For example, you may want to categorise the modus operandi used by offenders, such as blitz (violence first), confrontation (threat first), distraction (talks to victim first) or snatch.

Demonstration

‘Chrome’ was the name given to a police problem solving initiative to tackle gang-related shootings in Manchester. Table 1 summarises the main results that emerged from problem analysis using police data (Tilley and Bullock, 2002). It demonstrates some of the ways in which police data was analysed as part of a problem solving project to gain insights into specific aspects of a violence problem, and how these insights in turn informed the police response.

Further resources

Tompson L and Ashby MPJ. (2023). ‘Official police data’. In Groff ER and Haberman CP. (2023). ‘Understanding Crime and Place: A Methods Handbook’. Philadelphia, PA: Temple University Press

Table 1: Summary of problem analysis for Chrome, a problem solving initiative to tackle gang-related shootings in Manchester.

What question were analysts trying to answer?	What data was used to answer that question?	What were the findings?	How did the findings inform the response?
What is the relationship between victims and suspects?	▪ Free-text crime reports ▪ Relationship to suspect field	Most offences involved known associates and/or rivals participating in urban street gangs.	Development of inter-gang mediation services.
What is the motivation for the offence?	▪ Free-text crime reports	Endemic conflict between area-based urban street gangs.	
What are the key victim and offender characteristics?	▪ Names ▪ Dates of birth ▪ Gender ▪ Ethnicity	Victims and perpetrators often overlapped, and mainly involved young, black or black British males.	Targeted protection for victims and repeat victims.
Is there evidence of repeat offending and/or victimisation?	▪ Names ▪ Dates of birth ▪ Unique person ID	Both victims and offenders were commonly identified as being involved in previous incidents of violent crime.	

How did victims and offenders arrive at the crime scene?	▪ Vehicle data ▪ Home address data	Most persons involved in shootings lived in close proximity to one another, particularly in areas of South Manchester.	Efforts to improve community relations and build collective efficacy in affected neighbourhoods.
What was the extent of injuries sustained?	▪ Crime type classification ▪ Injury degree severity field	Across 185 shootings where the extent of injury was determined, 16% were fatal, 42% resulted in serious injury, 34% resulted in minor injury and 8% resulted in no injury.	Primed agencies about their role in protecting victims, such as housing allocation decisions and care decisions.
What weapons were used and how were they obtained? What happened to the weapons after the crime?	▪ Feature code or description ▪ Free-text crime report	Shootings involved semi-automatic pistols (48%), revolvers (26%) and shotguns (18%), with a fifth of weapons identified as being used in multiple shootings. Few weapons were recovered. Those which were recovered mostly came from outside the UK.	Initiate crackdowns targeting firearms possession and/or use in South Manchester – engagement with selected individuals to elicit information on weapon supply, storage and distribution.
Where do offences occur?	▪ Crime location address data	Gun violence and fatal shootings were heavily concentrated in small areas of South Manchester (57%).	

Unit 3: Health and ambulance data

Learning objectives

To know about the nature and quality of different kinds of health data that might be drawn on to better understand and respond to serious violence.

Description

Although the police collect lots of data about violent crime, it should come as no surprise that much violence does not come to the attention of the police. Moreover, there are often systematic patterns in the kinds of violence that the police are and are not made aware of, which means that some people, some areas and some types of violence are disproportionately absent from police statistics. Consequently, analysis based on police data alone can provide an incomplete picture of violent crime. For example, evidence shows that domestic abuse, sexual violence and violence in and around licensed premises are less likely to be reported to the police than other forms of violence (Brennan, 2011). These patterns of underreporting are variously attributed to victims feeling that there is little that the police could do, a desire to resolve issues personally or not wanting there to be consequences for the perpetrator.

For the most serious types of violence, such as violence with injury and violence involving a weapon, levels of reporting are generally higher. But even then, a fifth of the most serious violent incidents do not reach the police (Brennan, 2020). One conclusion to draw from these findings is that good problem solving carries a commitment to consider alternative sources of data to complement police records. One such alternative is healthcare data.

Healthcare data is arguably the most widely used alternative to police data when analysing violent crime. The term ‘healthcare data’ generally refers to violence that comes to the attention of the health service such as ambulance services and emergency departments. Like all data, each source of healthcare data has particular strengths and weaknesses that affect how they can be used for the purposes of problem solving serious violence. Here we consider three kinds of healthcare data.

Ambulance data

Ambulance data usually contains accurate time and location information, details on injuries sustained and a written description of the incident. Ambulance attendance usually indicates more serious violent injury. For example, over a ten-year period in Cardiff, less than a third of patients who attended an emergency department for violent injury arrived via ambulance. However, 45% of all knife-related attendances arrived via ambulance (Brennan, 2022b). Consequently, in the absence of high-quality data on the timing and location of violence from emergency department records, ambulance data may provide a good substitute when analysing patterns of the most serious violence offences.

Emergency department data

Emergency department data can also be a valuable source of information about the timing and location of serious violence. Although only about 15% of violent incidents result in medical treatment, those that do will likely be the most serious violent incidents. Many local hospitals have trained reception staff to record information on things such as the timing, location and type of weapon used violence that results in emergency department treatment, a process known as the Information Sharing to Tackle Violence scheme (also known as the ‘Cardiff Model’). This information is typically anonymised and can be shared with the police and local authorities.

Hospital admission data

Hospital admission data is the third source of healthcare data relevant to violence prevention. When a patient is admitted to hospital, the primary cause of that attendance is recorded using an established set of categories. For violent injury, for example, this relates to 16 causes of injury including ‘Assault by bodily force’, ‘Assault by sharp object’ and ‘Assault by blunt object’. This information is then collated as part of the Hospital Episodes Statistics data and controlled by NHS Digital (in Wales, NHS Wales). Case-level information is generally not obtainable for police operational purposes, but aggregated data at the hospital level is available through a data sharing agreement. In addition, the **NHS Fingertips** data repository provides useful data summaries at the county or unitary authority level.

All data has limitations. Healthcare data is no exception. All health services data, for example, relies on patients telling medics that an injury was the result of violence. This may be obvious in some cases, such as weapon-related injury, but less serious incidents of violence may be classified inaccurately. This risk is particularly acute for domestic abuse when the abusive partner is present.

The value of using health data when analysing problems of violence is commonly stated. However, an audit of data sharing between health services and the police found marked variation in data accuracy, data sharing and data use, with many examples of missing or unusable information on the location and timing of violent crimes (Department of Health and Social Care, 2015).

Demonstration

Health and police data is arguably most valuable when combined to provide a more complete picture of the timing and location of violence. This is illustrated in the maps in Figure 1, which were created using the SafeStats resource managed by the Mayor's Office for Policing and Crime (MOPAC) and the Greater London Authority (GLA).

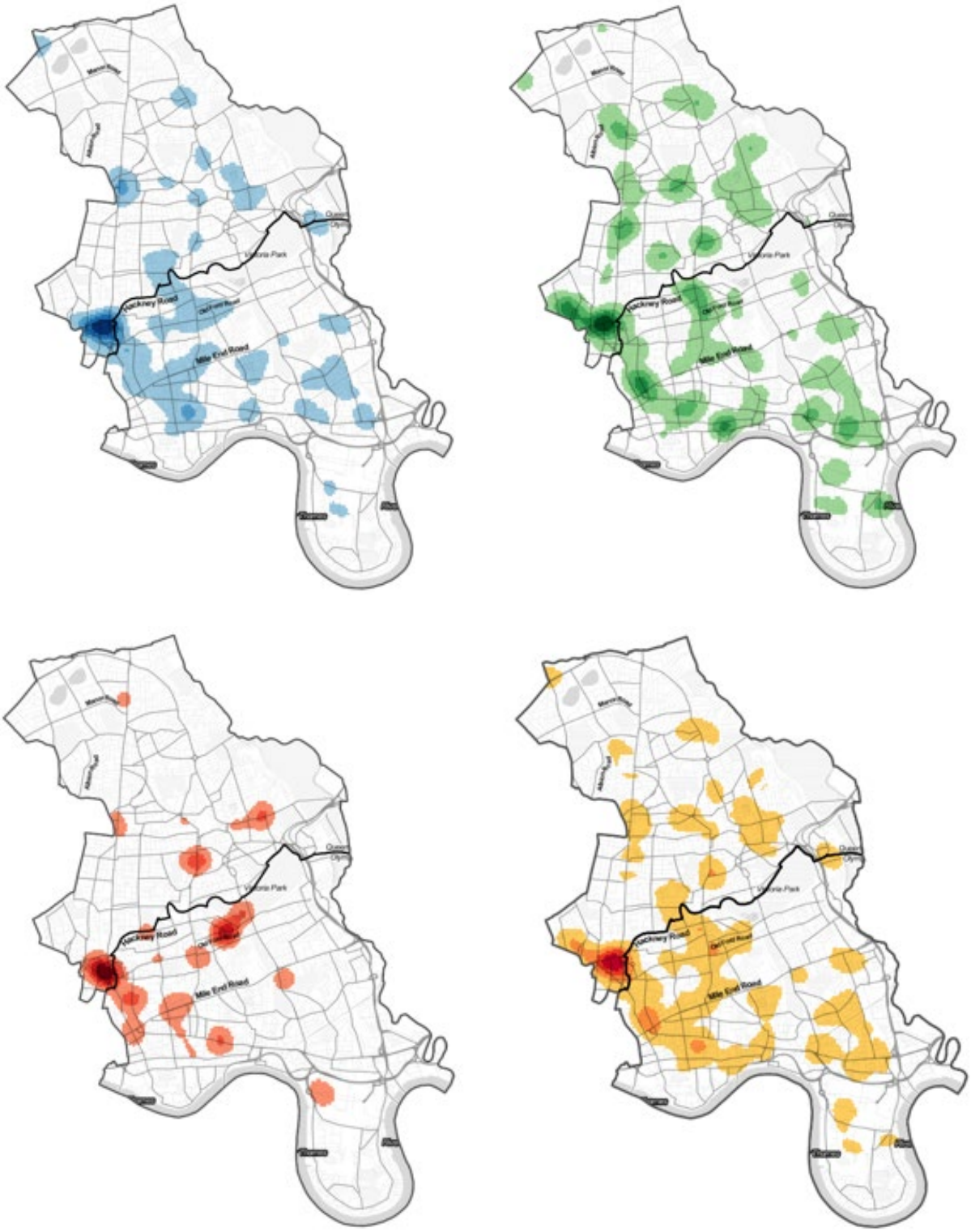
SafeStats is a secure data platform that hosts crime and community safety datasets from key organisations across London in a single online resource. Access to the portal is restricted to authorised personnel from public safety authorities, agencies and services across London. However, aggregated SafeStats data that is suitable for public disclosure is also placed publicly on the **London Datastore**.

Depicting the same part of London, the maps in Figure 1 show that different data sources reveal similar but not identical hot spots of violence. Understanding the disparities between different data sources may prove insightful.

Further resources

Sutherland A and others. (2021). ‘Tracking violent crime with ambulance data: How much crime goes uncounted?’. Cambridge Journal of Evidence-Based Policing, volume 5, pages 20-39

Figure 1: Hot spots of violence in London using different data sources: police (top-left, in blue), ambulance (top-right, in green), emergency department (bottom-left, in red) and combined (bottom-right, in yellow).



Unit 4: Points of interest data

Learning objectives

To know what is meant by a point of interest and how they can affect crime patterns.

Description

The analysis of crime has, historically, tended to focus on so-called ‘macro’ places such as entire police force areas, cities or neighbourhoods. While informative, evidence invariably finds that crime levels differ substantially within macro units. For this reason, more recent research has tended to focus on the relationship between ‘micro’ places and crime, such as specific streets, addresses or businesses where crime is more or less likely.

A ‘point of interest’ (POI) is a specific place that can be plotted on a map. It might be a building, a landmark, a road or some other geographic feature. POIs matter when problem solving because certain places facilitate crime. Others repel it. Addressing what makes certain POIs criminogenic (or not) can in turn inform crime prevention.

Environmental criminology provides several useful concepts to help us think about why some places might be more prone to crime than others (Wortley and Townsley, 2016). Those concepts most relevant to violent crime are as follows.

Crime generators, crime attractors and crime enablers

These concepts refer to three different kinds of crime hot spots (**Unit 17**). Crime generators are places that attract large numbers of people for reasons unrelated to criminal behaviour, some of whom might be susceptible to offending and/or victimisation (for example, a busy transport hub). Crime attractors are places that routinely afford crime opportunities and thus attract motivated offenders (for example, a drug market). Crime enablers are places where there is limited guardianship or regulation of behaviour which in turn gives rise to crime (for example, a badly managed bar).

Comfort spaces

Comfort spaces are places offenders use as meeting points before or after offending. This is usually a private place (such as an offender’s home) but could be recreation or leisure facilities situated near to where offending occurs (such as a bar or café).

Corrupt spaces

Corrupt spots are places fostering crime elsewhere (for example, a second-hand electronics store buying items stolen in robberies).

Relationship between POIs and violence

Let's consider the relationship between POIs and violence. Specifically, how a bus stop located near to a wooded playing field, alleyway and bar might affect sexual violence.

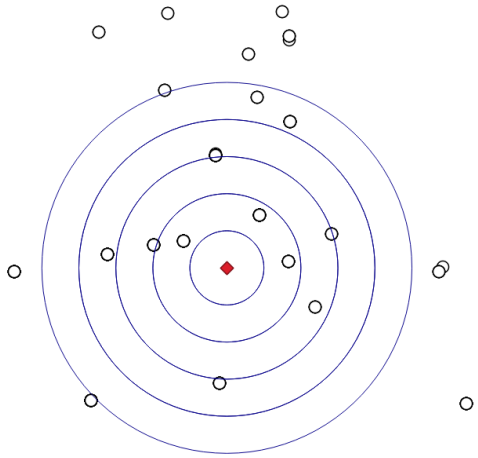
Evidence shows that offenders of sexual violence prefer to seek out victims in isolated areas (Beauregard, Proulx and Rossmo, 2005). In our example, the bar might supply motivated offenders under the influence of alcohol. Leaving the bar at night, an offender could follow a target alighting the bus headed towards the alley. The playing field provides a location for the offender to push the target away from potential witnesses or guardians. Thinking about the presenting problem of sexual violence in this way can help us think about the sustainability of alternative responses. Catching the offender, for example, does not address the inherent risks that created the conditions which made sexual violence possible in the first place. A plausible response strategy might, therefore, draw on multiple partners to improve how the bar operates (licensing), improve sightline and surveillance of CCTV (highways and community safety), or consider alternative bus routes after dark (transport company) to make this place less risky for sexual violence.

Demonstration

The relationship between POIs and crime can be explored using concentric ring buffers and location quotients (LQs). This can be done using Geographic Information Systems (GIS) software, crime data and POI location data.

We begin by mapping crime and POI data, and creating 'donut' buffers around the POIs, as shown in Figure 2. The five ring buffers depicted here are 50 metres apart and emanating from a single point of interest, a bar, denoted by the red dot. The white circles are crime locations.

Figure 2: Donut buffers emanating from a single point of interest.



Using a GIS, several calculations can be performed to generate Table 2, here considering violent crime occurring around 73 bars in a borough of London. To determine the presence of crime relative to the wider geographic area, we can calculate what is called the location quotient (LQ), a geographic statistic that measures the over- or under-representation of crime in a small geographic unit (here a ring buffer) relative to an entire study area (here the London borough). The LQ equation is as follows, where x is the number of crimes within a specified small area (y) and X is the total number of crimes in the entire geographic area (Y):

- LQ = (x ÷ y) ÷ (X ÷ Y)
- 50m buffer LQ = (264 ÷ 0.22) ÷ (7611 ÷ 31.75), LQ = 5.0

Table 2: Patterns of violent crime around a point of interest (a bar).

Distance from the POI (a bar)	Area sq. miles	Violent crimes within designated area	Location quotient
50m	0.22	264	5.0
100m	0.60	574	4.0
150m	0.93	796	3.6
200m	1.19	784	2.7
Entire borough	31.75	7,611	1.0

In this example, a LQ of 1.0 denotes that there is a proportional share of violent crime in the small area (the 50m buffer) relative to the borough as a whole. Considering the first row of data, the LQ of 5.0 indicates that there is five times the level of violent crime within 50 metres of a bar than would be the case if crime was equally distributed across the borough. In this example, we see that violence disproportionately occurs closer to bars, with LQs decreasing as distance from bars increases. However, this pattern alone is not sufficient to conclude that bars **cause** violence. Further exploration would be needed to consider whether, say, violence occurred when bars were open and if persons involved in the violence were under the influence of alcohol.

Further resources

Andresen MA. (2014). ‘The Science of Crime Measurement’. New York, NY: Routledge

Unit 5: Open-source intelligence data

Learning objectives

To know what is meant by ‘open-source intelligence data’ and how to quality assure this data for effective problem solving analysis.

Description

Good problem solving involves drawing on any kind of data that can help you dig deep into the details of a problem. In recent years there has been an increase in the availability of so-called open source intelligence (OSINT). This represents an additional source of data to consider when problem solving. OSINT refers to data that is accessible via publicly available sources including the media (for example, news articles and television documentaries), online publications (for example, journal articles and working papers), discussion groups, social media and commercial data. For the purposes of policing and crime prevention, OSINT has proven helpful as a means of surfacing information that typically isn’t held in other datasets or that which is clandestine in nature. A recent example involved working out an individual’s involvement in crime based on the lyrics in an online music video (Railton, 2022). The four key steps for using OSINT when problem solving are as follows.

Step 1: Online search for data

This process works best when using a set of key words to perform your searches. Start by creating a list of about 10 words on the topic of interest. Then, consult with at least one other person who has knowledge about the topic and ask them to come up with 10 key words. Review the two lists and agree on those words that will be used as search terms. Then use one or more relevant online search engines to perform your key word searches. An issue with any key word search is that it will likely generate lots of results. One way to effectively whittle down the number of search returns is to use combinations of key words (rather than single words). If you are interested in the problem of robbery against school children for their mobile phone, for example, try the key word combination of ‘robbery’, ‘school children’ and ‘mobile phone’.

Step 2: Sifting

Your key word searches will have likely returned a large number of documents. These documents need to be sifted in some meaningful (and transparent) way so as to separate those which are and are not relevant to your problem solving project. You could, for example, remove documents on the basis of their temporal and geographical relevance. This might involve defining a specific time period (for example, only include OSINT published in the last two years) or defining a geographical area of relevance (for example, a particular country or city). Another common sifting strategy is to retain only factual documents and discard, say, opinion-based editorials.

Step 3: Document analysis

Those documents which passed the sifting process are now assessed in terms of their meaning, authenticity, credibility and representativeness. The application of these criteria will help further reduce the volume of returned OSINT material and produce a more relevant and manageable sample.

- **Meaning** – whether the document provides information that is comprehensive and clear with respect to the topic of interest.
- **Authenticity** – the trustworthiness of a document's origin.
- **Credibility** – the sincerity, accuracy and consistency of a document's content (such as cross-checking the content with alternative sources).
- **Representativeness** – whether the document is representative of conditions elsewhere.

Step 4: Data extraction

A useful approach to perform here is to use a data extraction form and a data coding process. Data extraction forms help to systematise the data extraction process. A data extraction form can be constructed in Excel with columns relating to, say, the source of the data, publication date, the setting or context that the data refers to, and the data extracted. It is often useful to apply a coding process to the data extracted. This makes it easier to review and cross-reference similar data. For example, if the data refers to an individual you could use the code 'A' (as in Actor). If the data refers

to equipment or tools used in crime you could use the code ‘E’. If the data refers to a decision that offenders make you could use the code ‘D’, and so on.

There is no rule on the number of OSINT results to include in your analysis. Start by considering the results that appear on the first page of an internet search. If you have more time, you can then consider items listed on subsequent pages.

Demonstration

Here is an example for you to try. This demonstration illustrates the use of OSINT to identify a potential suspect. The suspect in question is not the perpetrator of a violent crime, but the graffiti artist Banksy.

- Use these key words to perform your internet search: ‘Banksy’, ‘suspect’, ‘identify’ and ‘England’.
- Refine your internet search by only considering those returned documents that were published in the UK between 2020 and 2024.
- Review the returned documents by applying the following criteria.
    - **Meaning** – assess whether the material contained in the document is comprehensive and clear in its reasoning for suggesting who Banksy is.
    - **Authenticity** – only consider results published from credible news outlets or those which refer to empirical or scientific studies. Discard opinion pieces.
    - **Credibility** – cross-check the content of your results with alternative sources.
    - **Representativeness** – evaluate whether the content is typical of what other documents suggest.
- Extract the results from your OSINT search and input them into a spreadsheet using columns that refer to:
    - the source of the data
    - publication date
    - setting or context of the data
    - the details you have found about the identity of Banksy

Further resources

Chainey SP and Berbotto A. (2021). ‘A structured methodical process for populating a crime script of organized crime activity using OSINT’. Trends in Organised Crime, volume 25, pages 272-300

Analysis to identify and prioritise problems

Unit 6: Counting crime – volume, rates and harm

Learning objectives

To know about some of the different ways of measuring crime, and their respective strengths and weaknesses.

Description

Crime can be measured in different ways. As a problem solver, it is important to know about the different metrics for crime, and their respective strengths and weaknesses. That is the subject of this unit.

Crime count

The most common way of measuring crime is through crime counts. This represents the number of offences in a given area over a given time period. Most crime analysis is based on crime counts, as is much crime prevention policy and practice. Yet it has long been known that crime counts provide an incomplete and sometimes misleading picture of crime. A major shortcoming of crime counts is the failure to account for variations in crime opportunities. Some places will have more crime by virtue of there being more crime targets, be they people or possessions. Simply put, crime counts do not capture the risk of crime.

Crime rate

Crime rates denote the number of crimes per target at risk. In most cases, crime rates are calculated by dividing the count of crime (known as the numerator) by the number of people living in an area (known as the denominator). The result of this calculation is then multiplied by a standard measure, such as 1,000 people. The resulting statistic represents, say, the number of robberies per 1,000 population.

The need to control for population size when calculating crime should be self-evident. Some places are more populous than others. All things being equal, we would expect to see more crime at those places where there are more people. By controlling for population size, crime rates standardise risk, thereby enabling you to make more reliable comparisons than can be achieved on the basis of crime counts.

Two areas differing in population may record equivalent crime counts but markedly different crime rates.

For some crime types, the number of people in an area may not be an appropriate denominator. The number of people may not accurately reflect the population at risk of crime. A good denominator is one that captures the opportunities specific to the crime problem being analysed. For car crime, the number of cars in a given area is a suitable denominator. For domestic burglary, the number of households in a given area is a suitable denominator. And so on.

For some crime types, appropriate denominators are obvious. To produce a rate for on-street robbery, for example, the ideal denominator would be estimates of the on-street population (Chainey and Desyllas, 2010). But the ideal denominator is not always available. Sometimes compromises must be made.

Consider the problem of assaults in bars in a city centre. The ideal denominator would be the number of people in each bar in the city centre. This captures the number of people who could be assaulted within a bar setting. But data on the number of people in city centre bars might not exist. Or the data might exist, but bars are reluctant to share it out of fear that such data serves a commercial advantage. In this scenario, an alternative denominator would need to be identified, something which approximates the population at risk (people in bars), but which is more readily accessible and available for all the city centre bars of interest. One proxy measure might be bar capacity. This information is likely available from licensing officers and would differentiate larger from smaller bars. It isn't a perfect denominator, however. Some bars may never reach capacity and others might routinely exceed it. Neither case would be accurately captured in data on venue capacity.

A second major shortcoming of totalling crime counts is that all crimes are considered equal. Equal weight is given to each crime incident, be it a bike theft or a sexual assault. Yet clearly crimes are not equal, not in terms of the demand they generate, the fear they provoke or the harm they produce. A hundred more bicycle thefts would likely have little impact on police resources and community sentiments, while a hundred more homicides surely would.

Crime harm

Consequently, in recent years commentators have called for a move away from the use of crime counts in favour of a measure of crime harm, which weights different categories of crime by the harm they create (broadly defined).

The Cambridge Crime Harm Index is one way to measure crime harm (Sherman and others, 2020). This tool produces a harm score for different categories of crime based on UK sentencing guidelines (multiplying each crime incident by the recommended minimum number of days a first-time offender is imprisoned). Emerging research using the Crime Harm Index has identified several noteworthy findings at both the area- and individual-level. For example, studies show that crime hot spots may concentrate at different locations to crime harm spots (Weinborn and others, 2017). Moreover, research using data from Dorset Police found that less than 4% of victims accounted for 85% of all estimated crime harm suffered by victims (Dudfield and others, 2017).

Crime harm is gaining in prominence as a standard metric of crime. The Home Office have recently requested that police forces use the Cambridge Crime Harm Index to identify crime harm hot spots. It should be noted, however, that estimates of harm relate to broad categories of offences, which are often broader than that focused on as part of local problem solving projects.

Demonstration

Figures 3 to 5 were generated using total notifiable offences data for each middle super output area in Cleveland Police in 2016. For each crime point, a harm value was added using the Cambridge Crime Harm Index to weight crime counts. Figure 3 shows the total count of crime. Figure 4 shows the total rate of crime per workday population. Figure 5 shows the total harm score. It can be seen that different metrics give rise to different patterns, which in turn would have implications for decisions about police resourcing and prevention efforts.

Figure 3: Map showing crime count in Cleveland.

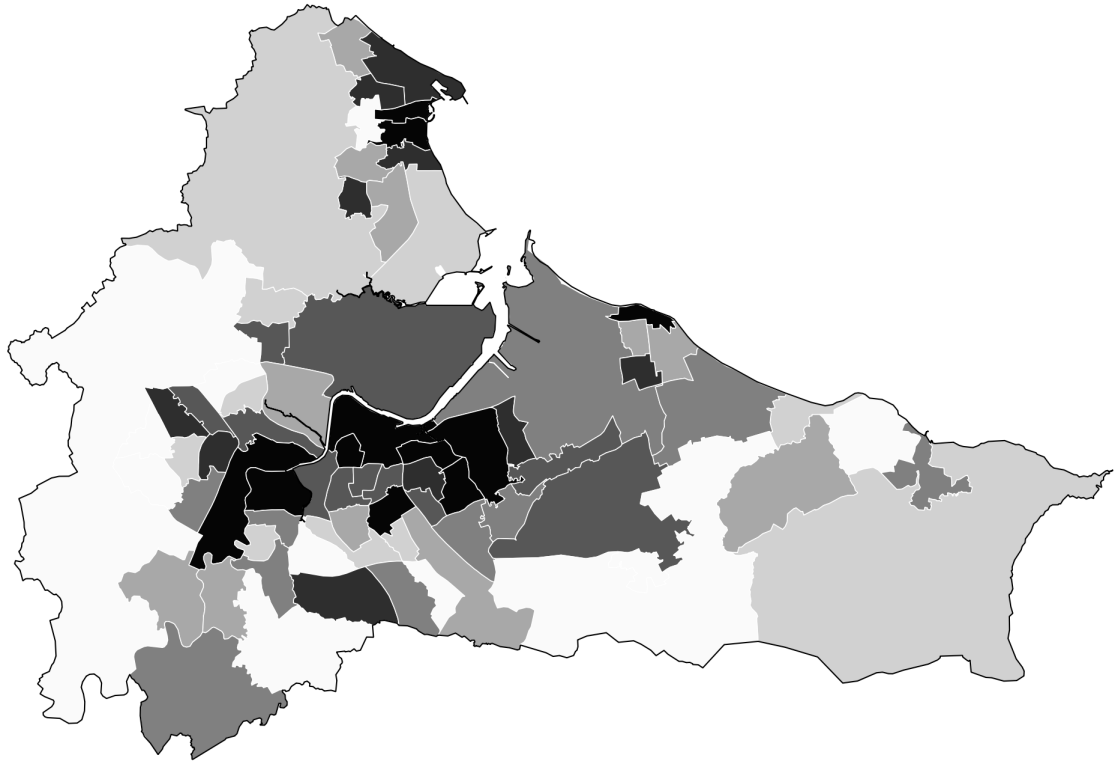


Figure 4: Map showing crime rate in Cleveland.

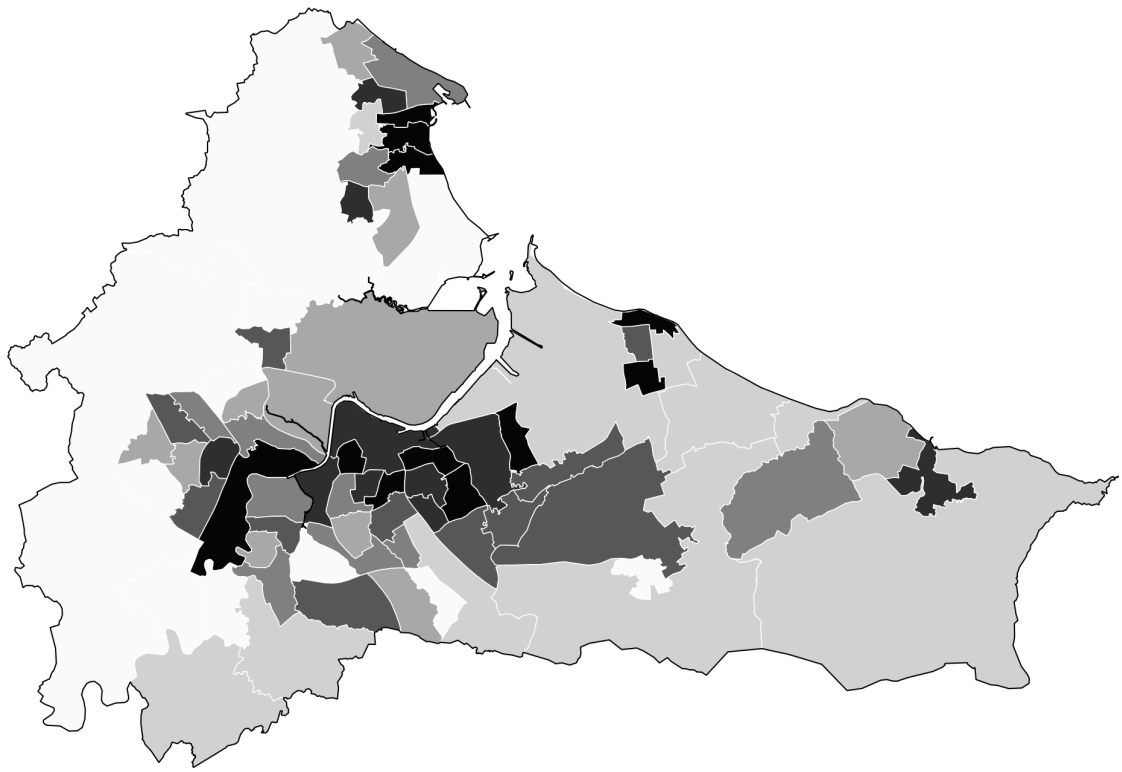
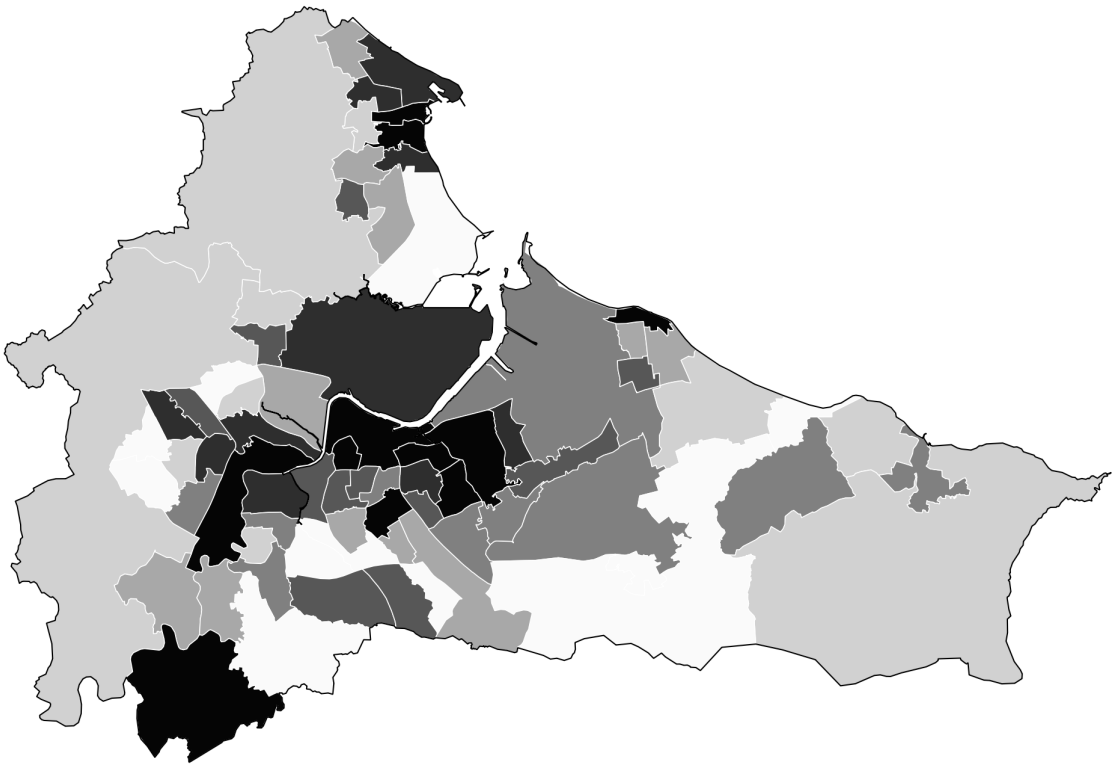


Figure 5: Map showing crime harm in Cleveland.



Further resources

Sherman LW and others. (2020). ‘How to count crime: the Cambridge Harm Index consensus’. Cambridge Journal of Evidence-Based Policing, volume 4, pages 1-14

Unit 7: Theory for problem analysis

Learning objectives

To know about the theories that support effective problem solving.

Description

Environmental criminology theories can support effective problem solving (Wortley and Townsley, 2016). Awareness of these theories can advance your problem solving in two main ways. First, these theories can act as a guide to get the best out of problem analysis. Second, these theories can help you make sense of your analytical findings, in order to better understand specific problems and work out how best to address them. Four theories are presented here, which share two common features.

- They are concerned with explaining **crime events** rather than criminality. They seek to explain why crime occurs when and where it does, as opposed to explaining why some people are more motivated to offend than others, and the source of that motivation.
- At the heart of these theories is **opportunity**. These theories maintain that opportunities cause crime, and that changes and patterns in crime can largely be explained by the supply, movement and distribution of crime opportunities. It follows that crime can be reduced by removing or reducing crime opportunities, without the need to alter offender motivation.

Routine activity perspective

Routine activity perspective is a theory about why crime events happen. It holds that crime requires three necessary components:

- the presence of a motivated offender
- the presence of a suitable victim or target
- the absence of a capable guardian

Crime occurs when these three components — offender, target and lack of a guardian — come together in place and time. The routine activity perspective appears simple, but it has great explanatory power. It tells us, for example, that crime requires more than criminals. Likewise, it suggests that crime can go up or

down even when our pool of offenders remains constant, because of, say, increases in potential victims or a loss of capable guardians.

Place management theory

Place management theory is closely related to the routine activity perspective (Eck, Linning and Madensen, 2023). This theory helps work out why many places have little or no crime and a few places have a lot of crime. The focus of this theory is on place managers, meaning people or organisations who own or operate specific places, from schools and shops to hotels and hospitals. Place managers matter because their actions can increase or decrease crime opportunities, be that through changing how space is organised, accessed and through ways in which behaviours are managed. Identifying and mobilising place managers is often a key component of good problem solving.

Crime pattern theory

The routine activity perspective sets out the ingredients for crime. It says little about how these ingredients converge in time and space. For this we turn to crime pattern theory, which considers how offenders locate or encounter crime opportunities as part of their everyday activities. Crime pattern theory argues that offenders prefer to commit crimes in areas that they are familiar with, where they possess greater knowledge about available targets and guardians. These places form part of an offender's awareness space, referring to the areas where offenders routinely visit or pass through as part of their daily routines.

Crime pattern theory makes two predictions relevant to problem solving:

- crime will cluster in areas where the awareness space of motivated offenders overlaps with the awareness space of suitable victims
- since most human activity starts and ends at home, offenders will tend to commit more crimes closer to home than further away

So-called journey-to-crime research confirms this prediction. Evidence consistently shows that offenders do not travel far to commit crime and that the rate of crime diminishes as distance from offender's homes increases. For example, in Chicago it was found that 72% of sexual assaults and 53% of robberies occurred within 1500 metres of the offender's home (Block, Galary and Brice, 2007).

Rational choice perspective

Crime pattern theory complements the routine activity perspective. The latter describes the conditions that need to be in place for crime to happen. The former describes where and when these conditions are most likely based on the everyday activities of offenders, victims, and guardians. But crime isn't inevitable when offenders and victims meet in the absence of suitable guardians. This is because crime is a choice. And offenders choose whether to act on available crime opportunities. To better understand the criminal decision-making process we go to the rational choice perspective.

Rational choice perspective takes the view of the offender. It assumes that offenders choose to commit crime in much the same way as people choose to carry out any type of behaviour. Decisions are based on a rough-and-ready assessment of the perceived risks, efforts and rewards associated with a particular behaviour at a particular time in a given setting. Viewed this way, crime is considered more likely to occur if the perceived gains outweigh the perceived losses (broadly defined).

Of course, rational does not mean successful – if it did then no offender would ever be caught. Instead, crime is considered rational insofar as choices about whether to engage in crime are to some extent deliberate (as opposed to random), are informed by information present in the immediate environment, and represent what an offender considers to be the best course of action at that particular time and place.

Rational choice has important implications for problem solving. If decisions about crime are based on a person's perceived 'rational' assessment of risks, effort and reward, it follows that crime can be reduced by activities which lead offenders to believe that crime in a given situation is more risky, requires more effort and is less rewarding. This basic premise underpins the highly successful situational approach to crime prevention (Clarke, 2016).

Demonstration

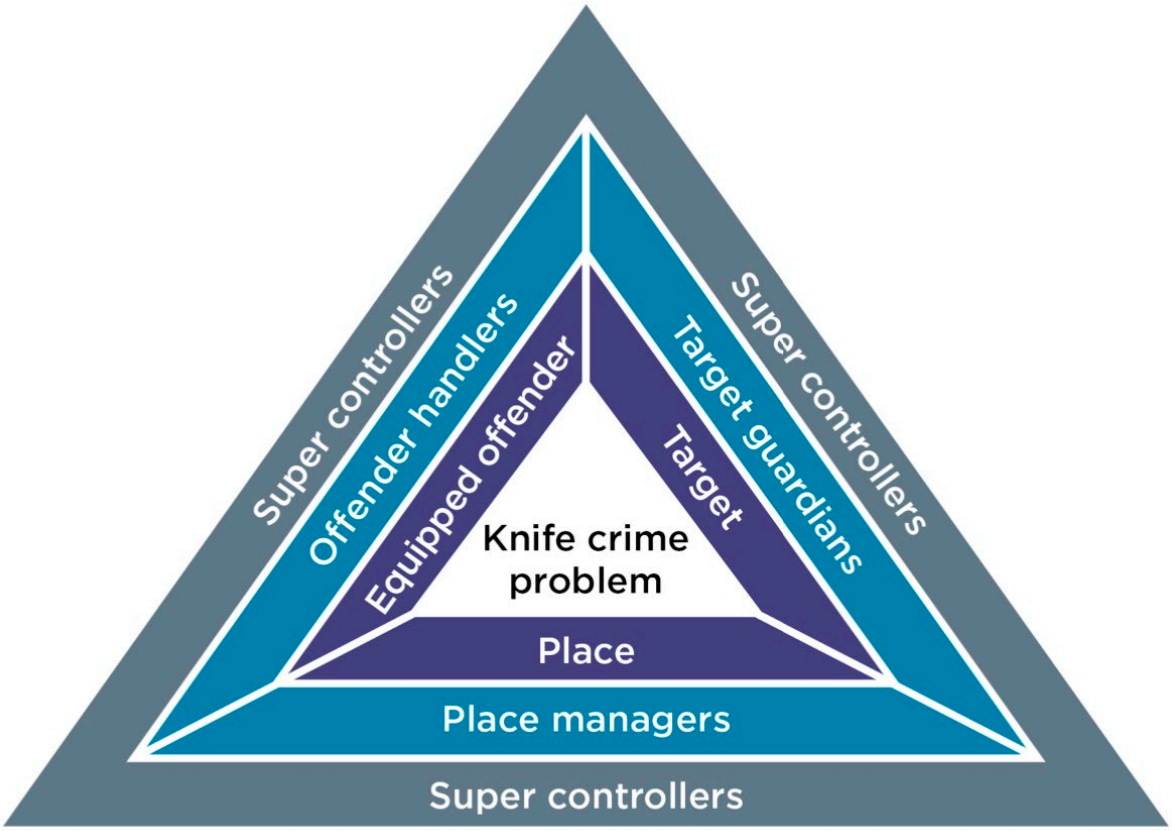
The problem analysis triangle (see Figure 6) is a reframing of routine activity theory. It is an important tool for two main reasons.

- It provides a framework to structure crime analysis so as to pay due attention to the offender-, victim- and location-aspects of a problem.

- It emphasises that crime is dependent on more than offenders, thereby helping to identify a fuller range of prevention possibilities.

In the context of knife crime, for example, considering each side of the problem analysis triangle might encourage problem solvers to ask how the locations where knife crimes cluster might be made less conducive to violence (place). Or, how might the predominant targets of knife-crime be better protected to make them less vulnerable (victim)?

Figure 6: Problem analysis triangle applied to knife crime.



Further resources

Wortley R and Townsley M. (2016). Second edition. 'Environmental Criminology and Crime Analysis'. London: Routledge

Unit 8: Selecting suitable problems

Learning objectives

To know what is meant by a ‘problem’, and the kinds of problem most suited for police problem solving.

Description

Police problem solving was born of dissatisfaction. Dissatisfaction with the prevailing model of policing, which was predominately reactive and heavily reliant on law enforcement. And dissatisfaction with efforts to reform policing, which centred on what the police did rather than what the police achieved. This is what Herman Goldstein called the ‘means-over-ends syndrome’ (Goldstein, 1979). A problem solving approach called for a shift of the goalposts – a focus on the effectiveness of the police to deal with persistent ‘problems’.

But what are ‘problems’ in police problem solving? And are some problems better suited to the problem solving process than others? Answering these questions is the goal of this unit.

There are four hallmarks of an appropriate problem for the purposes of problem solving:

- A problem should be **reoccurring**, rather than be a one-off incident.
- Those incidents of crime and disorder which are reoccurring must be **related** in some meaningful way.
- The problem should **negatively affect** the community.
- The problem should fall within the **police remit** to do something about.

Defined this way, it should be clear that not every issue that is brought to the attention of the police will benefit from a problem solving approach. Problem solving is not about responding to singular incidents. Nor is problem solving, as defined here, about tackling broad social forces such as poverty and inequality, which contribute to violence but which largely fall outside of the police remit.

Defined this way, it should also be clear that there are a great many issues which **do** meet the criteria of a ‘problem’, meaning persistent and connected issues that concern the police and harm the community. Serious violence is one example. But

serious violence is likely too broad a category of crime when it comes to effective problem solving. Evidence shows that problem solving tends to be more effective when focused on **specific** categories of offences. This is because different types of crime tend to be carried out by different groups of people, for different reasons, using different resources. Responding to these different categories of crimes may require different interventions involving different partners. Importantly, a focus on specific problems when problem solving does not need to follow official Home Office or police force crime categories. For example, for the purposes of problem solving, it often makes little sense to separate assault with and assault without injury, since the threshold of 'injury' is often a function of circumstance rather than offender motivation.

Take knife crime. Though routinely discussed as a singular problem, in reality 'knife crime' encompasses a range of different problems including knife-enabled robberies, knife-enabled assaults, possession of an offensive weapon, illegal sale of a prohibited weapon, and so on.

Even within these more specific categories of knife crime, differences in offender, victim and/or location might give rise to distinct problems which would benefit from being analysed separately. In the case of knife-enabled robbery, for example, knife-enabled robbery of school children for their mobile phones is a rather different problem to knife-enabled robbery of victims for expensive watches. Simply put, problem solving tends to be more effective when directed at more specific, tightly defined problems.

As Ron Clarke and John Eck have noted, 'there are few rules for determining precisely the level of specificity needed for a successful POP project' (Clarke and Eck, 2003). Go too specific and the number of crimes might be too low to warrant your problem solving efforts. Likewise certain kinds of serious violence, such as gun-enabled homicides, are sufficiently rare in the UK that at the local level there may be too few incidents to identify meaningful patterns. Such problems, where patterns are evident, would therefore need be assessed at a broader level of geography.

Demonstration

Being crime specific is an important element of effective problem solving. Going too broad can miss important clues that can usefully inform your response. Moreover, a

broad problem definition often leads to shallow analysis which invariably translates into generic enforcement-oriented police tactics. Figure 7 and Figure 8 help illustrate the value of being crime specific. Both relate to the same small area of London over the same time period. Both maps show the spatial concentration of knife crime (the darker areas denote areas of higher levels of knife crime). However, Figure 7 shows the spatial distribution of knife-enabled robbery, while Figure 8 shows the spatial distribution of knife-enabled wounding. Same place, same broad category of serious violence but, when broken down into something more specific, markedly different spatial patterns – one highly concentrated (around several restaurants and bars) and the other more diffuse, clustering around a group of local convenience stores and fast-food premises.

Figure 7: Map showing the spatial distribution of knife-enabled robbery in London.

Figure 8: Map showing the spatial distribution of knife-enabled wounding in London.

Further resources

Eck J. (2003). 'Police problems: The complexity of problem theory, research and evaluation'. Crime Prevention Studies, volume 15, pages 79-114

Unit 9: Prioritising problems

Learning objectives

To know about some of the key considerations when prioritising problems for problem solving.

Description

Unit 8 defined a ‘problem’ as a group of reoccurring events which share something in common, which impact the community and which the public expect the police to deal with. Defined this way, it is clear that the police are called upon to contend with a vast array of problems. This poses a challenge when problem solving. If so many issues meet the criteria for a ‘problem’, and given resources are always finite, how might you go about prioritising problems for problem solving attention?

Mike Scott, director of the Center for Problem-Oriented Policing, outlines seven considerations when prioritising policing problems (Scott, 2015).

Severity of harm

All crime generates harm, but some crimes are more harmful than others. All things being equal, those violent crimes which generate the most harm should take precedence over other less harmful violent crimes.

Frequency of violent events

Violent crimes can generate similar levels of harm but occur at dissimilar frequencies. All things being equal, those violence issues that occur more frequently should take precedence over other less frequent forms of violence.

Fear of crime

Crime is an inadequate predictor of fear of crime. Some people who experience low levels of crime can nevertheless exhibit high levels of fear of crime, and vice versa. Some types of violent crime generate more fear among the public than others. Stranger-perpetrated sexual assault is a prime example. All things being equal, those violence issues that generate higher levels of fear of crime should take precedence over other violent crimes which generate less community concern.

Financial costs of crime

All crime carries costs (broadly defined), but some crimes are more costly than others. All things being equal, those violence issues that generate greater financial costs should take precedence over comparable but less costly violence problems.

Whether police and partners want to address the problem

Many officers and staff join the police service to reduce crime-related harms. Yet among a range of presenting violence problems, it is likely that some will be viewed as more pressing than other. There are many reasons why this might be so. There may be concerns about how a particular violence problem has so far been approached. Or there may be a sense that a particular violence problem is rising and efforts are needed to stem the tide. As Scott (2015) writes, ‘Effective problem-oriented policing projects invariably require strong leadership, a critical aspect of which is persistence in seeing the project through to a satisfactory conclusion: a deep and genuine interest in addressing the problem fosters that persistence’.

Prospects for successfully tackling the problem

Problem solving is pragmatic. It is about selecting suitable problems and directing preventive attention to those aspects of the problem that are amenable to change. When prioritising problems, it is therefore sensible to devote resources to those issues where there is a reasonable chance that success can be achieved. Clearly this is hard to predict in advance. But, in deciding on presenting violence problems, it makes sense to favour those where sufficient resources are available, where rich data and intelligence exists, and where there is greater community, partner and political support in tackling the problem.

Whether the problem will improve without dedicated problem solving attention

The robbery of cash boxes from bus drivers was once a common problem in the UK. Likewise the robbery of cash from taxi drivers. Both kinds of robbery are now rare, owing to reductions in crime opportunities following both modes of transport being largely cash-free. These two examples speak to a broader point of relevance here – some current pressing violence problems might be expected to fall as a result of developments in the near-future and without any dedicated police intervention. Where this is deemed likely, clearly a decision has to be made about whether

increased investment to reduce harm in the here-and-now makes sense or whether other candidate problems are more deserving of greater police investment.

Demonstration

Problem solving is often a collaborative endeavour, involving colleagues from within your organisation as well as external partners. Different members of a problem solving team will likely hold different views about the aforementioned seven considerations for prioritising policing problems. Table 3 illustrates how these factors might be organised and scored in a transparent way to assist prioritisation decisions.

Further resources

Scott M. (2015). ‘Identifying and defining policing problems’. Problem-oriented guides for police, problem-solving tools series no. 13

Table 3: Prioritising problems when problem solving.

Violent crime problems	Severity of harm	Frequency of incidents	Fear of crime	Financial costs	Will to address the problem	Prospects for success	Improvement absent police intervention
Knife-enabled robbery	Medium	Frequent	High	Medium	High	High	Unlikely
Gang-related homicide	High	Infrequent	High	High	High	Medium	Unlikely
Assaults in or near bars	Medium	Frequent	Low	Medium	Medium	Medium	Likely
Zombie knife carrying by young people	Low	Infrequent	Medium	Low	Medium	Low	Unlikely
Violence in and around football stadia	Medium	Infrequent	Low	Low	Low	Low	Likely
Robbery against taxi drivers	Low	Infrequent	Low	Low	Low	High	Likely

Analysis to determine patterns

Unit 10: Repeat offending

Learning objectives

To know what repeat offending is, how to measure it, and its implications for reducing crime.

Description

The previous units in this guide focused on data and ways to identify specific and suitable problems. In this section, we now turn our attention to the different ways in which problems are patterned. We start with repeat offending.

Most people who commit crime do so infrequently and when they are young. Extensive evidence shows that the likelihood of engaging in criminal behaviour peaks in adolescence and declines from early adulthood (Loeber and Farrington, 2014). This enduring pattern is known as the age-crime curve. Yet within any offender population, there are some offenders who reoffend. These persistent offenders typically make up a small proportion of all **offenders** but account for a sizeable proportion of all **offences** (Tilley, 2013). For problem solving, the importance of repeat offending is straightforward. Crime can be reduced if you can identify persistent offenders and implement measures to reduce their rate of offending.

There are different ways of counting repeat offending.

- **Proven reoffending** counts offences that have been proven in court, using criminal justice data.
- **Accused data** count offences where a named suspect has been formally accused of a crime, using police recorded crime outcome data.
- **Suspect data** count offences where there is at least a named suspect, using police recorded crime data. This could include offences for which a person faced no further action or was not charged because there were evidential difficulties.

Rates of reoffending are usually generated over 12-month rolling periods. Although this is often satisfactory for higher volume violent crimes such as domestic abuse

and robbery, you may wish to consider longer time periods if focusing on the most serious (but less frequently recorded) violent crimes, such as shootings. The time between reoffences in this case may be longer such as when the original event has been followed by a lengthy period of imprisonment and/or injury recovery following weapon-related violence.

For some violence problems, there may be benefits in considering a wider range of factors beyond just the violent crime of interest. For example, is there a sequence of events that escalate from less to more severe forms of violence? If your problem focuses on a vulnerable population, then you might want to isolate that population first before going on to analyse repeat offending across a range of crime types. Similarly, if identifying repeat offending among individuals continues to provide limited value, then you might try shifting the target of your analysis to consider the extent of victim-offender overlap (**Unit 16**).

Demonstration

This demonstration shows you how to calculate levels of repeat offending using police data. It also demonstrates how you can use this data to estimate the probability of subsequent repeat offences.

First, create a frequency distribution table as shown in Table 4. This table should contain the number of offences a person is accused of committing over a given time period (column 1). For the purposes of this demonstration, accusations number from 1 to 5. The next column (column 2) reports the total number of persons who have, say, one, two, three … accusations over that time period. Column 3 then shows the total number of offences per row. We would read this information as follows. There were 85 people who were accused twice of committing crime over the selected time period. These individuals collectively committed a total of 170 offences (85 × 2). For each row, we then calculate the total number of people who were accused of committing that number of crimes (column 4). In this demonstration, for example, there were 773 people who were accused at least once (sum of column 2 values). In each row we remove the preceding row, so in Column 4 row 2, we remove all one-time offenders from the total sample which leaves us with 129 people who were accused of two or more crimes. We then calculate for each row how many people went on to commit a subsequent offence (column 5). In the first data row, there were

129 people, from 773 in total, who went on to commit a subsequent offence. Of those 129 who committed at least a second offence, 44 went on to commit at least a third offence and so on. Finally, we can calculate the conditional probability (column 6) of repeat offending by dividing column 5 by column 4.

Table 4: Frequency distribution table on patterns of offending.

Person number of times accused (n)	Total persons by count of crimes committed	Total sum of offences	Total persons who committed n or more offences	Subsequent reoffenders	Probability of subsequent reoffences
1	644	644	773	129	17%
2	85	170	129	44	34%
3	25	75	44	19	43%
4	10	40	19	9	47%
5	9	45	9	0	-

Table 4 shows that the conditional probability of a repeat offence among this sample is 17%. In other words, given that a person has been accused of one offence, there is a 17% chance that they will be accused of one or more subsequent offences during the time period. This escalates with second time offenders having a 34% probability of committing further offences. At the third event this rises to 43% and so on. Using conditional probabilities alongside repeat rates can provide additional context that may be useful in determining a cut-off point for intervention or in determining the level and type of intervention applied to particular groups at a particular point in time.

Further resources

Tilley N. (2013). ‘Analyzing and responding to repeat offending’. Problem-oriented guides for police, problem-solving tools series no. 11

Unit 11: Geographic profiling

Learning objectives

To understand what geographic profiling is and how it can be used to support problem solving and criminal investigations.

Description

Geographic profiling is an investigative method that uses the locations associated with a series of crimes to determine where an offender most probably lives, or some other location from which an offender anchors their daily activities. The results from a geographic profile can help lead to the arrest of a serial offender or can support other investigative strategies such as intelligence gathering and surveillance.

To do geographic profiling effectively requires specialist knowledge and skills that cannot be covered in this single unit. Further resources are provided at the end of this unit on key publications and certified training. Geographic profiling is, however, an important method to be familiar with because of the large amount of offending that is serial offending. In this unit, we describe some of the key principles that underpin geographic profiling to help you consider how to incorporate them into your problem solving efforts.

At the heart of geographic profiling is the recognition that locations where offences take place can offer useful clues about an offender's spatial decision-making. Crime pattern theory (**Unit 7**) tells us that offenders tend to operate in places that are familiar to them, where they feel comfortable, that are easy to get to and where suitable crime targets are located. Other theoretical principles that are used in geographic profiling include consideration of the offender's search and attack methods (for example, did they follow their victim first or were they waiting at a location for the victim to pass by before attacking them?). Locations used in geographic profiling not only include where offences take place, but also other locations associated with criminal activity. For example, if an offender steals an item from their victim and then disposes of it, where they dispose of the item can be useful for a geographic profile. Being confident that different crimes are linked is an essential part of geographic profiling.

Geographic profiling is not necessarily about identifying where an offender most likely lives. Instead, it is best to think about geographic profiling as identifying where an offender anchors their spatial activities. These anchors could include a place of work or the location from which an offender conducts a hunt for their victims. Although initially developed to support the investigation of stranger violent crime (such as murder and rape), geographic profiling is now applied to a wider range of crime types that are considered to have serial qualities, including robberies against pedestrians and assaults.

There are several spatial analysis techniques that support geographic profiling. The most commonly used is the criminal geographic targeting (CGT) equation, a distance decay formula that analyses the locations associated with an offender (for example, crime locations and property deposition sites) to produce a probability map showing the offender's likely anchor point. The CGT equation is incorporated into Rigel, a specialist geographic profiling software application. The example in Figure 9 shows the use of Rigel and so-called 'journey to crime circles' as a simple alternative to the CGT equation.

Demonstration

Over a six-month period there was a series of eight sexual assaults in the city of Bath. All offences occurred between 23.00 and 03.30, with the majority occurring on Friday and Saturday nights. Each of the victims were young women who were walking alone from pubs, bars or nightclubs. The offender wore a balaclava at the time of each attack. Figure 9 illustrates the use of journey to crime (JtC) circles. A radius of 0.5 miles was drawn around each assault location (drawing on previous research into the distance offenders travel when committing sexual assaults). Based on these circles, it was assumed that the offender most likely had an anchor point in the area where most circles overlapped, denoted in red. Figure 10, covering the same area of Bath, shows the result from the CGT equation. The peak profile identified the area around Milsom Street, George Street and Broad Street. The analytical interpretation from the temporal characteristics of the crime series and the MO of the offender, suggested the peak profile area most likely identified where the offender was searching for victims. It was suspected that the offender was following his victims from this area before assaulting them.

Figure 9: Results of a geographic profile on sexual assaults in Bath, shown with journey to crime (JtC) circles.

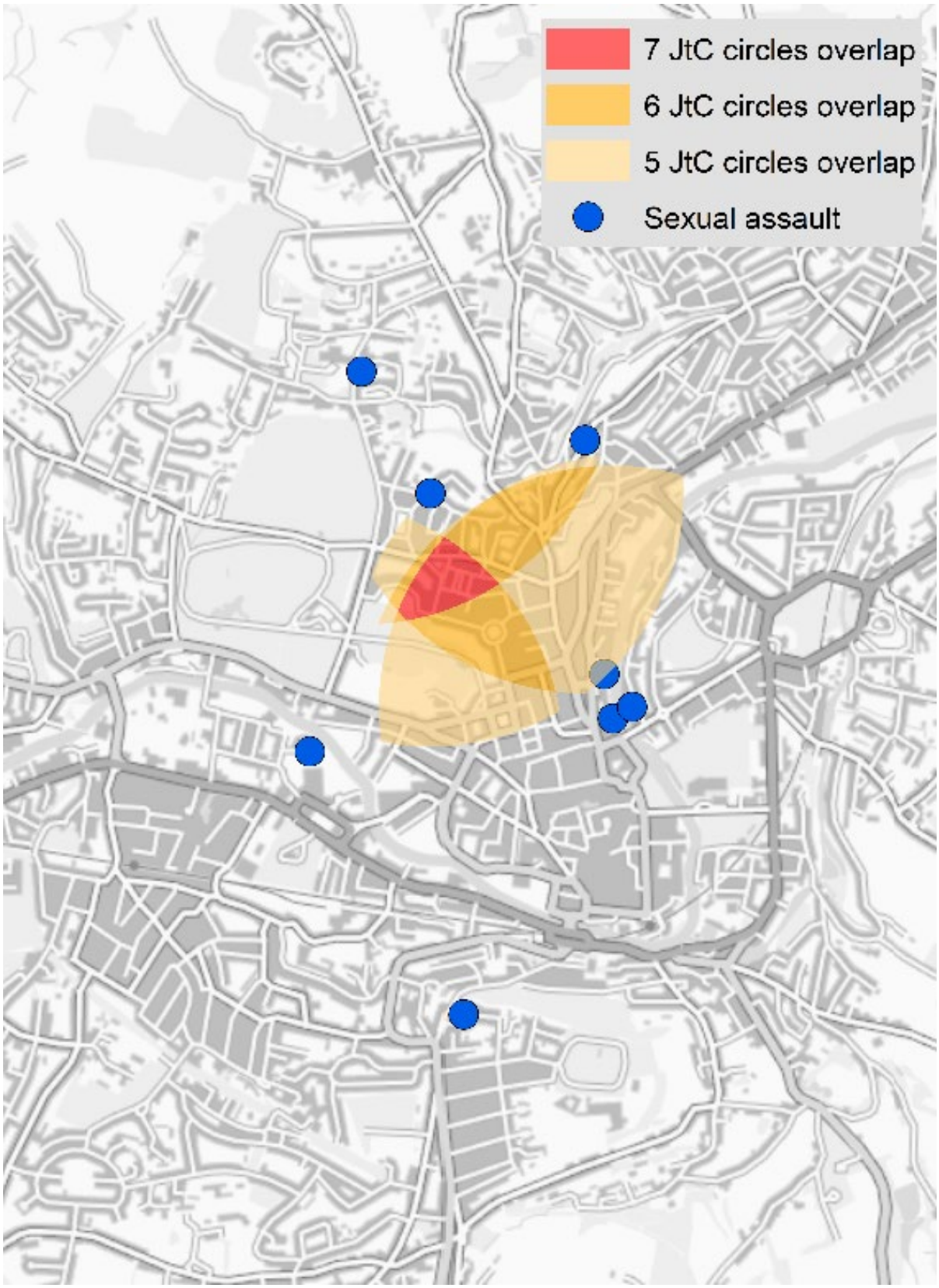
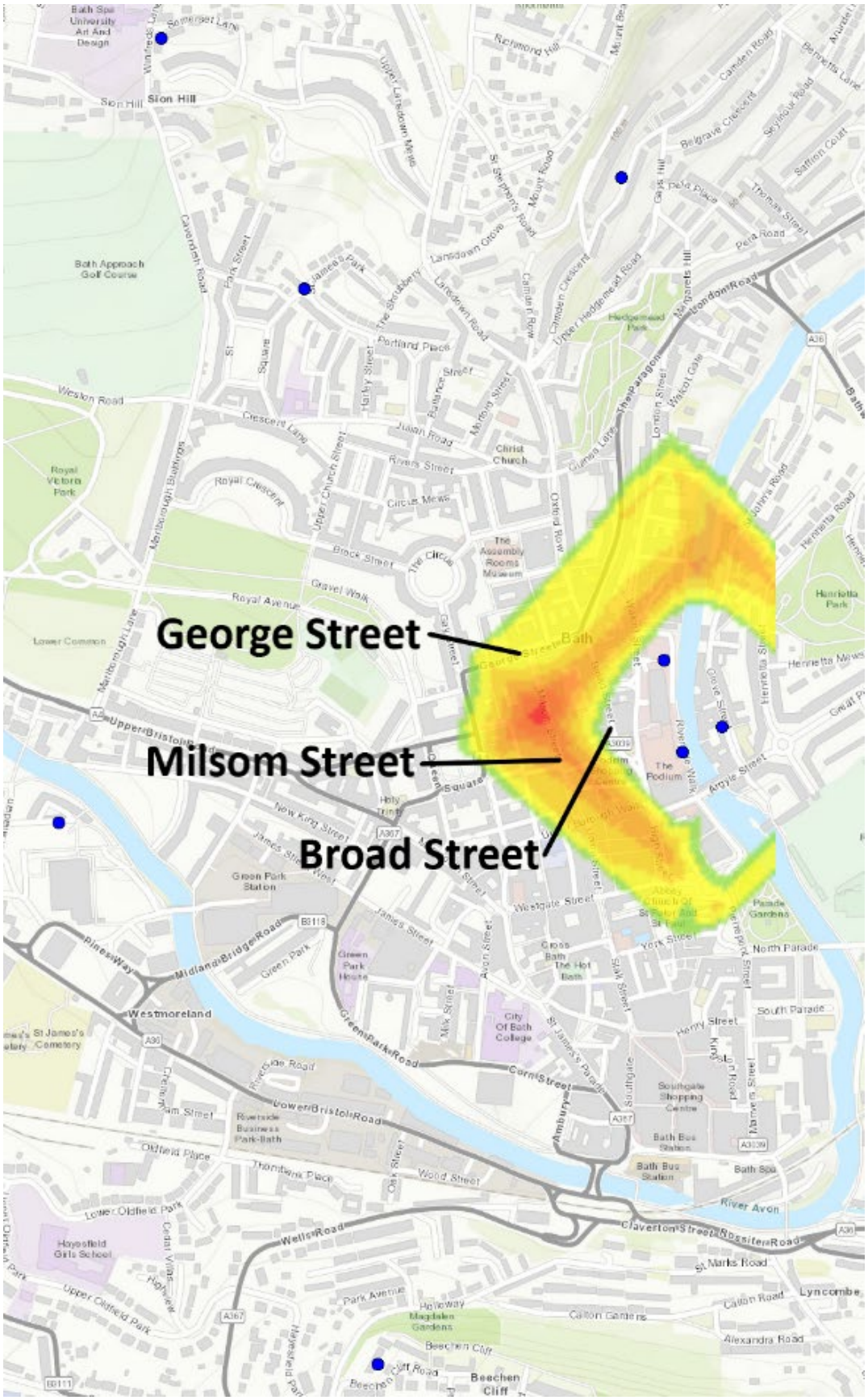


Figure 10: Results of a geographic profile on sexual assaults in Bath, using a criminal geographic targeting equation.



Using these results, the police implemented a decoy operation, using a young female police officer (dressed in plain clothes) as the decoy, walking along George Street, Milsom Street and Broad Street, supported by a team of police colleagues providing surveillance to ensure her safety and looking out for anyone behaving suspiciously. On the first night of the operation, the police identified a man who was watching the decoy police officer with interest, who then followed her as she walked north of the city centre, and was arrested when he tried to enter the safe house that she had entered just moments before. The man confessed to committing the sexual assaults.

Further resources

- Chainey SP. (2021). 'Understanding Crime: Analyzing the Geography of Crime'. Redlands, CA: ESRI Press
- **Internationally certified training programme in Geographic Profiling Analysis**.

Unit 12: Violence as social contagion

Learning objectives

To know that violence has been shown to spread within social networks, and the implications of these contagion effects for violence prevention.

Description

Human beings are social animals. Our thoughts, attitudes and behaviours are strongly influenced by our social ties and interactions. Take depression. Evidence shows that depressive symptoms can spread through social networks – they display so-called social contagion. Having a friend with depression increases the likelihood that you too will exhibit depressive symptoms (Bastiampillai, Allison and Chan, 2013). What goes for depression is also seen in patterns of obesity, smoking and, most relevant to this guide, violence.

Andrew Papachristos is a leading researcher into the transmission of serious violence across social networks. His research addresses a fundamental question – if your friend is a victim of violent crime, are you at an elevated risk of also experiencing violence in the near future? Put differently, does the risk of serious violence spread across social networks via a social contagion process?

In a word, yes. A series of studies on gun violence in the US has identified several recurrent findings about how violence spreads. First, gun violence is found to be highly concentrated within certain segments of a social network. In the Cape Verdean communities of Boston, for example, it was found that just 5% of the population accounted for nearly 85% of all gunshot victims (Papachristos, Braga and Hureau, 2012). Second, it matters what company you keep. Individuals belonging to social networks with a greater proportion of gun violence victims carry an elevated risk of being the victim of gun violence themselves. Third, ‘Closeness’ to a victim of gun violence is also important. Analysis of a co-offending network in Chicago, for example, revealed that for every social tie removed from a gun homicide victim, the odds of an individual themselves becoming a gun homicide victim reduced by around 58% (Papachristos and Wildeman, 2014). And fourth, attending to patterns of social contagion improves prediction. When assessing the performance of statistical models designed to predict who will be shot in the future, Papachristos and

colleagues found that models which included measures of social contagion outperformed those based only on demographic data such as a person's age, race and gender (Green, Horel and Papachristos, 2017).

Why, though, might exposure to violence in our social networks affect the odds of being the victim of violent crime? Papachristos and colleagues propose several mechanisms (Tracy, Braga and Papachristos, 2016).

- **Direct influence** – being in a social network with a violent offender increases the likelihood that they might act violently towards you.
- **Indirect influence** – interactions with members of your social network who are perpetrating violence might put you in risky situations where violence is more likely.
- **Exposure** – being exposed to violence as part of your social network might increase the chances of you acting violently, be it due to peer pressure or a (perceived) need to act in a given way.
- **Associations** – having links to those involved in violence might increase the risk of you being caught in the crossfire of violent conflicts and reprisals. This mechanism is commonly cited in instances of group-related violence.

Like the other crime patterns featured in this guide, knowledge that violence is both concentrated and contagious within social networks has important implications for violence prevention. If violence diffuses within social networks, it follows that anti-violence narratives and norms might likewise cascade through these channels. Opportunities might also exist to monitor, mediate and respond to community tensions in ways that might curb the spread of violence. This approach underpins the 'Cure Violence' strategy used in Chicago which, among other things, involves trained mediators and mentors being deployed in the aftermath of a shooting to those individuals judged to be at the highest risk of being involved in further conflicts and retaliatory violence (Butts and others, 2015). Similar violence interrupter (or navigator) programmes are in use in the UK, often targeting young people who present at emergency departments with injuries resulting from violence (see the **Accident and emergency navigators** section of the College of Policing **crime reduction toolkit**).

Demonstration

The study of violence as social contagion is a new and developing field. Available studies are predominately on gun violence in America. Moreover, at the time of writing we know of no software tools or available code to perform the sorts of analyses described in this unit's description section. There is, however, one recent study which suggests that network effects are similarly important in explaining patterns of violence in the UK.

In 2020, Paolo Campana and Andrea Giovannetti published a study which tried to predict who will commit violence with injury, based on information about prior behaviours (Campana and Giovannetti, 2020). Using a large dataset comprising 63,022 individuals linked to 375,599 police-recorded events, the data was split into two time periods:

- time period 1 comprised data between 1 January 2015 to 31 December 2016
- time period 2 comprised data between 1 January 2017 to 18 October 2018

The first dataset was used to generate a statistical model predicting assault with injury. This model included network-based variables. Two people were linked if the police data showed that they had committed a crime together, and the data for each individual included information about the behaviour of their associates. This model was then used to make predictions for time period 2. The success of these predictions was measured by calculating how accurate the model was at determining who did and who did not go on to commit violence with injury.

A series of statistical analyses identified several significant predictors of violence (with injury). The strongest predictor of future violence was previous violence. Put differently, individuals who committed violence with injury in time period 1 were much more likely to commit violence with injury in time period 2 (compared to offenders who did not commit violence in time period 1). Next, Campana and Giovannetti considered the role of social networks. Their results were consistent with results from the US. The offending behaviour of known associates had a significant impact in explaining future violent behaviour, even when controlling for the effects of previous episodes of violence. For example, Campana and Giovannetti found that prior association with an individual convicted of violence increased the chances of committing violence in the future by 16%. Prior association with someone flagged for

knife crime offences similarly increased the chances of committing violence in the future by 20%.

Further resources

Campana P and Giovannetti A. (2020). ‘Predicting violence in Merseyside: A network-based approach using no demographic information’. Cambridge Journal of Evidence-Based Policing, volume 4, pages 89-102

Unit 13: Social network analysis

Learning objectives

To understand what social network analysis is and how it can be used to inform disruption and prevention strategies.

Description

Social network analysis (SNA) is the study of relationships between social entities (such as people, groups and organisations). Most people associate SNA with network charts (or sociograms) such as the one shown in Figure 11. These diagrams illustrate the relationships between social entities, where nodes represent each entity and edges (the line drawn between nodes) represent a relationship. There is more, however, to SNA than the creation of sociograms.

SNA draws on the principle that what happens to a group is influenced by the extent and nature of connections within a group. It can support criminal investigations and assist problem solving efforts in several ways, including the following.

- Better understanding the structure and development of criminal groups.
- Determining the relative position of entities in a given network, and from this identifying specific entities that are vital to the effective operation of a group.
- Developing an understanding of co-offender selection and criminal collaboration among members of a group.
- Examining how networks change over time in response to changes in criminal (and police) activity.
- Better understanding the social organisation of illegal markets. For example, who is responsible for supplying stolen goods, who do they source these goods from, and who do they supply them to?

In SNA there are four main metrics for examining a network.

- **Degree centrality** refers to the number of direct connections that a node has.
- **Closeness centrality** is a measure of reach. This refers to the speed with which information can reach other nodes from a given starting node.
- **Eigenvector centrality** is a measure used to identify those in a network that are connected to other well-connected individuals. A person with a high eigenvector

centrality score may not have the most (or even that many) connections, but they associate with key people who do have good connections within a network.

- **Betweenness centrality** is a measure of the position of an entity between other nodes within a network. It indicates the extent to which a person mediates connections between people. This means that a person who has a high betweenness centrality score is in a position that provides them with the potential to control the flow of commodities or information between nodes in a network. In other words, this person is likely to play an important brokering role within a given network.

Software such as i2 and free SNA programmes such as Gephi and UCINET include tools that calculate these centrality measures.

Demonstration

Consider a criminal group involved in violence. This group consists of 19 entities. Each entity refers to a person, shown here as letters A to S with four letters being replaced by the names of the authors. Figure 11 shows the position of each person and the connections they have with other people in the group, based on police intelligence data and co-offending history. In SNA terminology, each person is represented as a node and each connection between those nodes is referred to as an edge. These nodes and edges have been entered into SNA software (if you are unfamiliar with how to do this, refer to the guide listed in further resources). For each node, degree centrality, closeness centrality, eigenvector centrality and betweenness centrality have been calculated. The top three entities in the network for each of these measures is shown in Table 5 (with the score for each measure).

Calculating these measures of centrality can be useful for determining how best to target police operations against a particular criminal group. For example, prioritising investigative focus and establishing the means that removes the individual with the highest betweenness centrality score (Aiden) will likely have the greatest disruptive impact on the functioning of the group.

For example, Aiden is responsible for coordinating the violent activities of the group. His removal may have most impact on disrupting the group's overall violent activities. If the police focus was to establish a contact in the group who could act as an

informant, then targeting the person with the highest eigenvector centrality score (Spencer) could be most beneficial.

Figure 11: Social network analysis of a criminal group.

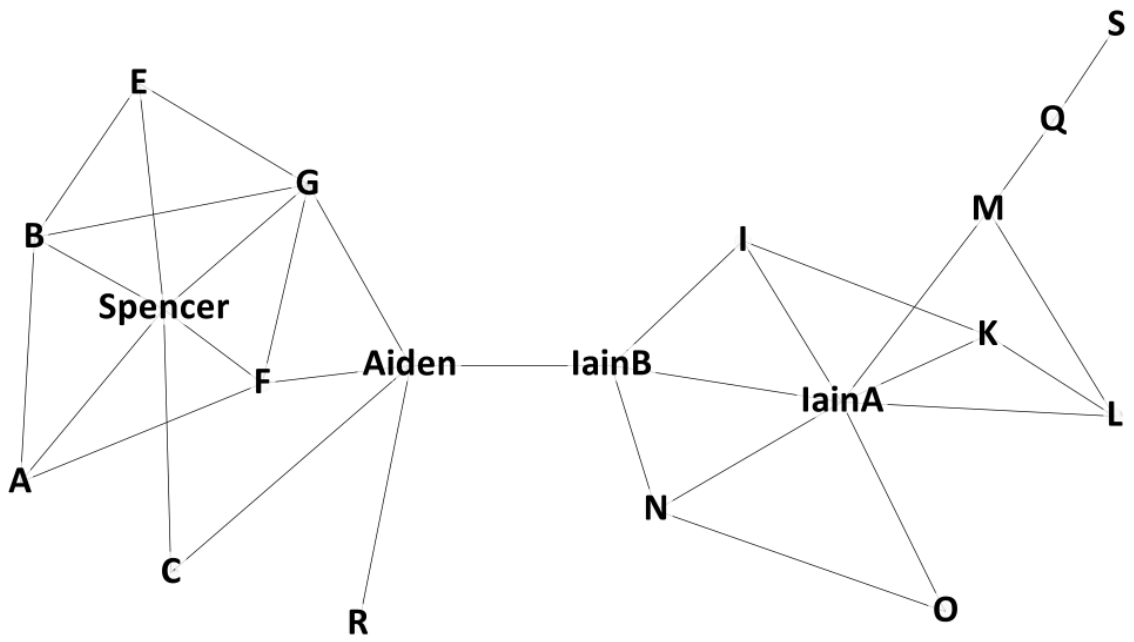


Table 5: The top three entities in the social network for four different measures.

Rank	Degree centrality	Closeness centrality	Eigenvector centrality	Betweenness centrality
1	Iain A (7)	Iain B (0.46)	Spencer (1.0)	Aiden (88.0)
2	Spencer (6)	Aiden (0.45)	G (0.94)	Iain B (81.5)
3	Aiden and G (5)	Iain A (0.43)	Iain A (0.80)	Iain A (66.5)

Further resources

Bichler G. (2019). 'Understanding criminal networks – a research guide'. Oakland, CA: University of California Press

Unit 14: Repeat victimisation

Learning objectives

To know what repeat victimisation is, how to measure it, and its implications for reducing crime.

Description

It is worth remembering that experiencing violence is rare. Most people do not. Those who do, tend to do so once. Yet in any given population, there are some victims who are repeatedly victimised. These individuals typically make up the minority of all victims but account for the majority of all victimisations (occurrences of violence). Research into repeat victimisation provides several important insights for problem solving.

- **Repeat victimisation is widespread**. Meaningful levels of repeat victimisation have been found for many crime types and across many settings, from Manchester to Malawi (Martinez, Lee and Eck, 2017).
- **Repeat victimisation is substantial**. Latest figures from the Crime Survey of England and Wales suggest that 52% of all violent crimes were committed against persons who already experienced violence in the past year.
- **Repeat victimisation tends to happen quickly**. Insofar as crime can be predicted, this suggests that prior victimisation is one of the best predictors of future victimisation (Polvi and others, 1991).

Patterns of repeat victimisation are not always self-evident, especially when using police data. Under-reporting of crimes to the police results in an underestimate of repeat victimisation, particularly among chronic victims (who with successive victimisations may be less willing to notify the police) or those reluctant to initiate police contact (such as sex workers who are the victims of assault). To illustrate, Table 6 reports estimates of repeat victimisation – the percentage of victims who were victimised more than once within the last 12 months – for different types of violent crime using police and survey data in 2021. It shows that victim survey data invariably reports higher levels of repeat victimisation than police data, sometimes considerably so.

Table 6: Estimates of repeat victimisation using police and survey data in 2021.

Category of violence	Police data	Crime survey of England and Wales
Domestic abuse	28%	29%
Knife wounding	4%	13%
Street robbery	2%	10%

The common presence and extent of repeat victimisation has important implications both for crime analysis and crime prevention. In terms of the former, comparing the characteristics of single victims with repeat victims can yield insights into what makes certain people and places more vulnerable to crime. These insights can in turn inform responses. In terms of crime prevention, the identification of repeat victimisation can help optimise resource allocation by directing police resources to those people and places who experience most crime and/or crime harm. Moreover, since repeat victimisation is often the work of the same offenders, focusing on repeat victims may provide an efficient means of identifying repeat offenders.

Demonstration

Calculating repeat victimisation using police data can require multiple variables, depending on how data is collected and stored. If your data systems assign unique reference numbers (URNs) to persons and venues (POLE databases), then the process is more straightforward. However, if this is not the case, then you may have to create your own unique identifier to determine which people and places are repeatedly victimised. A rudimentary way of doing this is to merge or concatenate a first and last name with a date of birth. Doing this in Microsoft Excel, the formula would look like this:

> =CONCATENATE(UPPER(cell with forename),” “,UPPER(cell with surname),” “,(TEXT(cell with date of birth,’DD-MM-YY’)

You can follow the same process for addresses by using a house or building number, street name and full postcode. However, you should recognise that simple methods such as this can produce undercounts or duplication where details are

entered incorrectly. For now, let's assume that you have a pristine dataset on victims of violent crime like that shown in Table 7. It should contain at least 12 months' data, which is standard for repeat victimisation analysis.

Table 7: Example dataset on victims of violent crime.

Crime number	Person URN	Person key	Count
587934	7370	JON SMITH 12-01-82	1
545401	2566	RAY SIGLER 14-02-96	1
549486	2566	RAY SIGLER 14-02-96	1
582272	3552	TONY GUY 31-11-00	1
553737	3552	TONY GUY 31-11-00	1
560713	3552	TONY GUY 31-11-00	1

By using a pivot table to summarise the information in Table 7, we can generate the statistics shown in Table 8. This tells us, for example, that two-thirds of the victims of violent crime experienced two or more offences, and that together these repeat victims accounted for 83% of all violent offences.

Table 8: Statistics generated from the example dataset on victims of violent crime (shown in Table 7).

	Persons	Crimes	% Persons	% Crimes
3 offences	1	3	33.3	50
2 offences	1	2	33.3	33
1 offence	1	1	33.3	17
Total	3	6	100.0	100.0

If we were to summarise our data by person, we can produce cumulative frequencies and rank order victims for prioritisation, as shown in Table 9. In this example, we can

see that 33% of victims, in this case just one person (Tony Guy), experienced 50% of all violent crimes.

Table 9: Statistics generated from the example dataset on victims of violent crime (shown in Table 7), summarised by person.

	Crimes	**% persons (cumulative)**	**% crimes (cumulative)**
TONY GUY 31-11-00	3	33.3	50.0
RAY SIGLER 14-02-96	2	66.6	83.0
JON SMITH 12-01-82	1	100.0	100.0

Further resources

Wiesel D. (2005). ‘Analyzing repeat victimisation’. Problem-oriented guides for police, problem-solving tools series no. 4

Unit 15: Near-repeat victimisation

Learning objectives

To know what near-repeat victimisation is, how to measure it and its implications for reducing crime.

Description

Unit 14 defined repeat victimisation and described how prior victimisation is a strong predictor of future victimisation. Repeat victimisation refers to the recurrence of crime against the same people or places. But what about people and places that are similar or related to the original victim, such as people located nearby? Following an initial crime, are they at a heightened risk of criminal victimisation?

Evidence says yes. Take residential burglary – evidence shows that following a burglary, the risk that the same property is burgled again increases, at least in the short term (usually a couple of weeks). This is repeat victimisation. Mounting evidence now shows that nearby neighbours also exhibit an elevated risk of being burgled, again in the near future. This pattern is known as near-repeat victimisation (Johnson and others, 2007).

Few studies have examined whether near-repeat patterns are observed for violent crimes in the UK. Examples can be found internationally, however. Jerry Ratcliffe and George Rengert analysed patterns of gun violence in Philadelphia (Ratcliffe and Rengert, 2008). Using analytical techniques originally designed to track the spread of infectious diseases, they found that shootings in Philadelphia were highly concentrated in time and space. In the wake of a shooting, another shooting was more likely to take place nearby and in the subsequent weeks. More specifically, they concluded that within two weeks and one city block of a previous shooting, the risk of a further gun crime was 33% higher than would be expected if shootings were random. Chainey and Muggah (2022) found similar near-repeat patterns in their analysis of violence across several cities in Brazil, which they attributed to retaliation and revenge offences between rival groups.

Patterns of near-repeat victimisations have important implications for crime prevention. If it is found that crime is more likely to occur close to, and shortly after a crime occurrence, then it follows that crime can be prevented by directing resources

at those places and times where crime is more likely. This basic premise lies at the heart of so-called predictive policing (Rosser and others, 2017).

Demonstration

There are several free tools to perform near-repeat analysis. This demonstration uses Jerry Ratcliffe's **near-repeat calculator**. The data requirements for this tool are straightforward. Data should be organised in comma separated values (*.csv), with each row of data containing an x-coordinate (or latitude), a y-coordinate (or longitude) and the date of the crime event, as shown using fictitious data in Table 10.

Table 10: Example of organising data for near-repeat analysis.

X-coordinate (latitude)	Y-coordinate (longitude)	Date of the crime event
440011	400326	04/03/21
431099	390512	13/03/21
453944	390877	17/02/21

The program performs the Knox test which determines whether events cluster in space and time more than would be expected by chance. It then generates an output – a Knox table – to indicate the degree of clustering across different spatial and temporal bands, as selected by the user.

The data used in this demonstration relates to confirmed incidents of illegal firearms discharges in one UK police force area for the period January 2018 to July 2020 (n = 177). 'Confirmation' is taken here to mean the recovery of ballistics at the scene and/or corroboration from multiple witnesses.

Table 11 shows the results of the near-repeat analysis using the near-repeat calculator. It shows the risk of firearms incidents by place (measured in 500m bands) and time (measured in seven-day intervals) following a firearms incident.

The values in the table represent effect sizes (**Unit 36**) and have an intuitive interpretation. The value in each cell represents how many times more pairs of events – here firearms discharges – occur within the selected space-time bands than would be expected if there was no spatio-temporal clustering.

Note that the Knox table presented in this unit does not include a ‘same place’ row, denoting firearm discharges which occur at the exact same location. This differs from many Knox tables produced when analysing property crimes such as burglary. There are two important differences between these crime categories. Firearms discharges (in the UK) are rare and they are not tied to fixed addresses in the same way as burglaries are. For this reason, exact-repeat firearm discharges at the same locations are infrequent. If the data you are analysing is of sufficient volume then it is worth exploring different bandwidth options including a same place option.

Table 11: Near-repeat patterns for illegal firearms discharges.

		Time between shootings (days)		
		[0, 7]	**(7, 14]**	**(14, 21]**
Distance (m)	**[0, 500]**	**3.34**	**4.30**	0.87
	(500, 1000]	**2.11**	**2.93**	0.58
	(1000, 1500]	1.63	1.06	1.44
	(1500, 2000]	1.69	1.46	1.29

The top left cell of Table 11 indicates that the number of pairs of events that occurred within 500m and 7 days of each other is 3.34 times higher as would be expected if there was no dependence. Values in bold are those where the clustering is statistically significant (**Unit 35**). Although the sample size here is small for this kind of analysis, the results provide tentative evidence that firearms incidents in this police force area display a ‘near-repeat’ pattern, over and above what would be expected on the basis of spatial concentration alone.

Further resources

Johnson SD. (2023). ‘Near repeat victimisation’. In Groff ER and Haberman CP. ‘Understanding Crime and Place: A Methods Handbook’. Philadelphia, PA: Temple University Press

Unit 16: Victim-offender overlap

Learning objectives

To know what is meant by the victim-offender overlap, how to measure it and its implications for crime reduction.

Description

It is commonplace to distinguish between those who experience crime and those who commit it. This is evident in the problem analysis triangle (**Unit 7**). It is also seen in the labels commonly ascribed to crime prevention initiatives, victim- or offender-oriented. In reality, however, evidence shows that the line between victims and offenders is often blurry. For many violent crimes, victims and offenders share similar characteristics. Moreover, those who commit crimes of violence are generally more likely to have experienced violence or do so in the future. This unit reviews the evidence and theory around the so-called 'victim-offender overlap' and describes why it matters for effective problem solving.

The term victim-offender overlap refers to the phenomenon whereby the same individuals both perpetrate and experience crime. This does not mean that **all** victims of crime are either prior offenders or will go on to offend. Rather, research into the victim-offender overlap indicates that a meaningful proportion of offenders also experience victimisation. Put differently, experience of crime is found to be a robust correlate of offending.

There is much evidence to support the existence of a victim-offender overlap, particularly for violent crime (Jennings, Piquero and Reingle, 2012). In a study of homicide, for example, it was found that 39% of victims had a prior arrest for violence (Broidy and others, 2006). Likewise for the broader category of violent crime, Feigelman and colleagues found that nearly three-quarters of those who admitted to committing violence had both experienced **and** witnessed violence in the past six months (Feigelman and others, 2000). Similar findings are observed across a range of settings, time periods and crime types. Indeed, some commentators have gone as far as stating that the victim-offender overlap sits alongside the age-crime curve as one of the most enduring findings in criminology (Berg and Schreck, 2022).

There are several explanations for the victim-offender overlap (Berg and Schreck, 2022). Some have argued that the experience of criminal victimisation results in elevated fear and anger which may provoke victims to perpetrate crime. Others suggest that offending and victimisation both arise from deficits in self-control, which give rise to more chaotic and reckless lifestyles where crime (and other risky behaviours) are more common. Others identify various risk factors – such as childhood neglect, exposure to violence, substance abuse and peer networks – which are associated with an increased probability of both engaging with and suffering from crime.

Knowledge about the overlap between victims and offenders yields at least two important insights for problem solving. The first relates to the targeting of interventions. In a recent study using data from Leicestershire Police, Sandall and colleagues found that individuals identified as both victims **and** offenders generated considerably higher harm scores (measured using the Cambridge Crime Harm Index, **Unit 6**) than individuals in the same dataset designated as either offenders or victims (Sandall, Angel and White, 2018). It follows that concentrating resources on dual victim-offenders may yield the greatest harm reductions. The second insight concerns the wider benefits of effective crime prevention. Put simply, evidence on the victim-offender overlap implies that successful efforts to reduce rates of victimisation may also prevent future offending behaviour.

Demonstration

Various methods have been developed to identify the extent of victim-offender overlap. These methods often use harm weighted measures to classify individuals along a victim-offender harm continuum. This demonstration describes one approach to work out the extent of the victim-offender overlap in your own data.

Classifying individuals into victims, victim-offenders and offenders first requires the preparation of data. A decision is required here as to whether you use named suspects or persons accused as your ‘offenders’ (**Unit 10**). Once decided, you should then aggregate counts, or harm-weighted sums, of crimes for everyone based on their designated role as either victims or offenders, as shown in Table 12. Current research has favoured using crime harm weights, which can be a more

useful approach when working with multiple categories of crime data and will allow for harm-focused prioritisation of individuals (**Unit 6**).

Table 12: An example of a data table showing crime counts and harm-weighted sums for individuals, categorised as either victim or offender.

Unique person ID	Role	Crime count	Harm sum
125567	Victim	5	128
125567	Offender	7	728
766888	Victim	30	600
4999680	Offender	2	4,500

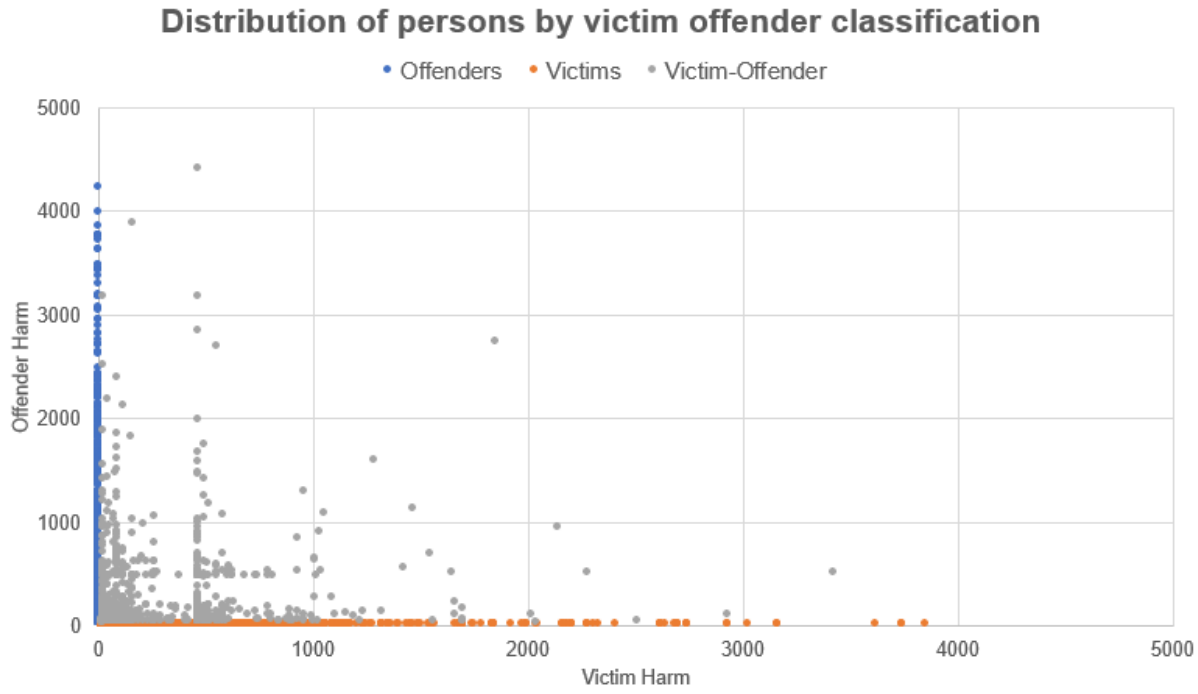
The next step is to transform your data into a table of individuals (one individual per row) alongside their victim and offender data. In Table 13, we proceed with the harm sum rather than crime counts. The simplest way to classify everyone is to assign those with 0 victim harm as ‘offender’ and those with 0 offender harm as ‘victim’. all remaining individuals are then ‘victim-offenders’.

Table 13: An example of a data table showing harm-weighted sum for individuals, categorised as victim, offender, or ‘victim-offender’.

Person ID	Victim harm	Offender harm	Classification
125567	128	728	Victim-Offender
766888	30	0	Victim
4999680	0	4,500	Offender

Your table can then be visualised using a scatter plot. This can help establish cut-off points for the targeting of interventions at high-harm victim-offenders. An example is shown in Figure 12. This scatter plot is based on a study by Natalie Hiltz and colleagues, who computed a ratio of victim harm to offender harm as a way of further classifying victim-offenders in Toronto (Hiltz, Bland and Barnes, 2020).

Figure 12: Scatter plot showing victim harm and offender harm.



Further resources

Bailey L, Harinam V and Ariel B. (2020). 'Victims, offenders and victim-offender overlaps of knife crime: A social network analysis approach using police records'. PLoS One, volume 15(12)

Unit 17: Hot spots

Learning objectives

To understand the value in identifying and examining hot spots of crime.

Description

A hot spot is an area of high crime concentration relative to the distribution of crime across an entire area. Hot spots can exist at different geographic scales, whether it be at the district level for identifying neighbourhoods where crime is highest, or at the neighbourhood level for identifying particular streets or buildings where crime concentrates. Identifying hot spots is a common feature of effective problem solving. In many cases it is the start of a problem solving project. Hot spots matter because they help determine where best to target preventive resources. Going further, working out what it is that is generating the 'heat' in a hot spot can help formulate more effective responses.

It has become trite to say that crime concentrates at hot spots. Those working in policing and crime prevention already know this. What is less evident, however, is the **extent** to which crime concentrates at hot spots. This is where research evidence adds value. Numerous studies have repeatedly found that crime, including violent crime, concentrates at small geographic scales. This is sometimes referred to as the **law of crime concentration** (Weisburd, 2015). Moreover, available evidence converges on the finding that about 1% of places in a city account for about 25% of crime in that city, and that about 5% of places account for about 50% of crime (Lee, Eck and Martinez, 2017). Effectively targeting crime hot spots can therefore make significant inroads into a city's overall crime problem.

There are two main technical approaches for identifying crime hot spots. The first approach involves using a 'heatmap' surface representation of the distribution of crime to show variations in crime levels across an area – using techniques such as kernel density estimation. The second approach is oriented towards identifying micro-places such as street segments or specific locations where crime is highest.

There are several techniques that can be used for identifying hot spots of crime. Here we list the main ones and refer you to the further resources section to find out about others.

Nearest neighbour index

The nearest neighbour index (NNI) (also referred to as the average nearest neighbour test) is a useful preliminary statistical test for determining if hot spots are present in geographically referenced crime data. If the NNI result is less than 1, then the data shows evidence of crime clustering (meaning that there are crime hot spots). If the NNI is 1, then the data is randomly distributed and if the NNI is greater than 1, it indicates that the data being analysed is uniformly distributed across place. The NNI also includes a test to determine if your results are statistically significant (**Unit 35**).

Kernel density estimation

Kernel density estimation (KDE) is one of the most common mapping techniques for visualising crime hot spots. KDE uses geographically referenced point data to create a surface representation of the variation in the density of crime. Areas with the highest levels of density are hot spots.

Gi* statistic

The Gi* statistic is a technique that identifies statistically significant hot spots of crime. The technique uses counts of crime for geographic units (such as small grid cells) to compare if the sum of values in the unit of interest and its neighbours (within a user defined radius) is different to the values in the geographic units across the entire study area. The output generated from the Gi* statistic are standardized Z scores that are used to determine whether the Gi* value for each geographic unit is statistically significant.

Street segments

The analysis of geographic patterns of crime has increasingly become concerned with examining crime at the micro-place level. This is based on the recognition that district and neighbourhood level analyses often mask the uneven distribution of crime at lower levels of geography (such as streets and specific addresses). Street segments are the most common unit of study in micro-place hot spot analysis. This type of analysis requires counts of crime to be calculated for each street segment, from which the streets with the highest levels of crime can then be identified. In line with the bandwidths for the law of crime concentration, this usually involves

identifying those streets that account for a cumulative proportion of 25% or 50% of all crime.

Demonstration

An analysis of robbery in an area in London identified clustering in the data – the NNI result was 0.32 (p-value <0.001). A KDE map showed where the density of crime was highest (Figure 13) and the Gi* statistic map showed where the concentration of crime was statistically significant (Figure 14). A street segment level analysis revealed that within the main crime hot spots, only certain streets experienced high levels of crime. Collectively, these maps show the areas and specific micro-places where robbery concentrates, and where problem solving attention could sensibly be focused.

Figure 13: Kernel density estimation of robbery in London.

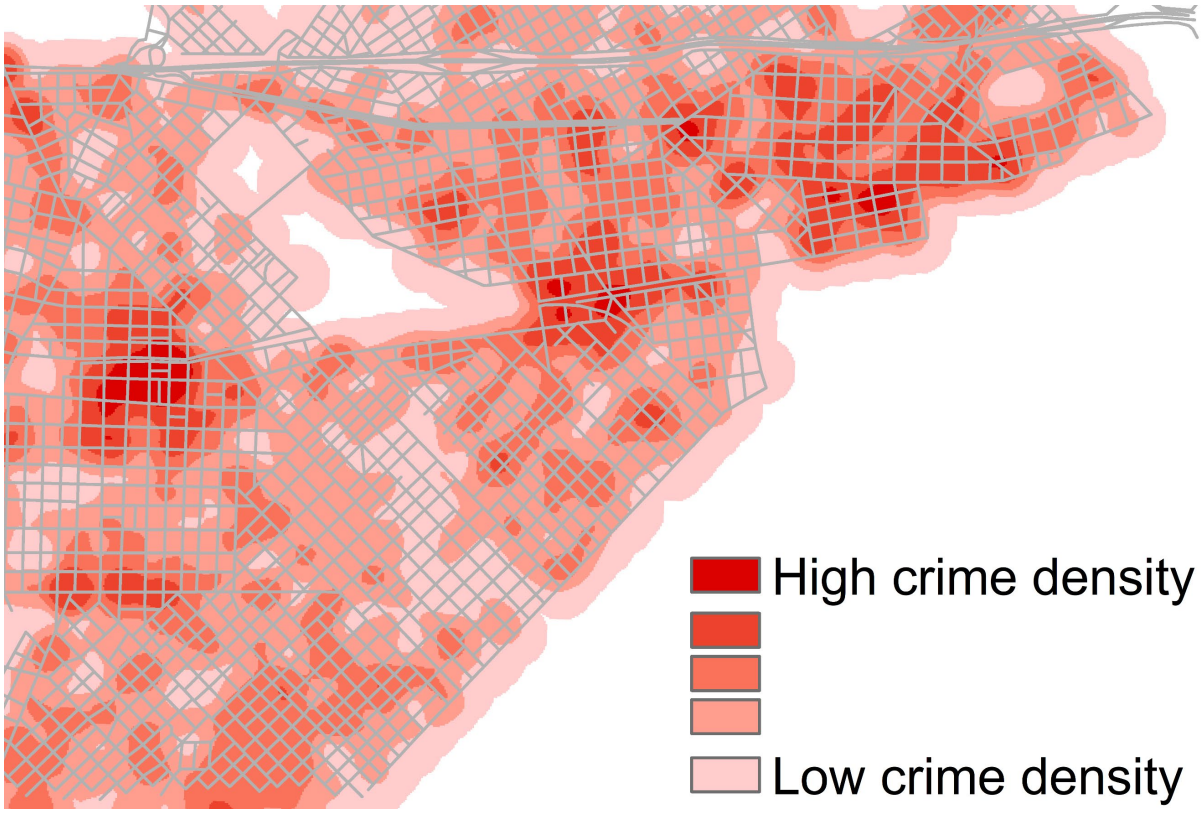
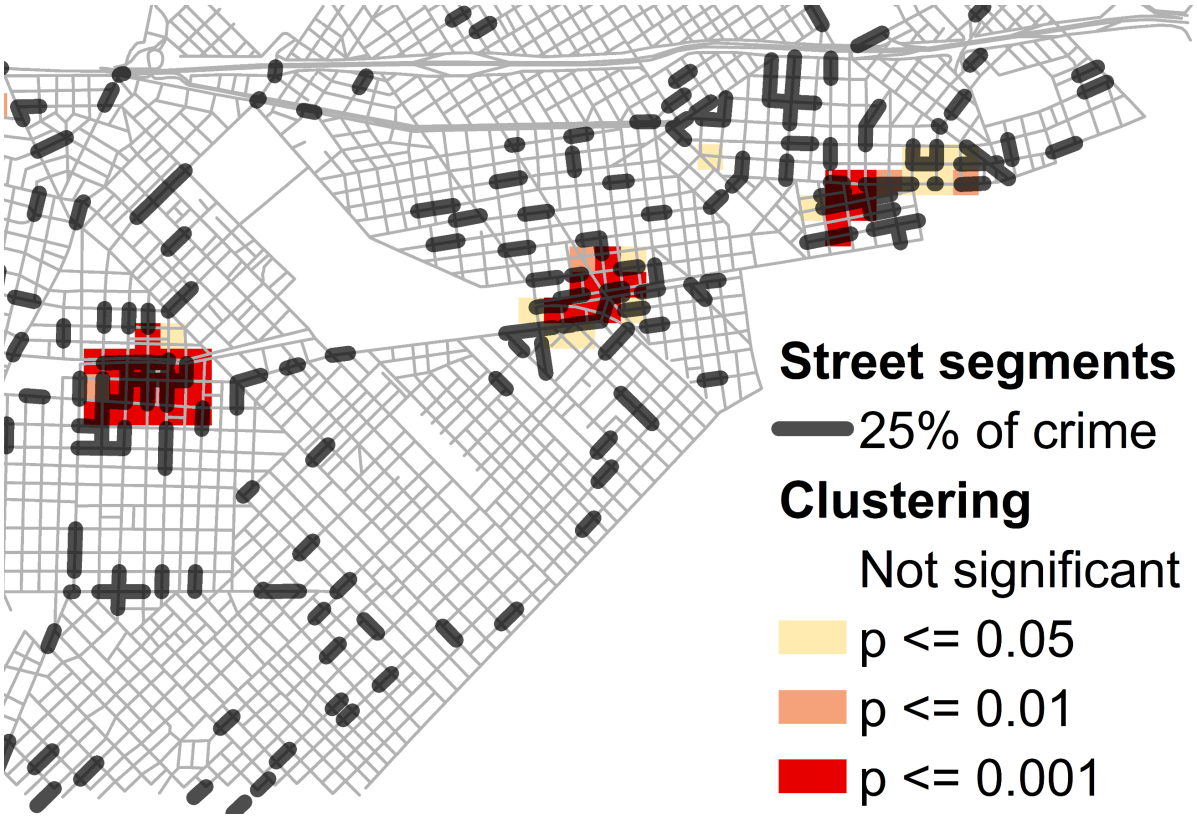


Figure 14: A Gi* statistic map of robbery in London, overlayed with street segments that account for a cumulative proportion of 25% of crime.



Further resources

Chainey SP. (2021). 'Understanding Crime: Analyzing the Geography of Crime'. Redlands, CA: ESRI Press

Unit 18: Emerging hot spots

Learning objectives

To understand how to identify emerging hot spots.

Description

Good problem solving gets upstream of crime. A simple way to identify areas where crime is increasing is by using a technique known as map subtraction. This technique involves creating a hot spot map for a time-period of interest, creating another hot spot map for a second time-period of interest (but for the same time duration as the first hot spot map) and subtracting one map from the other. Most GIS software includes functions for performing map subtraction. However, there are limitations with this technique. First, this type of map only indicates numerical change. This means it may show areas where crime is increasing but this increase has been from a low level (for example, of only one crime) to what is still a relatively low level (for example, three crimes – a difference of two additional crimes, or represented as a 200% increase). Second, the map may show areas experiencing a small percentage change in crime but which are areas where high levels of crime continue to persist (for example, from 15 to 17 crimes, representing a 13% increase). A more useful map would be one that shows those areas where new hot spots have emerged and where existing hot spots have intensified. This requires the use of more advanced analytical techniques. We introduce these techniques in this unit and refer you to the further resources section for more details.

One technique to identify emerging crime hot spots uses the dispersion calculator (Ratcliffe, 2010). Imagine that your district has experienced a 25% increase in assaults. It is likely that not all areas within your district have experienced an equivalent increase in assaults. Instead, some areas have likely contributed more than others to produce this overall increase. The dispersion calculator is a free tool that identifies those areas that are most responsible for an overall increase in crime. The tool requires data to be aggregated as counts of crime for geographic units such as Census output areas or grid cells. The dispersion calculator generates three useful outputs.

- The **offense dispersion index** (ODI, ranging from zero to one) denotes the proportion of areas that have contributed to an area-wide equivalent increase in crime. If the ODI value is close to zero, it indicates that crime has increased in only a small number of areas, whereas an ODI value closer to one indicates that overall crime increases are associated with rises in crime in many areas.
- The **non-contributory dispersion index** (NCDI, ranging from zero to one) indicates the proportion of other areas that showed increases in crime but which were not major contributors to the overall crime increase. The NCDI is useful to help identify areas of possible concern where a problem may be emerging. A NCDI value close to zero may suggest an isolated emerging problem whereas an NCDI value closer to one indicates a more widespread emerging crime problem.
- The rank ordering of areas (referred to as **emerging problem areas**, EPAs) that have contributed most to the overall increase in crime. These EPAs can be mapped and, for obvious reasons, might sensibly be prioritised for problem solving attention.

A technique that complements the dispersion calculator is the **crime concentration dispersion index** (CCDI). The CCDI determines whether an observed increase in crime in a given area is attributable to either hot spots becoming hotter or increases elsewhere (meaning that new hot spots are emerging). The CCDI uses the EPA results from the dispersion calculator and identifies if any of these areas were previously categorised as hot spots. The CCDI is the ratio of the crime increase in EPAs that were not identified as hot spots and the crime increase in areas that were hot spots for the time-period when crime has increased. If the CCDI:

- is close to zero, it suggests the crime increase is associated with existing hot spots getting hotter
- is greater than one it suggests that the observed increase in crime is mainly due to new emerging hot spots
- is close to one, it suggests that the crime increase is associated with a combination of hot spots getting hotter and increases in new emerging hot spots

In this guide we have avoided referring to software specific tools, but in this unit we make an exception by referring to particular tools that are available in ArcGIS, namely the space-time cube and emerging hot spot analysis tools. These tools use a

space-time implementation of the Gi* statistic (**Unit 17**) that involves a test for determining the types of space-time hot spots that are present. For example, an intensifying hot spot is a location that has been a statistically significant hot spot for 90% of the time, including the most recent time-period, and that the intensity of the clustering of high counts of crime over time is increasing at a level that is statistically significant.

Demonstration

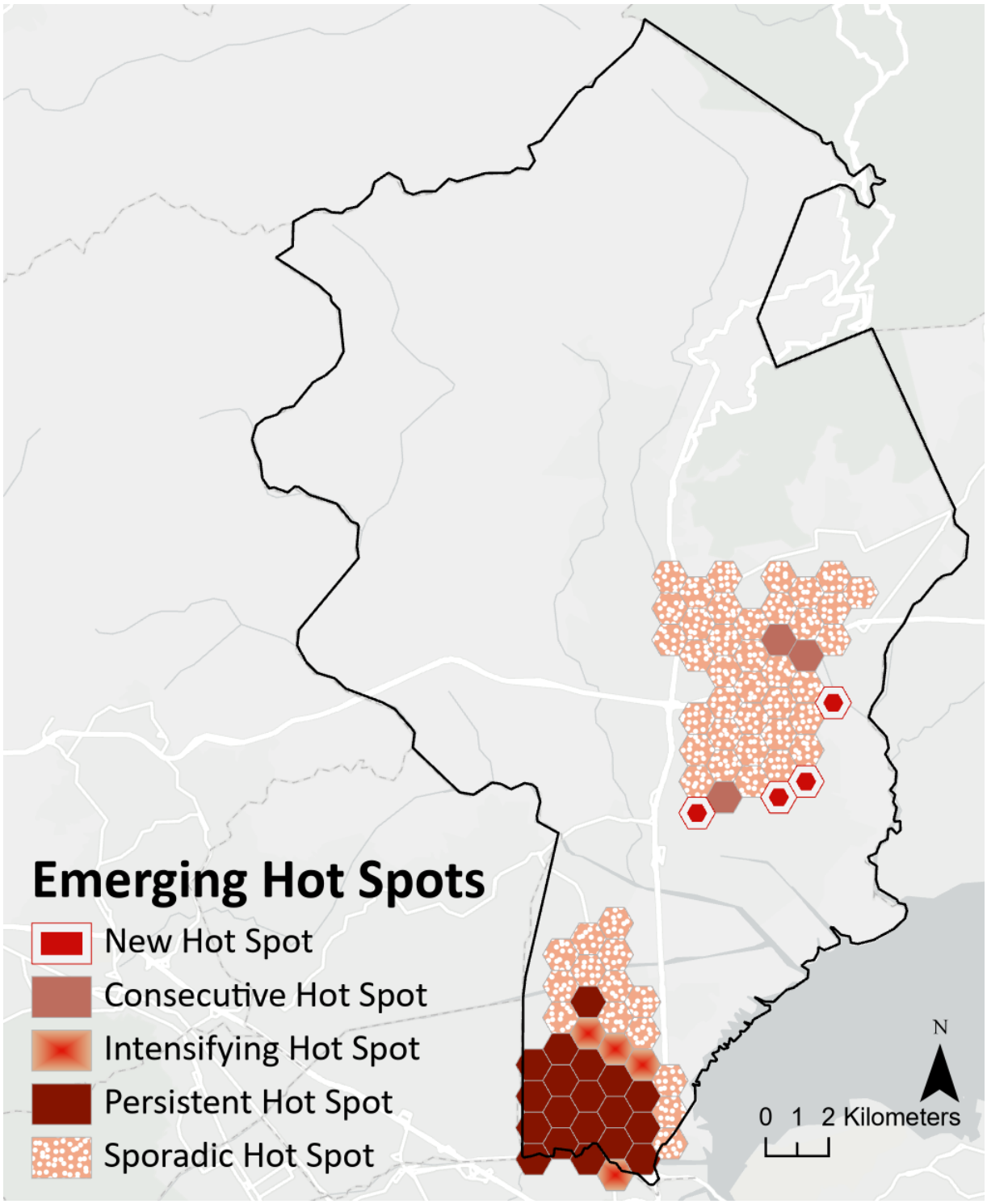
Assaults have increased by 25% in a district. The ODI for this district was 0.034 and the NCDI was 0.134. These results suggest that the observed increase in assaults was experienced in only a small number of areas. Many areas did not experience an increase in assaults. The CCDI for this district was 0.902, suggesting that hot spots became hotter and that other new hot spots (new areas of high crime concentration) had emerged and contributed to the increase.

Figure 15 shows the space-time cube and emerging hot spot analysis results. It shows that five of the 17 categories of space-time hot spots and cold spots were present – each of these being different types of hot spots. Several new hot spots are shown, alongside several intensifying hot spots and an area consisting of numerous persistent hot spots, reflecting the ODI, NCDI and CCDI results.

Further resources

Chainey SP and Monteiro J. (2019). ‘The dispersion of crime concentration during a period of crime increase’. Security Journal, volume 32, pages 324-341

Figure 15: Space-time cube and emerging hot spot analysis of assaults.



Unit 19: Hot times

Learning objectives

To understand the value in identifying and examining when crime concentrates.

Description

All crime has a temporal component – it has to happen at some time. It is highly unlikely that this temporal component is random. Instead, there is a reason why violent crimes tend to occur at some particular times and not others. Working out when and why violent crimes tend to occur is an important part of effective problem solving. There are a number of ways to consider the temporal aspects of crime. In this unit we focus on examining techniques for analysing patterns of crime by day of the week and by time of day.

Simple temporal analysis of when crime occurs involves aggregating the number of crimes by, say, the days of the week or hour of the day in order to generate a count for each temporal unit of analysis. This type of analysis can helpfully identify the days in the week when levels of crime are highest and variation in levels of crime across times of the day, both of which might inform response development. Beyond these simple techniques, there are two common forms of temporal crime analysis.

Data clocks

Data clocks simultaneously show the variation in levels of crime across days of the week and time of day. To produce a data clock requires coding each crime event by the day on which it took place (for example, 1 for Monday, 2 for Tuesday and so on) and the hour interval in which it took place (for example, 1 for 00.00 to 00.59, 2 for 01.00 to 01.59, … and 24 for 23.00 to 23.59). The benefit of using data clocks is that they can show the specific days in the week when there are peaks in crime for certain hours of the day. An example of a data clock for violent crime is shown in this unit's demonstration section.

Aoristic analysis

Another kind of temporal crime analysis is aoristic analysis (Ratcliffe, 2023). This technique takes into account the date and time range that are typically recorded in police crime data. It involves assigning equal probability values to each, say, one

hour interval across the date and time range for each crime record and aggregating these to show the temporal variation in crime. To elaborate, in most police crime data, violent crime and other crimes against the person usually only have a single entry for date and time committed (for example, date 14/03/2023, time 17.20) and so aoristic analysis is usually unnecessary. However, we describe this approach so that you can consider applying it when your data does have a date and time range. If a crime record stated that the crime took place on, say, the 14/03/2023 between 07.15 and 18.45, there would be 12 one-hour intervals during which the crime could have occurred. For this record, as part of aoristic analysis, each interval is assigned the probability value of 0.083 (1/12). For a crime record that had a date and time range from 23/03/2023 19.30 to 25/03/2023 10.30, there would be 40, one-hour intervals, and for each interval we would assign the probability value of 0.025 (1/40). After calculating one-hour probability values for all crime data that has a date and time range, the probability values for each one-hour interval are summed to determine the hour intervals that have the highest total values (when crimes tend to peak). In the further resources section, there are details about a publication that explains why this approach is more accurate than using the mid-point within a time range.

Demonstration

Figure 16 and Figure 17 show counts of crime for robberies of personal property for the district of Newcastle upon Tyne by days of the week and by time of day. Figure 16 shows that robberies were highest on Fridays. Figure 17 shows peaks in offending in the late afternoon to early evening period (16.00 to 19.59), between 22.00 and 22.59 and between 00.00 and 00.59.

Figure 18 shows a data clock that was created using the same data on robberies in Newcastle. This data clock was created using crime analysis tools available in ArcGIS, but can also be created in Microsoft Excel by following the data clock calculation directions described previously or using Andrew Wheeler's **Aoristic analysis for hour of day and day of week in Excel** tool. The data clock shows that only certain times on certain days of the week were hot times for robberies (depicted in red). For example, the day of the week graph in Figure 16 showed that most robberies occurred on Fridays. Yet the data clock for Fridays shows that it was between 16.00 and 20.00 when robberies peaked, and then peaked again between 21.00 and 1.00. The time of day graph for robberies indicated that the overall peak

for robberies was between 22.00 and 23.00 hours. The data clock shows that these peaks were only present on Tuesdays and Fridays. The day of the week graph in Figure 16 shows that Mondays was one of the days when fewer robberies occurred. However, the data clock shows that Mondays between 17.00 and 19.00 was a hot time for robberies.

Figure 16: Robberies in Newcastle by day of the week.

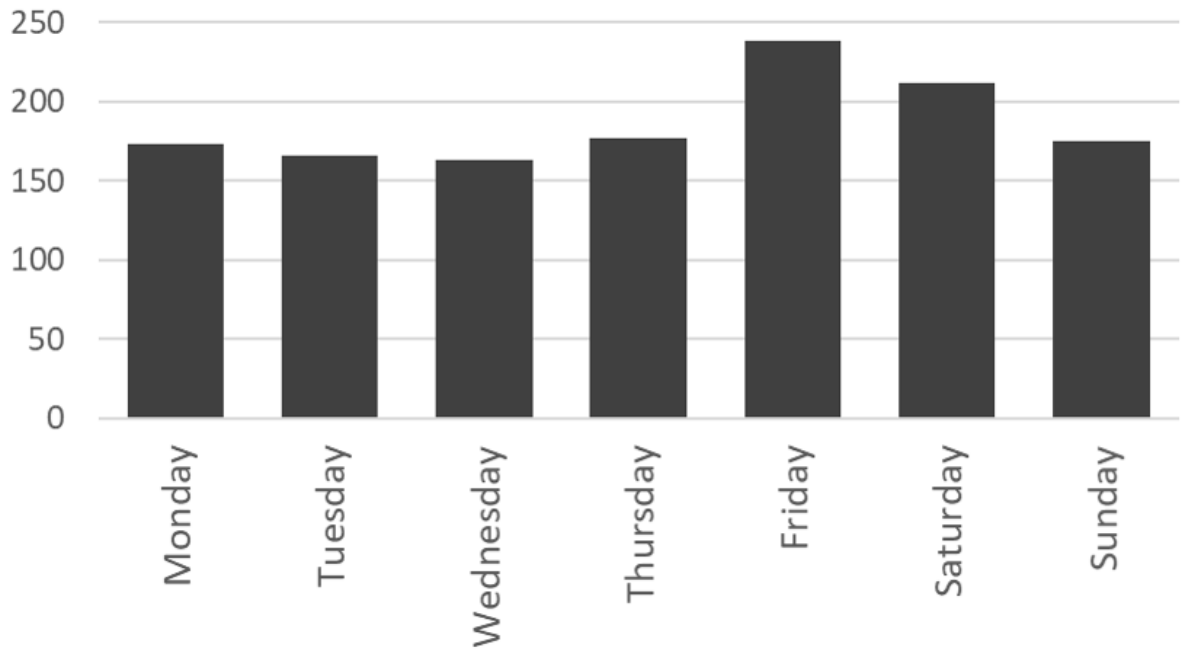


Figure 17: Robberies in Newcastle by time of day.

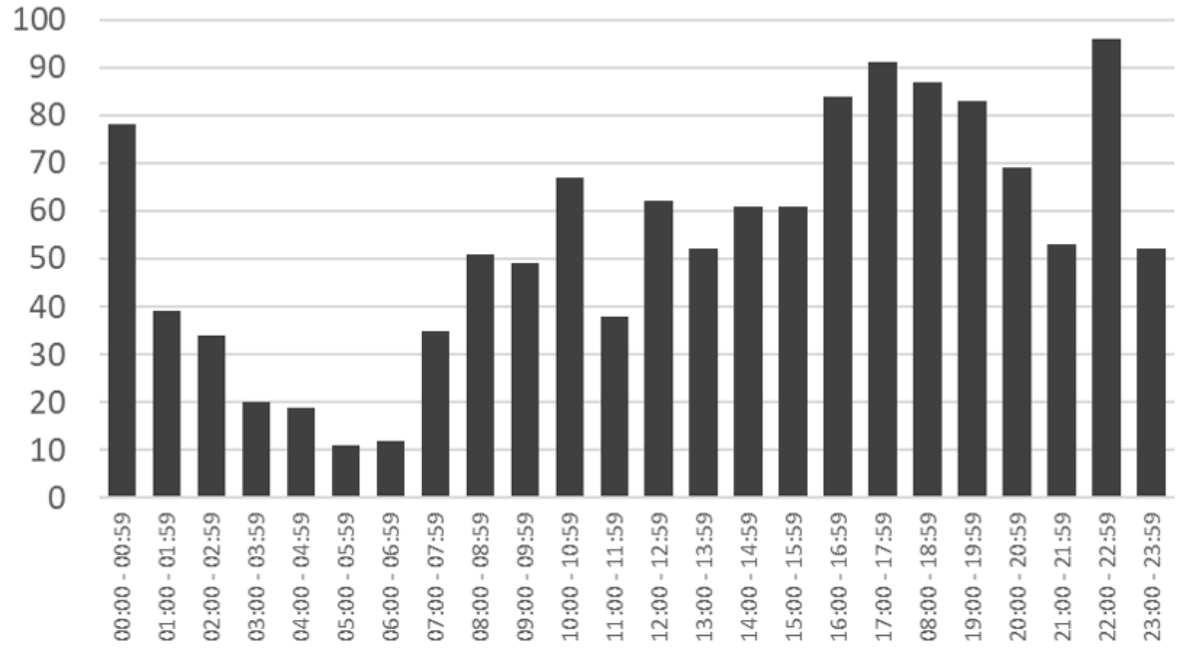


Figure 18: Data clock showing temporal patterns of robberies in Newcastle.

Further resources

Ashby MPJ and Bowers KJ. (2013). **A comparison of methods for temporal analysis of aoristic crime**. Crime Science, volume 2(1)

Unit 20: Risky facilities

Learning objectives

To know what is meant by a ‘facility’, and that crime tends to concentrate on a small proportion of ‘risky’ facilities.

Description

It is commonplace in crime analysis to assess the spatial and temporal concentration of crime, as discussed in previous units of this guide. This unit describes a lesser-practised form of crime analysis that considers a different kind of crime concentration – the distribution of crime across similar facilities.

What do we mean by a ‘facility’? Facility is taken here to mean a location that serves a particular function. Think bar, hotel, hospital, library, airport or petrol station. Why do facilities matter? They matter because evidence shows that in any given area and for any given group of facility, crime is unevenly distributed. The same is true for violent crime. Most facilities tend to experience little or no crime and a few experience a lot. This pattern is identified so often it has been dubbed the iron law of troublesome places (Wilcox and Eck, 2011).

That crime concentrates on a small number of ‘risky facilities’ has important implications for crime prevention. First, it helps with resource allocation, ensuring that preventive resources are allocated proportional to crime volume (or harm). Second, comparisons of high and low crime facilities can help you work out why some facilities are more conducive to violence than others, which in turn can inform responses, perhaps targeted at place managers.

Demonstration

This example considers serious violence in licensed premises. The first step of a ‘risky facilities’ analysis is to define the type of facility that you are interested in. In the case of licensed premises, for example, are you including private members’ clubs, hotel bars, sports clubs and so on? Once you have agreed on a definition for your facilities of interest, the second step is to identify all those facilities that exist in your chosen area. This is typically done by using police recorded crime data, selecting all those licensed premises that are present in police data because one or more crimes were recorded as having taken place there. In practice, however, not all

licensed premises will be visible in police data, either because no crimes occurred there or because those that did were not reported to the police. Other sources (such as licensing data) might therefore be used to get a more complete list of facilities in your area.

The third step is to determine how many crimes occurred in each facility. Once again, this step may require you to decide on the type of crimes you are interested in, and extract them accordingly. Difficulties are sometimes reported in determining whether crimes occurred inside or outside selected facilities. Sometimes manual assessments of crime reports may be required. The next step is for you to create a table, much like Table 14, which contains two columns. Column A lists ten (fictitious) licensed premises and column B shows the number of serious violence crimes linked to each venue. Using this information, we then rank the facilities according to crime count, from highest to lowest.

Table 14: Number of serious violence crimes linked to fictional premises.

A: Licensed premise	**B: Crime count**
White Hart	4
Red Lion	13
The Fox	22
The Green Man	39
The Queen’s Head	3
The Old Market	2
Pinfold’s	11
Space Bar	15
Total	**109**

This reordering of licensed premises can be seen in Table 15, with the Green Man now top of the table with 39 crimes. A risky facilities analysis requires two further calculations. First, we work out the percentage of crimes that took place in each facility. In Table 14 and Table 15, the most problematic venue experienced 39 crimes. This equates to 36% of all the violent crimes which occurred across the 10 licensed premises. This is shown in Column C. The next step is to calculate the cumulative percentage of crime for each facility. This is shown in Column D. Here, we successively add the individual percentage crime contribution of each facility. For example, the cumulative percentage of the three most crime-ridden licensed premises is the sum of the individual percentage of The Green Man, The Fox and Space Bar (36 + 56 + 70 = 162).

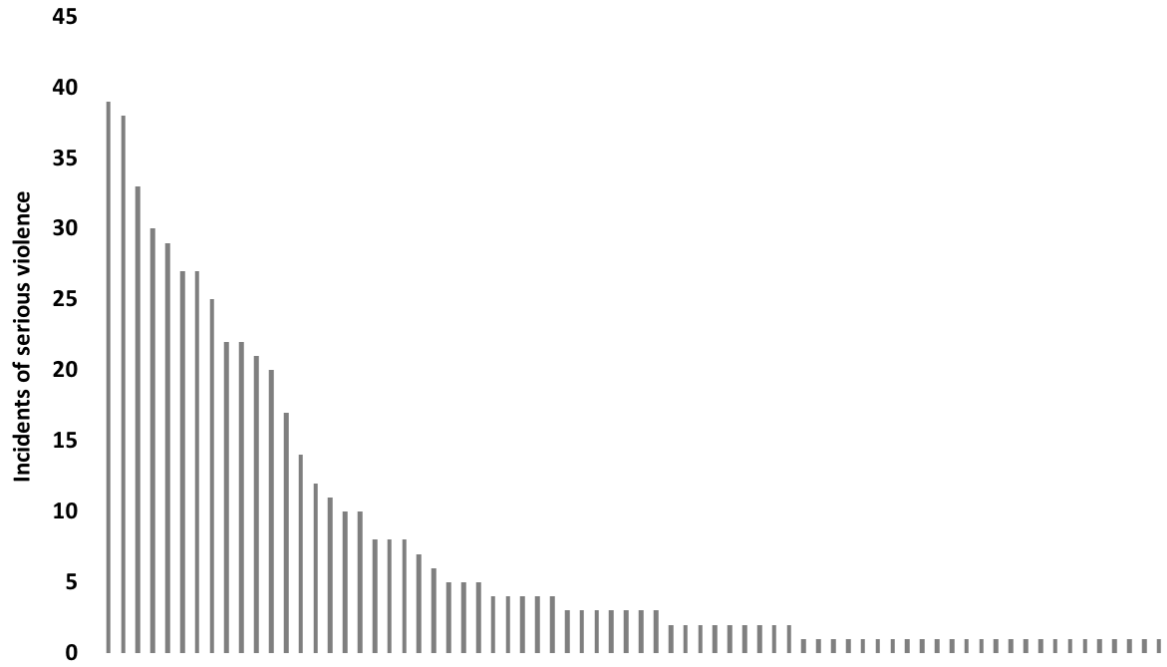
Table 15: Fictional premises listed in Table 14, ranked by crime count.

A: Licensed premise	B: Crime count	C: % all crime	D: Cumulative %
The Green Man	39	36%	36%
The Fox	22	20%	56%
Space Bar	15	14%	70%
Red Lion	13	12%	82%
Pinfold’s	11	10%	92%
White Hart	4	4%	95%
The Queen’s Head	3	3%	98%
The Old Market	2	2%	100%
Total	**109**		

The final step is to produce a bar chart showing the distribution of crime across facilities. An example is provided in Figure 19, which shows the distribution of serious violence (n = 543) across 72 licensed premises in one year in one British city. The observed distribution is common in this type of analysis. It is sometimes referred to as

a J-curve, as the distribution resembles the letter ‘J’ if flipped vertically. Figure 19 shows that serious violence is unevenly distributed across the 72 licensed premises in this city. Over the one-year study period, most licensed premises experienced few incidents of serious violence, and a few experienced a lot. When focusing on the most problematic venues, and using a cut-off point of 50% of all serious violence, we can also determine that just nine venues (13% of the sample) accounted for half of all the violence occurring in these licensed premises (n = 270). It follows that reducing violence in this handful of ‘risky facilities’ would lead to large reductions in the overall serious violence problem.

Figure 19: Graph showing count of violent crimes per licensed premise.



Further resources

Clarke R and Eck JE. (2007). **Understanding risky facilities**. US Department of Justice, Office of Community Oriented Policing Services

Unit 21: Hot weapons

Learning objectives

To understand patterns in the use of different weapons in serious violence, and the possible reasons why they are used.

Description

Most violent incidents in the UK do not include the use of a weapon. Use of a weapon is, however, a strong predictor that a violent incident will result in injury (Brennan, Moore and Shepherd, 2006). Around 70% of homicides involve a weapon. Consequently, removing weapons from violent encounters is one strategy for reducing violent harm in society. Moreover, better understanding the weapons that are 'hot' in a given area can help determine the prevalence of and potential for violence. Understanding the patterns in weapon use can also inform more immediate responses to serious violence and weapon-specific prevention activity.

But just as crime is shown to concentrate on certain people and at certain times and places, so too does evidence suggest that some weapons are more popular among offenders than others. Take knife crime. Unlike firearms, knives are available in most homes, many workplaces and can be legally purchased online. Although legislation has banned some knife types and, in doing so, has reduced their availability, domestic kitchen knives and craft knives are ubiquitous. But availability alone cannot explain the observed patterns in the types of knives that are carried or those that are used in violence. Knife use for criminal purposes is also influenced by attractiveness, affordability and accessibility, which if altered may increase or decrease the likelihood that someone might use or carry a particular knife. These determinants of weapon usage are captured in the Four A's framework, which can be used to help think through patterns in (and ways to tackle) weapon selection for serious violence. Let's consider each element of the Four A's framework.

Availability – does it exist in your area?

Every home contains a range of objects that can become weapons or that, like kitchen knives, have licit and illicit uses. Kitchen knives, being ubiquitous, have universal availability while assault rifles have extremely low availability in the UK. Identifying opportunities to remove a weapon from a community or to prohibit its

entry can be an effective means of reducing serious violence. Comparing the use of a particular weapon type relative to its availability can tell you about the other three A's.

Accessibility – how easy is it to access in your area?

Accessibility and availability are closely linked. A weapon cannot be accessible if it is unavailable. However, availability does not mean accessibility. There are often logistical restrictions that prevent someone accessing a particular weapon, particularly in the very near-term. For example, a firearm may be stored at a house or there may be target hardening measures, such as knife arches in place that prevent it being accessible in a venue. Activities that reduce or complicate accessibility, such as weapon sweeps, can prevent a weapon's use in violence.

Attractiveness

While kitchen knives have high availability and relatively high accessibility, they may not be attractive for use in violence. Indeed, their high availability and high accessibility may actually be the features that make them less attractive for criminal use. Bigger, more specialist or prohibited weapons indicate that a person is more serious about violent intent. Kitchen knives also have features that make them less suited to serious violence committed in a public space, such as small blades and a lack of protective guards. Consequently, we see kitchen knives used less than their availability and accessibility would suggest, indicating that their attractiveness (to would-be offenders) is low while other knife types such as machetes, are used more in serious violence than their availability would suggest, indicating that their attractiveness is high.

Affordability

Acquiring knives comes at a cost – financial, logistical and legal. Kitchen knives, for example, have very high affordability – financially and logistically – but come with significant legal costs since being found in possession of a kitchen knife outside the home is illegal and is an aggravating factor in sentencing. Firearms, on the other hand, have very low affordability. They are expensive to purchase, often require significant logistical effort to source and store and the legal implications of possession are significant.

When analysing weapon use as part of a problem solving project, it is often useful to consider the Four As framework, to help work out the causes of identified patterns and to assess the merits of different response options. For example, in the case of expensive weapons with low affordability, such as zombie knifes, it is arguably less likely that such weapons will be discarded in parks or knife bins, suggesting that weapon sweeps and knife bins may be less effective. Furthermore, when the availability and attractiveness of given weapons is high in a particular area, then it is more likely that an illicit market or loan system for these weapons might emerge, which again might feasibly be the target for police disruption activities.

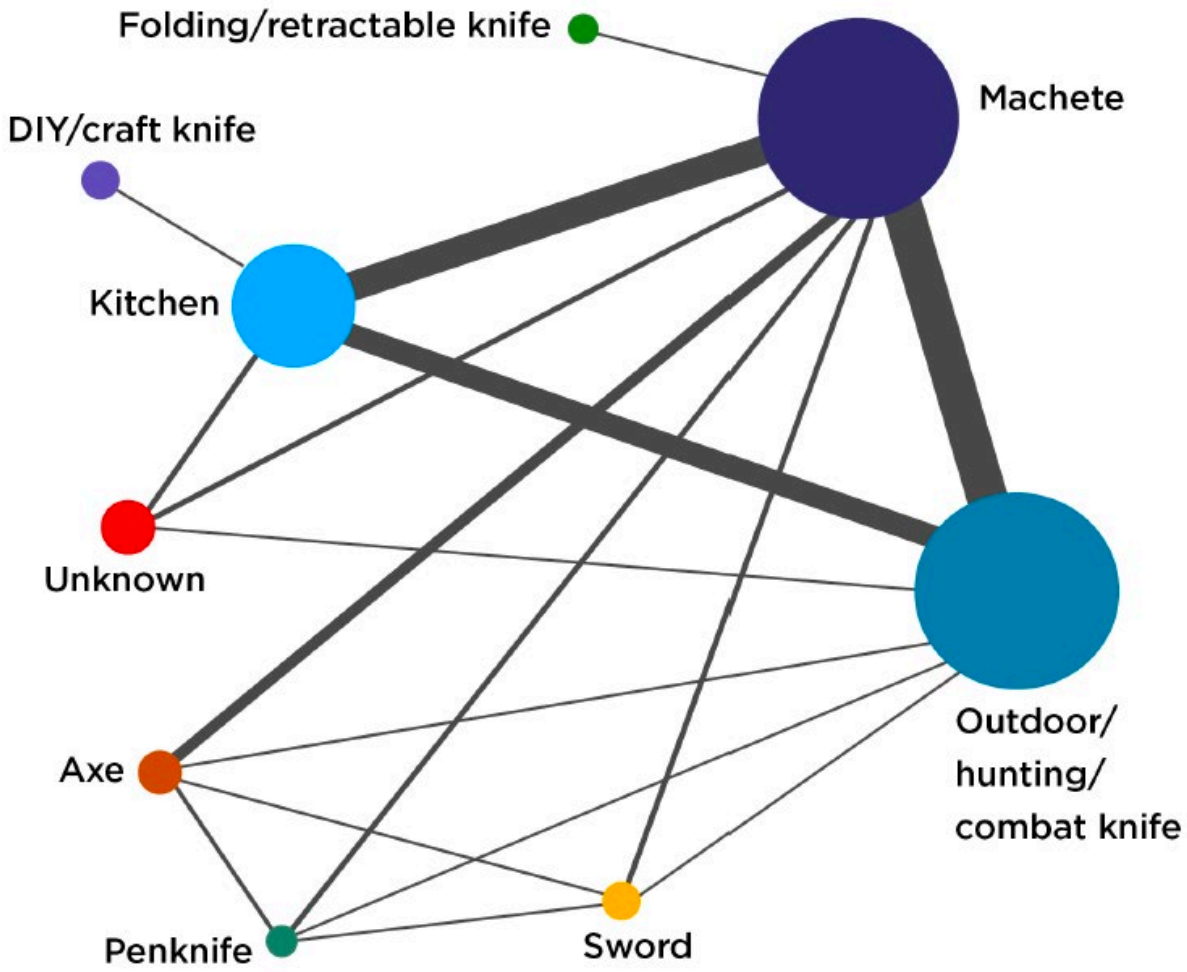
Demonstration

Sidebottom and others (2021) examined the types of knives used in fatal violence in London in 2019/20 and combined this information with survey data on the accessibility of different knife types. Comparing the two datasets is revealing. For example, although only 7% of a representative sample reported access to a machete or combat knife, these knives were frequently used in homicide. In the image in Figure 20, the size of each circle shows how often a particular type of knife was used in fatal violence. The width of the line connecting the circles represent how frequently two types of weapons were used in the same incident, thereby indicating group violence. The image tells us that (1) specialist knives were commonly used in fatal incidents and (2) specialist knives tended to be used together.

Further resources

Sidebottom A and others. (2021). **Knife crime: A problem solving guide**. College of Policing

Figure 20: Knife type used in fatal violence in London.



Unit 22: Crime script analysis

Learning objectives

To know how to use crime script analysis to better understand and prevent criminal behaviour.

Description

All crimes have a beginning, a middle and an end. Crime script analysis is a technique for sequencing offender decision-making along the crime commission process. Its origins are linked to the rational choice perspective (**Unit 7**) because it encourages us to think about the perceived rewards, effort and risks that offenders consider when committing crime. Crime scripts are a useful tool when problem solving to unpack what needs to happen for crime to occur and, by extension, help identify a range of possibilities for prevention.

There is no standard method or dataset for producing a crime script. Insights can be gleaned from numerous sources of data including police information systems, court transcripts, open source intelligence and discussions with key individuals, including offenders. One method for generating a crime script is as follows.

Step 1: Acts

Determining acts, which refer to the key stages of the selected crime commission process.

Step 2: Writing the crime script

To write a crime script, you can use a standard template organised into scenes, cast and conditions (for each act).

Scenes

Scenes are used to describe the activities that take place. There are four generic script scene classifications: preparation, pre-activity, activity and post-activity. The aim in crime script analysis is to describe the activities that take place in each of these scene classifications.

Cast

The cast refers to the participants involved in each act. This will include the offenders, any supporting cast members (including individuals, businesses and agencies with whom the offender is interacting, some of whom maybe behaving legitimately) and victims. Often, rather than specifying participants by name, the cast refers to the roles that they perform (for example, fence, victim and so on).

Conditions

The final part of the template refers to conditions, of which there are three. Prerequisites refer to the preconditions that need to be satisfied before the activity is initiated (for example, what tools or equipment are required for the activity to take place?). Facilitators are factors that make it easy or worthwhile for the offender to engage in the activity (for example, the rewards from the activity). Enforcement conditions refer to legislation or regulations governing the illegal activity. During step 2, we attempt to populate information under each Act using information that is already known, information we subsequently discover, or using details about what we believe is most likely.

Step 3: Interpreting and presenting the crime script

This step begins by reviewing the information you have for each act and connecting any content across the crime script (for example, identifying how an individual operates in many activities). It then requires interpreting what all the information means, such as how certain decisions are connected to others. Although all crime scripts are likely to be incomplete (some elements of the criminal activity may be unknown), the interpretation of its content should enable you to identify ‘pinch points’ for intervention (see **Unit 25**). These may include situational crime prevention techniques that increase the effort and risks of offending, and identifying ways to reduce the vulnerability of future victims (for example, opportunities for safeguarding). The crime script may also identify specific participants for investigative focus.

Demonstration

This demonstration concerns the use of a crime script to better understand and tackle moped assisted robberies of mobile phones from pedestrians. Scanning of relevant data identified the following acts for this crime type:

- planning
- transportation to
- robbery
- transportation from
- storage or disposal

For the ‘robbery’ act, the four specified activities are as follows.

- Preparation activity – the search for a suitable victim.
- Pre-activity – the selection of the victim and approaching the victim.
- Activity – the robbery or snatch of the phone from the victim.
- Post-activity – the escape from the scene of the crime with the phone.

Victims provided similar descriptions of two offenders, with most of these offences taking place between 15.30 and 18.30 on weekdays. In most cases, stolen phones were switched off within five minutes of the robbery. Two offenders on a single motorbike and the victims were the cast associated with the robbery act. Facilitating conditions associated with this act were that the victims were on their own and that they were using their phones when they were robbed. Several victims had stated that the offenders were riding a particular make of moped and said that the offenders headed in the direction of the train station after the robbery. Review of CCTV footage showed that the moped had false licence plates.

With regards to the ‘storage and disposal’ act, it is likely that offenders are stealing phones for resale rather than for personal use. It is also likely that they are not holding on to the phones for long because they do not want to be in possession of stolen items. Who is receiving the stolen phones and where the phones are being taken is not clear at this stage. However, on three occasions, phones have not been switched off until 30 to 40 minutes after the robbery, in a similar location two miles north of where these robberies have been taking place. An initial review of this area identified two second-hand electronic shops. These shops are soon to be visited to

review if any phones are identified as stolen and to review the record keeping of purchased items, which is a legal requirement (an enforcement condition) for these shops. The crime script also identified the moped being ridden on the street where the shops are located and on a nearby housing estate. Further intelligence gathering about the moped is now taking place in this area, including analysis of ANPR data to trace its movements.

Further resources

Dehghanniri H and Borrion H. (2019). ‘Crime scripting: a systematic review’. European Journal of Criminology, volume 8, pages 17-31

Unit 23: Crime disinhibitors and crime enhancers

Learning objectives

To know what is meant by a crime disinhibitor and a crime enhancer, why they are important, and the types of data and methods you can use to check for their presence.

Description

Many factors are implicated in crime. These causal factors are sometimes arranged in a temporal order. Distal causes, which occur a long time prior to a crime event, typically refer to prenatal and developmental experiences which make some people more likely to engage in crime in the future. Examples include growing up in an abusive home or having a parent incarcerated. Then there are proximal causes, which occur immediately before a crime event and which make crime more likely. Examples include the presence of weapons and crime-promoting peers. Both kinds of causes are important. Both warrant attention and preventive action. However, in seeking to bring about immediate reductions in crime, it is often advisable to focus your problem solving efforts on those more immediate causes which occur as close as possible to the crime event.

A crime disinhibitor is an example of a proximal cause of crime. The presence of drugs and alcohol is a prime example of a crime disinhibitor, with evidence showing that alcohol consumption can reduce a person’s inhibitions, thereby making them act more impulsively and aggressively.

Crime enhancers have the same effect as disinhibitors – they make crime more likely – but crime enhancers generally refer to aspects of place rather than things to do with an individual. For example, changing patterns of drug use in an area or an increase in the number of licensed venues offering cheap alcohol are common examples of crime enhancers. Weapons can also be considered a crime enhancer where they amplify an existing offender tendency, such as a robber who begins carrying a knife and is hence able to complete more offences with less effort.

Different data sources can be drawn on to help identify the presence and potential impact of crime disinhibitors and enhancers. Shown in Table 16, for example, are the different types of police data and associated analyses that can be used to help

identify the presence of alcohol, drug and mental health factors as they relate to both individuals and places.

Disinhibitors and enhancers can of course accumulate. Working out the presence and role of crime disinhibitors and enhancers can help you better diagnose and respond to identified problems. In the case of crime hot spots, for example, are assaults occurring in and around certain bars? Is violence occurring among dealers and/or users of illicit drug markets? Does weapon carrying and use increase in illicit drug markets?

Table 16: Types of police data and associated analyses to identify the presence of crime disinhibitors or enhancers.

Crime disinhibitor or enhancer	**Individual**	**Place**
Alcohol	▪ Person warning markers. ▪ Person victim and/or perpetrator in alcohol flagged offences. ▪ Keywords in crime reports. ▪ Flags or feature codes.	▪ Crimes in or near licensed premises. ▪ Hot spots of crimes involving persons with markers, or where keywords, flags and feature codes are present.
Drugs	▪ Person warning markers. ▪ Person victim and/or perpetrator in drugs offences. ▪ Keywords in crime reports.	▪ Public calls for service relating to drugs (these might be crime, anti-social behaviour or public safety and welfare related).
Mental health	▪ Person warning markers. ▪ Flags or feature codes.	▪ Crimes in or near mental health accommodation sites. ▪ Public calls for services relating to mental health.

Demonstration

The example shown in Table 17 is taken from the Essex Violence Reduction Unit. Using data on individuals who had been suspected of, or charged with, community violence offences over a four-year period (n= 21,356), the analysts created additional variables from crime data to denote individuals who had recent warning markers relating to drugs and alcohol (rows 2 to 5) and mental health (row 6) in the year of their offending. Variables were also created for weapon possession offences and whether violent crimes had involved weapons (rows 7 to 9).

Table 17: Individuals who were suspected of, or charged with, community violence offences.

Using prior offending and warning markers from police crime data	**Offenders of serious assaults**	**All community violence offenders**
Drug and/or alcohol dependency	3%	2%
Drug warning marker	44%	23%
Previous Class A drug possession	6%	3%
Previous Class A drug supply	7%	3%
Mental health warning marker	29%	18%
Previous weapon possession	10%	4%
Used knife or sharp implement as enabler	62%	21%
Used another type of weapon as enabler	18%	7%

Results showed that compared to all community violence offenders in Essex, those committing serious assaults were more likely to have prior involvement in drug-related offending and/or had an identified behavioural (mental) illness. The likelihood of using a knife was also three times higher for perpetrators of serious assaults than violent offenders more generally. Based on these results, a strategy was devised which centred on weapon and drugs stops in high-harm violence hotspots, combined

with an assessment of current service provision and whether the behavioural treatments on offer met the needs of those more likely to commit violence.

Further resources

Abt T. (2016). ‘Towards a framework for preventing community violence among youth’. Psychology, Health & Medicine, volume 22, pages 266-285

Unit 24: Hypothesis testing

Learning objectives

To understand how to use hypotheses as a way to frame and improve your problem analysis.

Description

A common challenge when doing crime analysis is to ensure that analytical outputs are meaningful. That is, producing analysis that answers the ‘why’ question. Lots of analytical products look good and provide interesting information about who, what, where, when and how crime occurs, but effective problem solving analysis also needs to get at the **why** question. Hypothesis testing can help you do this.

A hypothesis, for the purposes of police problem solving, is a true (or false) statement as to why a problem recurs and exhibits the patterns that it does. Hypotheses can come from many sources. Most obviously are those police officers and staff who know about the presenting problem and the affected area or group. They will be knowledgeable about the problem and so will likely have opinions about why the problem exists and why it displays certain patterns. Others to consult are partner agencies such as the local authority, health sector and local businesses (depending on the crime problem). As analysts, you too are well placed to come up with hypotheses about identified crime problems, drawing on your experience and your knowledge of the crime analysis literature. It is perfectly acceptable to have hypotheses that may contradict each other (for example, because of opposing views). It is the conclusions that are reached from testing hypotheses that are important when problem solving.

Typically, when problem solving, we will test three to five hypotheses. We may not have time to test more than five, and testing only one or two may not provide us with sufficient findings about the problem to usefully inform response plans. We then use the hypotheses we wish to test as a way to frame the direction of our analysis. Testing each one in turn helps arrive at inferences, which we then review to provide some conclusions to help understand our crime problem and possible responses.

Beyond sharpening your response plans**,** hypothesis testing has two other benefits. The first relates to efficiencies. A lot of an analyst’s time can be taken up cleaning or

preparing data before it is used. A hypothesis testing approach directs us to the data we need to test our hypotheses and can hence limit any data processing tasks to just this data. Second, if we propose a hypothesis but find that we do not have any data to test it, this exposes important data and intelligence gaps, which in turn can prompt a search to collect such data or access it from other partners. For example, when examining a violence issue that involved altercations between problematic street drinkers in a town in the UK, one hypothesis was that the alcohol treatment support services these street drinkers were receiving was not fit for purpose. Data on police systems was inadequate for testing this hypothesis. The best source of this information was the street drinkers themselves, and so arrangements were made to gather this information by speaking directly to them.

Demonstration

Picture the scene. There has been an increase in assaults in the town centre during hours associated with the night-time economy (NTE). After a discussion with the neighbourhood policing team and the alcohol licensing officer from the council, the following hypotheses were put forward as to why assaults were going up.

- The increase in assaults in the town centre is mainly associated with altercations between street drinkers and between class A drug users.
- The increase in assaults in the town centre is mainly connected to violence both inside and immediately outside a small number of licensed premises.
- The increase in assaults in the town centre is mainly because of an increase in violence against women in public places during hours associated with the NTE.
- The increase in assaults in the town centre is mainly due to more gatherings of young people (under the age of 18) drinking alcohol and assaulting one another.

How to test these competing hypotheses? Temporal analysis of police data revealed that the increase in assaults was mainly associated with offences being committed between 01.00 and 03.59 and was not to do with the street drinkers (which persisted as a daytime issue in the area), nor assaults between class A drug users. Although there were gatherings of young people in the town centre (particularly on Friday and Saturday nights), many of whom were under 18, over the last year police data indicated that there were only two to three assaults per month in the town centre that

were associated with assaults between people in this age group. These assaults were not a contributory factor to the observed increase.

There are 20 licensed premises in the town centre. A risky facilities analysis (**Unit 20**) revealed that two premises were responsible for over half of all the police recorded violence, particularly the recent increase in assaults. Site visits to and further analysis of these two licensed premises revealed that the management had changed in both premises in recent months, door and admittance policies were poor, one premises did not have suitably trained door security staff, and there was very little that was being done about any poor behaviour inside these premises. In one venue, drug use was frequently observed. Assaults against and harassment towards women was mainly associated with these two premises – both inside and outside. When neighbourhood policing teams were polled as part of the analysis about the premises, they believed were most problematic in the town centre, results highlighted a fast food vendor (Gary's) as a location where they were repeatedly called on to deal with acts of aggression. Analysis of crime data relating to the affected vendor revealed this location was responsible for over a quarter of the violence in the town centre on weekend nights, that one in three of the assaults connected to Gary's were against staff during late NTE hours, and that most of the other offences were a result of (as one officer stated) 'the chaos every Friday and Saturday night at three to four AM outside Gary's'. Crowds of revellers would gather after leaving local nightclubs and the road outside Gary's would get clogged with taxis. Gary's did employ a security guard, but this person was not proactive in dealing with issues before they escalated into more serious incidents.

This example highlights how the use of hypotheses, generated by consensus with key stakeholders, can help frame and direct problem analysis, and in doing so help identify promising avenues for intervention.

Further resources

Chainey SP. (2012). 'Improving the explanatory content of analysis products using hypothesis testing'. Policing: A Journal of Policy and Practice, volume 6, pages 108-121

Unit 25: Identifying pinch points for intervention

Learning objectives

To know what is meant by a ‘pinch point’, and the role of pinch points in bridging problem analysis and response development.

Description

Previous units in this guide have described the many ways in which violent crime is patterned, and the many sources of data and information you might fruitfully draw on when analysing specific violence problems. These units illustrate the depth and complexity of problem analysis. These units also raise a question that is often asked by problem solving analysts – when do I stop analysing? Or, at what point in a problem solving project can we draw a line under analysis and move to response?

Unit 24 outlined an approach to better streamline and focus problem analysis. Beyond that, unsurprisingly, there are no failsafe rules for when one stage of the problem solving process ends and another begins. There are, however, some general points that are worth keeping in mind when carrying out problem analysis.

First, be realistic. Problems of violence can be complex and enduring, resulting from myriad interacting causal factors. Likewise, data on the sources and patterns of violence are often missing and incomplete, as was discussed in earlier units. The purpose of problem analysis is therefore not to work out all there is to know about a presenting violence problem – that would be unrealistic. Nor is better understanding a particular violence problem an end in itself. Problem solving is an applied endeavour. It is about reducing crime-related harms. As such, the central purpose of problem analysis is to inform response development, and to help work out what to do, whom to involve and where to target. Simply put, good problem analysis is about the identification of ‘pinch points’.

Pinch points refer to the causes and conditions that contribute to a particular problem and which are open to intervention. To illustrate the concept, consider knife crime. Knife crime may involve many causal factors, from broad structural issues such as poverty and unemployment to more immediate situational causes such as the availability of weapons and peer pressure. All these factors (and many more) are plausibly implicated in knife crime. All are important, warrant attention, and could be

the focus of policy intervention. But not all factors are equally open to police and partner intervention. In some cases, there may be other organisations who are better placed than the police to address identified casual factors, such as education or drug and alcohol treatment services. In other cases, what is needed to address certain causes falls outside of what the police can feasibly do, as would be the case for changes in legislation about the kinds of knives that can be sold and to whom. A key component of good problem analysis is therefore to identify those pinch points which are most amenable to intervention in a reasonable time frame, but which also possess the promise of a sustained impact on a given problem.

Crucially, evidence shows that reducing crime is not dependent on knowing everything about a presenting problem. As the problem analysis triangle indicates (**Unit 7**), crime requires motivated offenders to come together in space and time with suitable victims in the absence of capable guardians. It follows that crime can be reduced by effectively addressing at least one side of the crime triangle. In some cases, other sides of the triangle may not form part of the response plan. This is relevant to the pursuit of pinch points. Take the problem of football-related violence. There are many reasons why someone might engage in football-related violence. There are also some people who are more likely than others to engage in football-related violence. But a recurrent pinch point in football-related violence is the coming together of opposing fans in areas where violence is possible. And, evidence shows that this kind of violence can (and has) been effectively reduced by putting measures in place to keep opposing fans apart, both at matches and while walking to and from the stadiums, without the need to address the underlying causes for why some people might be motivated to commit these forms of violence. What goes for football-related violence is seen in other kinds of violent crime. Indeed, the crime prevention literature furnishes several pinch point-related violence reduction interventions including:

- denying access to weapons (for example, reducing the availability of glasses used for violence)
- reducing sources of provocation (for example, improving queuing systems for bars and taxi ranks)
- guarding suitable targets (for example, targeted patrols to reduce robberies against children)

Think of pinch points as the bridge between your analysis and your response. Pinch points highlight the key themes to emerge from problem analysis, which in turn act as the basis on which a response plan is formulated. Being faithful to pinch points can help improve response plans, avoiding the common temptation of:

- going direct to response without completing any scanning and analysis
- ignoring – or departing from – what was learned from problem analysis and reverting to generic, often enforcement-focused responses

Demonstration

Some pinch points are more amenable to intervention. Some**,** when addressed, are more likely to bring about immediate impact than others. The highly successful Boston Ceasefire project is informative here. Analysis of the problem of gun-related violence in Boston identified several pinch points. These pinch points informed the discussions of a working group tasked with deciding what to do to tackle the presenting problem. Various strategies were proposed. To help adjudicate between rival response plans, David Kennedy and colleagues applied four simple tests.

- Will it make a big difference?
- How long will it take?
- Can we do it?
- Do we want to?

These tests proved helpful in homing in on the pinch points that might best lead to immediate, significant and sustainable reductions in the presenting violence problem. As an example, Kennedy discusses parenting classes. Effective parenting classes might well improve parent-child relations in ways that discourage some from engaging in violence. But even if such a programme were effective, it would likely take many years to realise any benefits on violence and associated harms. To borrow from Thomas Abt (2019), it is unlikely to ‘stop the bleeding’ now, hence preference was paid to those response plans that were deemed most likely to produce immediate reductions in violence and associated harms.

Further resources

Kennedy D. (2020). ‘Problem-oriented public safety’. In Scott MS and Clarke RV. ‘Problem-Oriented Policing: Successful Case Studies’. London: Routledge

Analysis to evaluate impact

Unit 26: EMMIE as a framework to support assessment

Learning objectives

To know about EMMIE and how it can support effective problem solving.

Description

Units 26 to 40 are about Assessment, the final stage of the SARA problem solving process. There are two main purposes of assessment in problem solving. The first purpose deals with the here and now. It is about assessing whether your chosen responses were effective in reducing the presenting problem. The second purpose of assessment is broader. It is about learning lessons to inform future problem solving efforts – helping you and others to avoid past failures and build on previous successes.

EMMIE is a framework to support effective problem solving (Johnson, Tilley and Bowers, 2015). It refers to five categories of evidence that can usefully be generated as part of a problem solving assessment. This unit describes the different elements of EMMIE and why they are important. Later units then present tools and techniques that speak to the different elements of EMMIE and which can be applied when problem solving. What, then, does the acronym EMMIE stand for?

Effects

A good assessment generates evidence on whether responses were effective in reducing problems. This is sometimes referred to as an impact evaluation. Most discussions of assessment relate to discussions of effectiveness. This is understandable. Those who fund, design and deliver interventions have an interest in knowing whether the observed positive outcomes outweigh any unwanted negative effects. This last point is important. ‘Effects’ refers to negative as well as positive outcomes. Well-intentioned crime prevention interventions can sometimes backfire (Welsh and Rocque, 2014). Good problem solving is alive to the possibility of unintended consequences. Good problem solving assessments make provision for their measurement.

Knowledge about effects has both short and longer-term implications. In the short term, this knowledge can help you decide whether the selected problem has declined sufficiently for you to no longer devote resources to trying to further reduce it. If so, you may elect to draw a line under the current problem solving project and move on to addressing the next issue. In the longer term, knowledge about the impact of a response has implications for whether you (or others) adopt that response again. Herein lies a problem, however. Knowing that a response worked there does not mean that it will work here. The inconvenient truth of crime prevention is that interventions seldom work everywhere and every time. Context matters. For this reason, it is important when problem solving to look beyond only questions of whether a response did or did not work and also consider how a response worked (or did not), for whom, under what conditions and at what costs. For these questions we turn to the other elements of EMMIE.

Mechanism

This refers to how an intervention produces its effects. Mechanisms matter because a single intervention can produce positive (or negative) effects in different ways. Take knife sweeps. A stated aim of knife sweeps is to reduce knife crime. But knife sweeps might reduce knife crime through different mechanisms. Knife sweeps might lead to reductions in knife crime by confiscating knives that otherwise might be used in crime. Knife sweeps might lead to reductions in knife crime by reducing the circulation of knives in a targeted area. And knife sweeps might lead to reductions in knife crime by altering the perceived need to carry knives. Working out how a response produced its effects is important when deciding whether to modify, (dis)continue, or scale-up that response.

Moderators

Mechanisms are not activated unconditionally. A good assessment works out the conditions (or context) in which mechanisms are more or less likely to be triggered. Continuing the example of knife sweeps. It is likely that knife sweeps will be more effective in areas where intelligence indicates that there is a knife crime problem and that knives used in crime are routinely being stored. The same scheme implemented under different conditions may be less likely to produce the sought-after effects.

Implementation

Implementing responses is often complex and difficult. Challenges abound, from issues with procurement to under-resourced partner agencies. Yet the practical process of implementing responses is often left out of many problem solving write-ups (see **Unit 28**). This is an important omission. Smooth implementation is not a given in policing and crime prevention. Moreover, those seeking to emulate your work need to know what has been found about the obstacles and enablers of effective implementation, not least because many instances of intervention failure are, on closer inspection, the result of implementation failure. In problem solving assessments, documenting what you did is just as important as documenting what you found.

Economics

This asks whether the benefits resulting from your response are greater than the costs. The importance of estimating cost-effectiveness should be self-evident. All resources are finite. All resources could be put to alternative uses. And so, a strong problem solving assessment is one which considers response effectiveness alongside cost-effectiveness.

Evaluation can appear daunting. Do not be put off. There are many useful resources to support evaluation (Eck, 2017). The College of Policing has a page dedicated to **practical evaluation tools**, and runs 'research surgeries' to provide bespoke advice on research approaches and issues. Moreover, when it comes to evaluation in problem solving, perfection can be the enemy of the good. All assessments have limitations. The level of resources devoted to assessment need to be proportional to those invested in the initiative and to the possibility that the response may be applicable elsewhere. In large-scale, costly projects designed with wider lessons in mind, it makes sense to consult external evaluation experts to advise on or collaborate in the assessment. For smaller scale local projects this is unrealistic.

Demonstration

To what extent does the available research evidence adhere to EMMIE? This question was addressed in a 2020 study led by Lisa Tompson, in which 70 systematic reviews were assessed using the EMMIE framework (Tompson and others, 2021). The results were sobering. Although most systematic reviews reported

solid evidence on the effects of interventions, their treatment of mechanisms, moderators and implementation tended to be weak. Coverage of cost-effectiveness was largely absent. These findings call on researchers to expand the breadth of evidence available to crime reduction decision makers.

Further resources

Johnson S, Tilley N and Bowers K. (2015). ‘Introducing EMMIE: An evidence rating scale for crime prevention policy and practice’. Journal of Experimental Criminology, volume 11, pages 459-473

Unit 27: Logic models

Learning objectives

To know what a logic model is and how they can support effective problem solving.

Description

The previous unit described an inconvenient truth of crime prevention – that interventions seldom work everywhere and every time. What worked to reduce sexual assaults in Newcastle may not work to reduce sexual assaults in Nottingham. This presents a major challenge when considering what to do to address your own local violence problems.

There are two useful approaches to help deal with this challenge. The first is to **consult the evidence base**. Has a response been effective elsewhere to address similar problems? If so, that tells in the intervention's favour. We should place greater stock in interventions that have consistently produced positive effects compared to those which have consistently produced null or negative effects. The second approach is to think through the **plausibility** of the proposed responses in a given context. To help with this, there are logic models (see the College of Policing **practical evaluation tools**).

A logic model is a schematic depicting how an intervention is expected to work (a so-called theory of change). Logic models are used in many domains as a way of facilitating discussions between partners, and making explicit assumptions about the mechanisms through which programmes might produce their effects (both positive and negative). When problem solving, logic models can help:

- arbitrate between alternative responses
- evaluate whether a given response stands a good chance of working
- identify what needs to happen to maximise the chances that a response is effective
- monitor the progress and impact of implemented responses

There is no set method for producing a logic model. They are often the result of desk-based research involving relevant stakeholders. These logic models often resemble flowcharts, illustrating how the input and activities associated with a given

intervention might plausibly lead to the sought-after outputs and logically to the desired outcomes (see example in Figure 21). Of course, not all crime prevention programmes achieve the desired objectives and, consequently, a good logic model should also identify possible unintended negative effects that might follow from the implementation of a particular response plan.

All logic models are simplifications – they cannot capture all the many factors that might influence whether an intervention is or isn't effective. In this sense, logic models are best thought of as general templates to be revised and refined to reflect the specifics of your own local context and violence problem.

Demonstration

The logic model shown in Figure 21 is taken from the College of Policing **guide on problem solving knife crime**. It is a logic model on the use of weapon sweeps to reduce knife crime (and related offences). This logic model consists of five columns organised in a causal sequence from left to right. These five columns relate to the:

- inputs and resources needed to launch a weapons sweep initiative
- activities associated with implementing weapon sweeps
- outputs that are expected to occur following weapons sweeps
- mechanisms through which weapon sweeps might generate impact, and
- outcomes, both intended and unintended, that might plausibly and logically occur as a result of weapon sweeps

Spanning these five columns is a box denoting context, to illustrate the kinds of conditions under which weapon sweeps might be more or less effective.

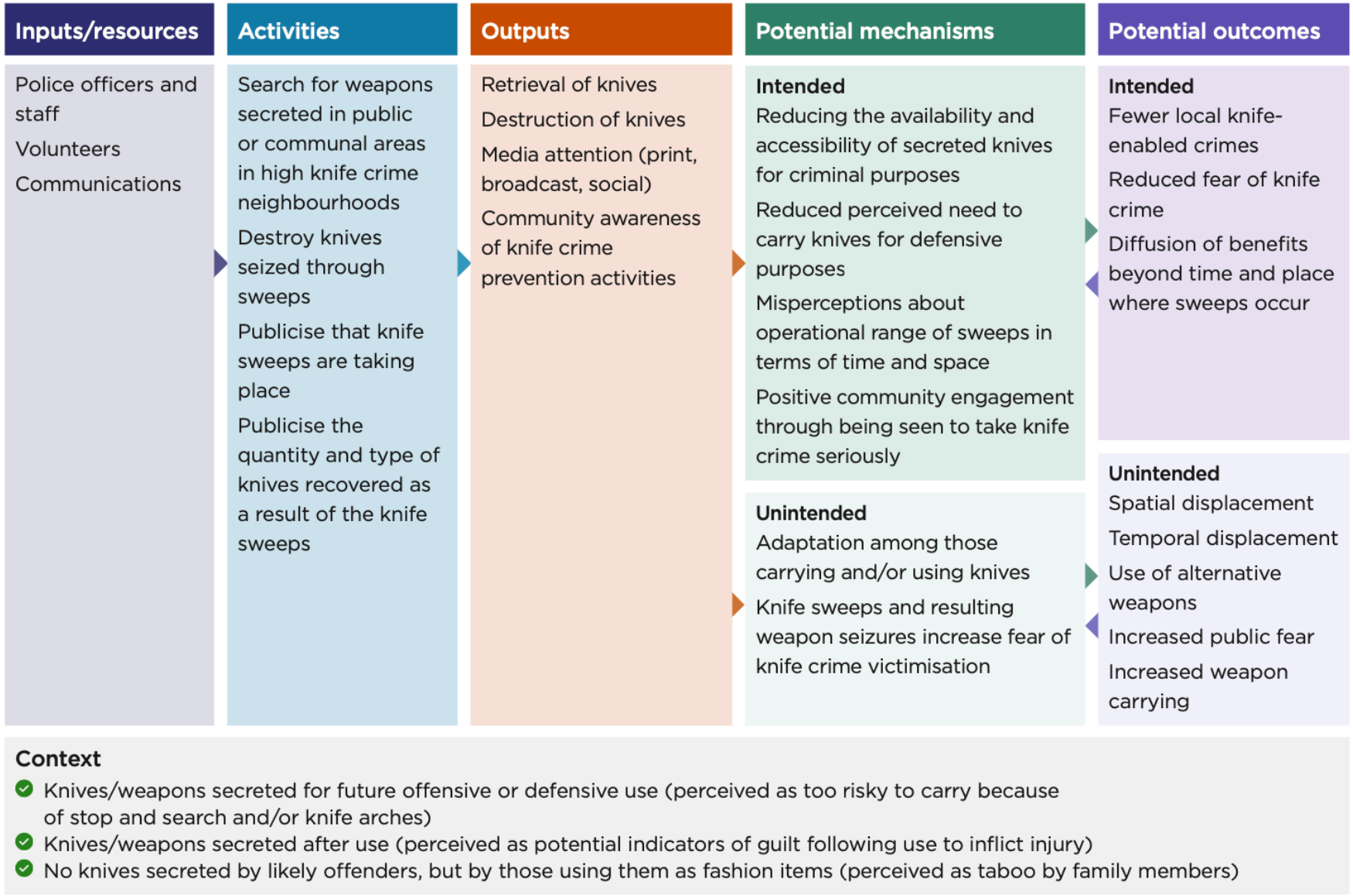
How to use a logic model when problem solving? Imagine that knife crime in your area is on the rise. Weapon sweeps have been proposed as one tactic to help reduce knife-enabled offences. Now imagine that you and a group of informed stakeholders have produced the logic model in Figure 21, based on your local knowledge and a reading of the available research literature. How might it help you going forward? First, by creating this logic model, you can better see whether available resources are sufficient to implement and sustain this particular initiative. A lack of personnel to go out and search for knives would clearly limit the impact of such an initiative, for example. Second, the logic model can help ascertain whether

the local context is conducive to this initiative bearing fruit. If, say, there is a lack of intelligence to suggest that weapons are being stored in given areas for criminal purposes, then it calls into question the rationale for pursuing this scheme, as opposed to something else. Third, logic models can help sharpen impact evaluation. By highlighting possible positive and negative consequences, it allows you to identify opportunities to collect data that speak to these outcomes to determine whether, say, weapon sweeps do lead to increased fear or increased weapon carrying among local residents.

Further resources

Sidebottom A and others. (2021). **Knife crime: A problem solving guide**. College of Policing

Figure 21: Logic model for weapon sweeps to reduce knife crime.



Unit 28: Process evaluation and tracking implementation

Learning objectives

To know what is meant by inputs, outputs and outcomes, and how to select and track them to ensure responses are implemented effectively.

Description

There are two basic kinds of evaluation. The first is an impact evaluation. Impact evaluations ask whether the selected crime problem has changed, and whether the chosen responses were the cause of those changes. This type of evaluation is covered in units 29 to 36. The second type of evaluation is a process evaluation. Rather than address questions of impact, a process evaluation asks whether the responses were implemented as planned, and whether you and your partners did what you said you would do.

A good problem solving assessment includes both a process and impact evaluation. The two are complementary. Process evaluations focus on inputs and outputs whereas impact evaluations focus on outcomes. To illustrate, consider an evaluation of use of police stop and search powers. A process evaluation would document, among other things, the time and resources devoted to stop and search (inputs). It would also keep track of what has been delivered as part of a stop and search initiative, such as the number of people stopped and the percentage of searches resulting in drugs or weapons being seized (outputs). An impact evaluation, by contrast, would determine the effects of police stop and search on, say, levels of crime or harm in the targeted area as compared to a control area.

Process evaluations do not need to be arduous. Useful information can be captured through little more than diligent record keeping to check whether reality matches plans. The process of monitoring implementation can in turn generate improvements in implementation, by helping to identify instances where corrective actions are needed to prevent things going astray. Consider a place-based police strategy where officers are required to be visible at a crime hot spot during hot times for a specified duration. In this example, regular monitoring of officer radio or GPS data would identify the extent to which these requirements are being met, and help reduce the likelihood of implementation failure.

Demonstration

This example considers how Thames Valley Police tracked the implementation of high-visibility police officer patrols in micro-hotspots as part of an initiative to reduce serious violence in public places.

There is extensive evidence to show that visible policing in hot spots can effectively reduce crime (Braga and others, 2019). Context is key, however, and what officers do when they are in those hot spots matters. Telling officers to remain stationary for prolonged periods of time, or having them simply drive through crime hot spots has been found to be neither efficient nor effective. Instead, continuous testing of hot spots police officer patrols suggests that intermittent patrols of micro-hot spots for periods of around 10 to 16 minutes at least every two hours, extends a deterrence effect. Furthermore, in ensuring that patrols do not become predictable and potentially avoidable, targeted patrols are best assigned randomly (see the College of Policing **Serious violence hot spots policing guide**).

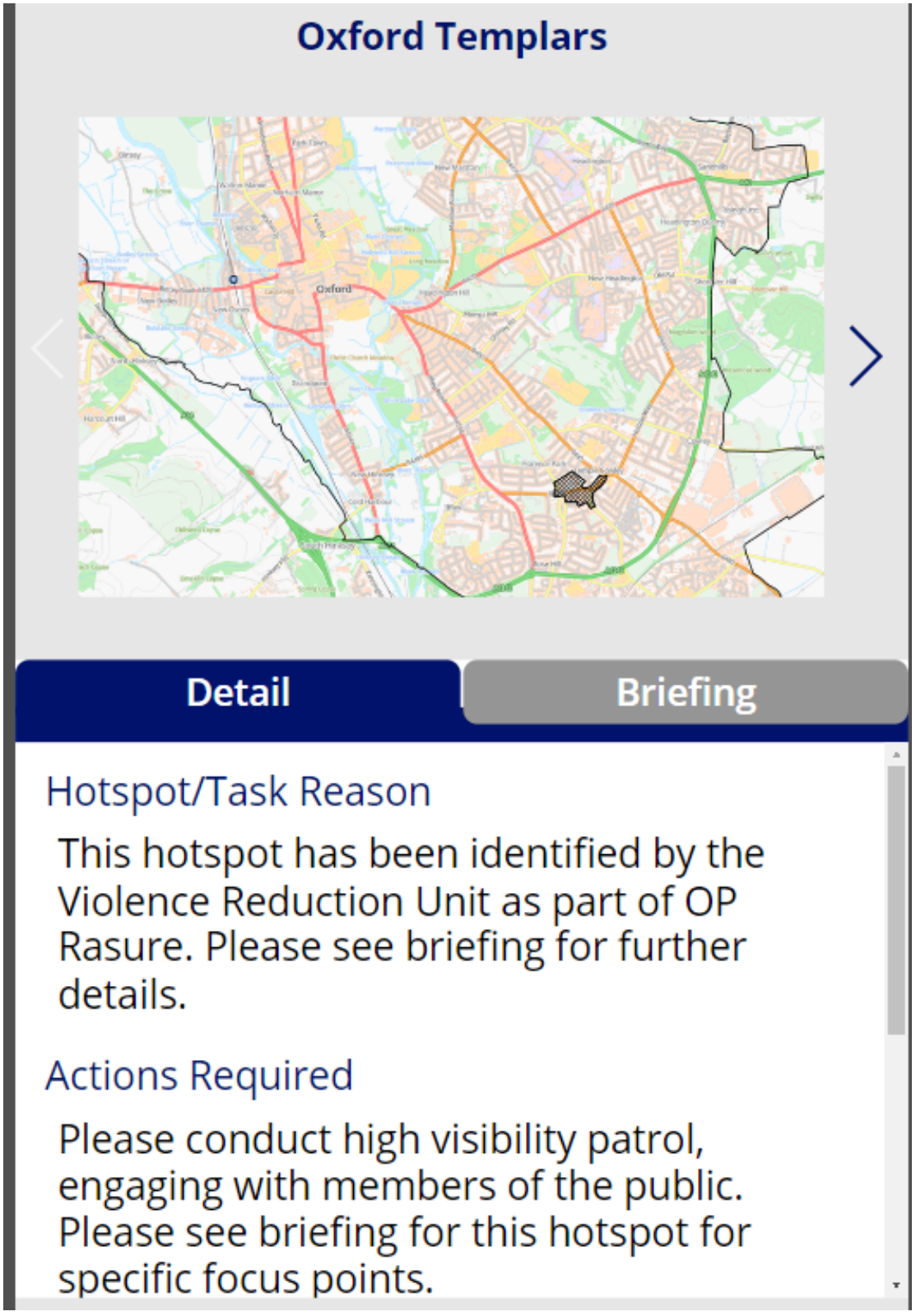
Theory and evidence on hot spots policing suggests several potential inputs and outputs to consider as part of a process evaluation, including the following.

- Inputs
    - The number of officers required to patrol identified crime hot spots.
    - The number of patrols an individual officer can fulfil in order to meet the specified time requirements per hot spot.
    - Whether resourcing is sufficient with current shift patterns to meet the hoped-for dosage rate, or is overtime required?
- Outputs
    - Number of hot spots to be visited daily.
    - Number of patrols to be conducted in those hot spots daily.
    - Duration of patrols.

Ideally, the tracking of any intervention data should be manageable for officers and analysts, without creating an additional burden. With this in mind, Thames Valley Police produced a mobile phone app that pushes out daily randomised patrol locations to their uniformed police officers (see Figure 22). The app captures the

previously mentioned output data, which is then directed to a monitoring dashboard that can support analysis, feedback and corrective action, where necessary.

Figure 22: Screenshot of a mobile phone app that randomises patrol locations. Image reproduced with the permission of Thames Valley Police.



Similar processes have been developed in other UK police forces. In Essex, for example, six intervention activities were created as stop codes so that officers could capture outputs using their radios (for example, routine patrol, plain clothes patrol). This made the data available real-time via the force's resource and activities database, and using scheduled reporting was directed to a monitoring dashboard for supervisors to regularly review levels of activity in line with implementation expectations.

Forms and e-surveys provide another option for collecting ad-hoc project-specific outputs. It is highly recommended that analysts develop working relationships with technical roles in Digital Data and Technology teams, management information programmers in IT departments and/or data engineers to explore software and options that might be available, and how to use them.

Further resources

Kime S and Wheller L. (2018). **The policing evaluation toolkit**. College of Policing

Unit 29: Internal and external validity, and their threats

Learning objectives

To understand the concepts of internal and external validity and their importance for effective evaluation and identifying causal effects.

Description

A key goal of an impact evaluation is to be able to make an unambiguous claim about whether a given response had a positive effect, a null effect, or a negative effect on the identified crime problem. Put differently, it is about determining whether a response 'caused' a change in a given outcome. A second goal is to be able to say whether a response that was found to work with one set of people or places might work elsewhere in another set of people or places. These goals sound straightforward. In reality, however, there are a great many factors that can make achieving these goals challenging. It is important to be aware of the things that stand in the way of making causal claims about the impact of crime prevention interventions. Knowing this can help you design evaluations better to overcome these challenges and thus save you time and resources in the longer term.

Two concepts lie at the heart of impact evaluation:

- **Internal validity** relates to the first goal – can we confidently say that an observed outcome was caused by the responses put in place?
- **External validity** relates to the second goal – can we generalise our results beyond our particular problem solving setting and population?

In relation to the latter, it should be noted that for some problem solving projects we are less interested in whether the observed results are generalisable to other problems and places. What matters is whether the chosen responses led to a reduction in the specific problem causing harm. There are, however, occasions where there is an interest in knowing whether a given response might work elsewhere, particularly in the case of large-scale, well-funded problem solving projects. With this in mind, the following demonstration covers threats to both internal and external validity.

Demonstration

There are many threats to internal and external validity – things that prevent you from being able to confidently attribute a reduction in crime to implemented responses, or to generalise your evaluation findings to other contexts.

Threats to internal validity

History

History relates to factors other than the intervention that might affect the outcome. Imagine that you were evaluating the impact of an alcohol-related violence intervention in bars. If, during the time of your evaluation, licensing laws changed which limited alcohol availability, then this change in the law might plausibly affect the number of alcohol-related violent offences, therefore making it tricky to separate the effect of your intervention from the effect of the new law.

Selection bias

Selection bias refers to individuals or areas who are either enthusiastic about or dismissive of an intervention, and who might therefore select themselves in or out of an evaluation. Selective uptake can affect outcomes, thereby obscuring any real effects. Selection bias is a common concern in many offender-oriented interventions. Individuals who take part in an intervention to reduce their domestic abuse offending might, for example, be more motivated to change than those who similarly perpetrate domestic abuse but who reject the offer to take up the intervention.

Differential attrition

Differential attrition refers to participants who may drop out of an evaluation, which in turn may create a false impression of an intervention's (in)effectiveness. An example would be an intervention requiring prolonged engagement with a service provider. If the outcome of an evaluation of this programme was self-reported offending using a survey, then clearly less motivated participants might not show up to complete the survey, thus giving rise to misleading results about the impact of the intervention.

Maturation

Maturation refers to changes in outcomes that happen naturally, but which sometimes can be mistaken for the effects of an intervention. Most teenagers, for

example, will naturally desist from offending as they enter their 20s, regardless of whether they do or do not take part in a specific violence reduction intervention.

Testing

Testing refers to people or communities becoming aware that they are part of a problem solving project, and when that awareness affects their behaviour. For example, the mere presence of evaluators observing a given area might influence people's behaviour and, particularly, reduce their offending.

Instrumentation

Instrumentation refers to the way in which an outcome is measured and whether that changes over the course of an evaluation. If so, this might artificially affect the outcome. If, for example, during the course of an evaluation a police force changed its policy to prioritise community resolutions over the use of cautions, it may falsely appear that an intervention is having a positive effect on offending if the use of charges and cautions is the only outcome measure.

Threats to external validity

Setting generalisability

An intervention's effectiveness is likely to be affected by the location in which it is implemented and the population on whom it is tested. This context-sensitivity has implications for the extent to which an effective intervention can be rolled out elsewhere and produce the same (positive results). This is a common problem in medicine, where evaluations might be undertaken under artificial laboratory conditions. Likewise in policing, initial enthusiasm for an intervention might mean that it is delivered more effectively than it would be as part of everyday police practice.

Sample generalisability

Some interventions work better with particular groups or places. For example, a hot spot policing intervention that works well in areas with wider streets and good visibility might not be as effective in areas with narrow streets and poor visibility.

Further resources

Ratcliffe JH. (2018). 'Reducing Crime: A Companion for Police Leaders'. New York, NY: Routledge

Unit 30: Before and after impact evaluations

Learning objectives

To understand good practice in the use of before and after impact evaluations, and the limitations of this evaluation method.

Description

The evaluation of a crime prevention intervention is primarily about understanding change. Did violence change for the better, for the worse, or not at all following some event or response? Change is, therefore, about time, and observing the world before something happens and asking if it is now different. This is often referred to as a before-and-after evaluation (or pre-post test).

The simplest version of a before and after evaluation uses two data points – before a response is put in place and after. While simple, there are compelling reasons why we should use a larger number of data points before an intervention is implemented and afterwards, to increase our confidence that any observed change in crime is indeed the result of the intervention. Resources will likely dictate the extent of data coverage. When using primary data, such as self-report surveys or observations in hot spots, we may only have the resources to capture data around a small number of time points. However, with data that is captured routinely, and which can be accessed retrospectively, such as police crime data or stop and search data, we are not limited to a small number of time points.

There are well established limitations with before and after evaluations. These limitations relate to several of the threats to internal validity described in **Unit 29**. Before-and-after impact evaluations are, for example, susceptible to the maturation effect and historical effect, where factors not related to the intervention might affect the outcome (see this unit's demonstration section). A more complex threat to internal validity is the statistical phenomenon of 'regression to the mean'. This can be summed up as follows. Extreme values tend to become less extreme over time, or, in a violence context, violence rates that are unusually high for an area are more likely to fall than they are to increase. This does not mean that violent crime rates definitely will fall or that there is not a problem with violence in a given area. It simply says that a natural decline in crime (like any variable) is more likely even if we do

nothing. Crucially, this is something that is not picked up in a simple before and after assessment. Yet because ‘doing nothing’ is rarely an option, and because police forces often target their activities on the highest crime areas or offenders, it is important that evaluators are aware of regression to the mean. One way to avoid this challenge is to undertake activities in a range of areas experiencing different levels of violence and/or to use comparison areas which do not receive intervention.

When setting the time periods for a before-and-after evaluation, you should consider the influence of time on the outcome of interest. The most recognisable effect of time on violence is ‘seasonality’. Every year in the UK, police records show increases in violence around July and August. This reflects increased interaction between people as a result of the holidays and warmer weather, which creates more opportunities for violent conflict. Therefore, a project that compares violence in June to August against September to November will almost certainly see a reduction in violence that is unlikely to have been caused by police activity. Even more nuanced might be comparing months which have different numbers of days, especially if the longer months include an extra weekend. Finally, it is important to remember that time periods, such as months are not independent. Although violence can go up or down between months, the amount of violence in month 2 will be correlated with the amount of violence in month 1 and so it is important to choose a sufficiently long follow-up period in order to be able to detect the true effects of an intervention should they emerge.

Using terms like ‘before’ and ‘after’ can often obscure how complicated policing interventions can be. In fact, it is rare that clear ‘before’ and ‘after’ time periods can be identified in police problem solving projects. For example, with activities such as hot spots policing, activity might roll out gradually in different areas and the extent of the activity going on in the hot spots might begin small and intensify over time. Therefore, it is important to plan for and keep track of these eventualities when designing a before-and-after study (**Unit 28**). You may wish to have a ‘bedding-in’ period that is excluded from the study evaluation. Whatever approach you choose, it is a good idea to make and write down these decisions before beginning the activity to avoid missing the real intervention effects later and to avoid the temptation to ‘tweak’ the time periods so that the effect looks greater than it actually was (a process known as t-hacking – see Sowell, 1981).

It is also a good idea to use as long a time period as possible when conducting a before-and-after evaluation, to help overcome any regression to the mean or seasonality effects. Where possible with violence, a period of two years before intervention is a good rule of thumb. Finally, while before and after evaluations provide useful insight into change over time, it is difficult to rule out the influence of factors that are not related to the intervention. To do this, we need a comparison group, which is discussed in **Unit 31** and **Unit 32**.

Demonstration

Here is an example of a problem solving project using a before-and-after evaluation design. In November 2017, the **London Metropolitan Police neighbourhood police team in Shepherd's Bush Green** noticed a rise in antisocial behaviour and violent crime linked to a local McDonald's restaurant. The problems included significant volumes of reported crimes, young people gathering outside the premises and intimidating passers-by , and a lack of security. A partnership approach was taken involving the police, council, and McDonald's. After unsuccessful attempts with conventional police tactics, a closure notice under the Anti-Social Behaviour, Crime and Policing Act 2014 was considered but not issued, as McDonald's agreed to make changes suggested by the police. These changes, such as turning off free wifi and playing classical music, resulted in an immediate decline in crime and antisocial behaviour – from 71 crime reports in the year to single figures after several months' follow-up. The success of the initiative attracted attention from other police services and the project paved the way for future proactive initiatives.

Further resources

Wooditch A and others. (2021). 'A Beginner's Guide to Statistics for Criminology and Criminal Justice Using R'. New York, NY: Springer

Unit 31: Using control groups

Learning objectives

To understand the purpose of using comparison or control groups when conducting evaluations.

Description

Evaluation is partly a philosophical activity. We are saying, in effect – if we could create two identical universes and in one, did nothing, and in the other, did something, then any difference in outcome between the two conditions would be attributable to our activity. Of course, we cannot simultaneously do something and do nothing – we can only see the 'factual' data that exists. We can, however, try to create a 'counterfactual', conditions that simulate what would have happened had we done nothing. This is where comparison or control groups come in. We can implement a policy, programme or practice in one place or group and do nothing or give business-as-usual to some other comparable 'control' unit. If we are confident that what happened in the business-as-usual units reflect what would have happened in the intervention units had we not put our intervention in place, then we can be more confident in saying that it was the intervention which caused any differences we observe. Unfortunately, in the complex world of policing and crime prevention, behind the word 'if' lies a great many challenges to our making strong causal claims about the effect of our interventions.

Research identifies four criteria for making reliable comparisons. These criteria cannot be met in all circumstances, but being aware of them can help you design better evaluations or recognise the limitations in existing evaluations.

Exchangeability

It is assumed that an intervention unit not receiving the intervention would produce the same outcome as a control unit. In other words, the presence of risk and protective factors between the intervention and control units are, on average, balanced. A violation of this assumption would be if, say, a treatment group in a cognitive behavioural therapy programme tended to have more family support, which helped reduce participants' violent behaviour.

Positivity

It is assumed that there are no conditions of an intervention or a control unit that are not matched in the other group, and that each unit has an equal chance of being in the treatment or control group. A violation of this assumption would arise if, say, there was a school-based violence intervention scheme that inadvertently excluded children who were persistently absent from school.

No interference

No interference (otherwise known as ‘spillover effects’) assumes that the outcome in one unit (intervention or control) is not affected by what happens in another unit. A violation of this assumption would be a hot spots policing initiative in which targeted activity in treatment areas displaced violence into nearby control areas.

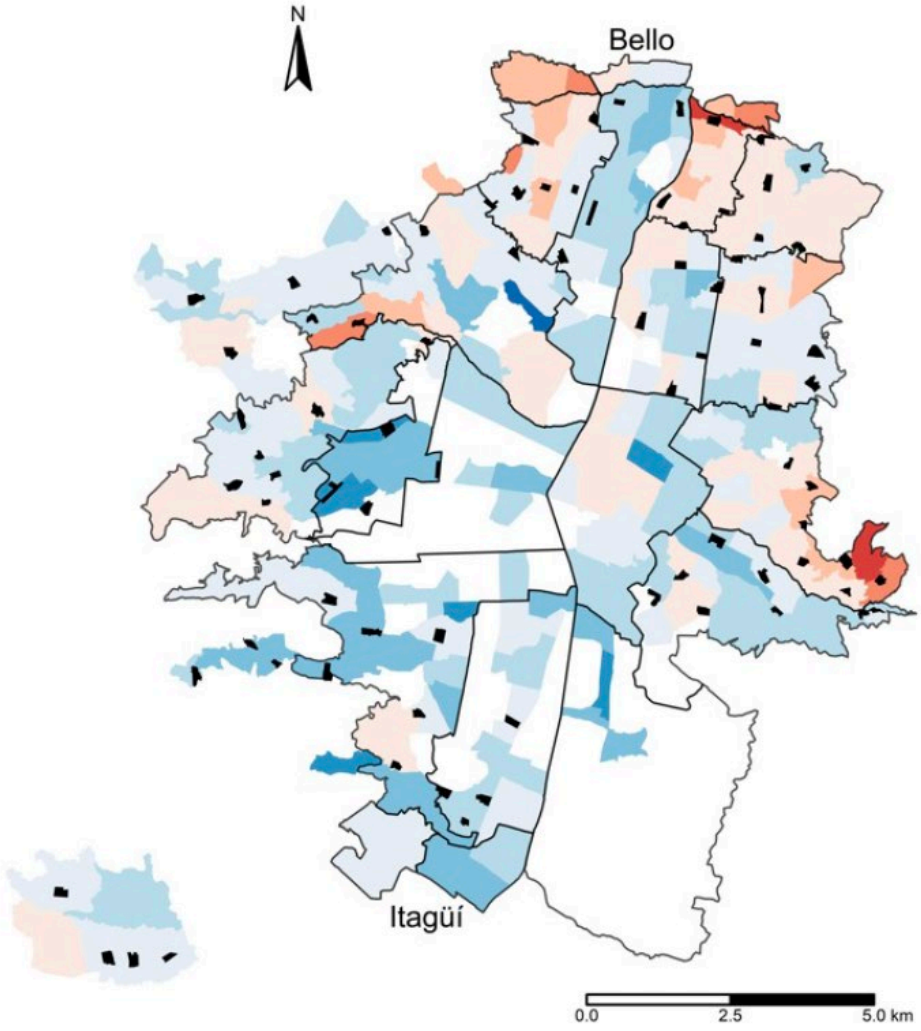
Consistency

It is assumed that an intervention and its effects are approximately the same across intervention units. By extension, an intervention should be very clearly defined and understood by those whose behaviour we are seeking to change. For example, a court order that is not explained in plain language may be understood differently by people whose first language is English and those whose first language is not English, thereby effectively resulting in different interventions.

Demonstration

In 2018 to 2020, Chris Blattman and colleagues worked with the Mayor of Medellin, Colombia, to test the effectiveness of local civilian problem solvers intended to help resolve disputes and, in turn, reduce crime. They chose 80 of the 1,600 neighbourhoods (shown in black in the map in Figure 23) in the city to be part of the evaluation and randomly allocated a civilian problem solver to 40 of them while keeping the other 40 neighbourhoods as control areas. A potential threat to the **internal validity** of the evaluation was that these problem solvers might affect crime beyond the local neighbourhood to which they were assigned. If this effect was to ‘spill over’ into the comparison areas, it could hide the true effect of the problem solvers. In order to reduce the risk of this happening, the team placed a 250m ‘buffer zone’ around the 80 participating neighbourhoods. The neighbourhoods within these buffer zones were then excluded from being treatment or control areas.

Figure 23: Treatment sites in Medellin, Colombia (Blattman and others, 2022). The black points indicate the neighbourhoods selected for this study. Control areas are not indicated for visual clarity but are of similar size. The colours indicate the relative level of dispute resolution according to official and unofficial sources. Warmer (red) colours indicate more official intervention, while cooler (blue) colours indicate more unofficial intervention.



Further resources

Blattman C and others. (2022). **Civilian alternatives to policing: Evidence from Medellín's community problem-solving intervention Operación Convivencia**. SocArXiv

Unit 32: Creating control units

Learning objectives

To understand some of the different methods for generating suitable control groups including propensity score matching, prognostic score matching and synthetic control matching.

Description

Resources are always finite. It follows that most violence prevention interventions do not have sufficient resources to target all relevant people and places. Creating suitable comparison areas or groups is therefore an important part of many violence prevention evaluations. Yet selecting suitable comparison units requires careful thought, paying due attention to the type of outcome being measured, the nature of the intervention under evaluation and the statistical methods used to estimate intervention effectiveness.

Unit 31 is about comparison units and how good comparison units should be as similar as possible ('exchangeable') to those units which are receiving an intervention. In practical terms, we are looking for people and places that share similar (relevant) characteristics and that are equally suitable for intervention. For people, this might be that they have a comparable history of violence. For places, this might also reflect a high risk of violence, or it might relate to particular land uses linked to crime (such as the presence of casinos, bars or train stations). In selecting comparable units, we should also try to ensure that the factors that might influence our outcomes of interest are equally balanced between treatment and control groups. A common challenge in crime prevention, however, is that we cannot know all of the things that might plausibly affect crime. If an important factor that has nothing to do with the intervention, such as the number of betting shops in an area or the extent of childhood adversity differs between the treatment and control groups, we might find a difference in the outcome and unwittingly attribute that difference to the intervention (as opposed to the unknown variables).

Different methods for generating suitable control groups include:

Matching

Matching is an important approach when you do not have control over which units get the intervention, as is often the case in policing. However, this approach makes a number of assumptions to be aware of. Firstly, matching assumes that all the important factors that might influence both the intervention and the outcome have been included in the data set used to create a matching score. This is a big assumption that is very difficult to confirm. The second assumption is particularly important to area-based crime prevention evaluations, namely that of ‘parallel trends’, which is that changes in the outcome variable over time in the intervention and control units have remained roughly parallel. At present, there is no definitive way to test for parallel trends, so careful visual examination of the trends over time is recommended.

Propensity and prognostic score matching

Propensity and prognostic score matching is a technique for identifying suitable control units. A data set is created that includes all eligible units for a study and, for each unit, as much information as possible about things that are likely related to the outcome of interest (e.g. factors that you believe cause violent crime). A statistical algorithm will then generate a weighting ‘score’ for each comparison unit ranging from 0 to 1 that reflect how similar that unit is to the intervention units. Similarity is assessed in terms of treatment condition (‘propensity’ to have been in the treatment group) or the outcome (‘prognosis’ that the outcome would occur or the scale of the outcome). A weighting of, say, 0.9 would indicate high similarity to the intervention units, while a score of 0.1 would indicate low similarity. These scores can be used to match individual intervention units with one or more control units.

Synthetic control

Synthetic control is an extension of propensity or prognostic matching that creates a weighted pool of control units. It is well-suited to evaluations where there is only one or a small number of intervention units and where there is longitudinal data on outcomes in the intervention and potential control areas before intervention. The method creates a pool of comparison units that are weighted to match the characteristics and trends in the intervention unit and any difference between the intervention and control units in the post-test period is assumed to be an effect of the

intervention. Although originally designed when there is a single intervention unit, this method can accommodate multiple intervention units, as described in the following demonstration section.

Demonstration

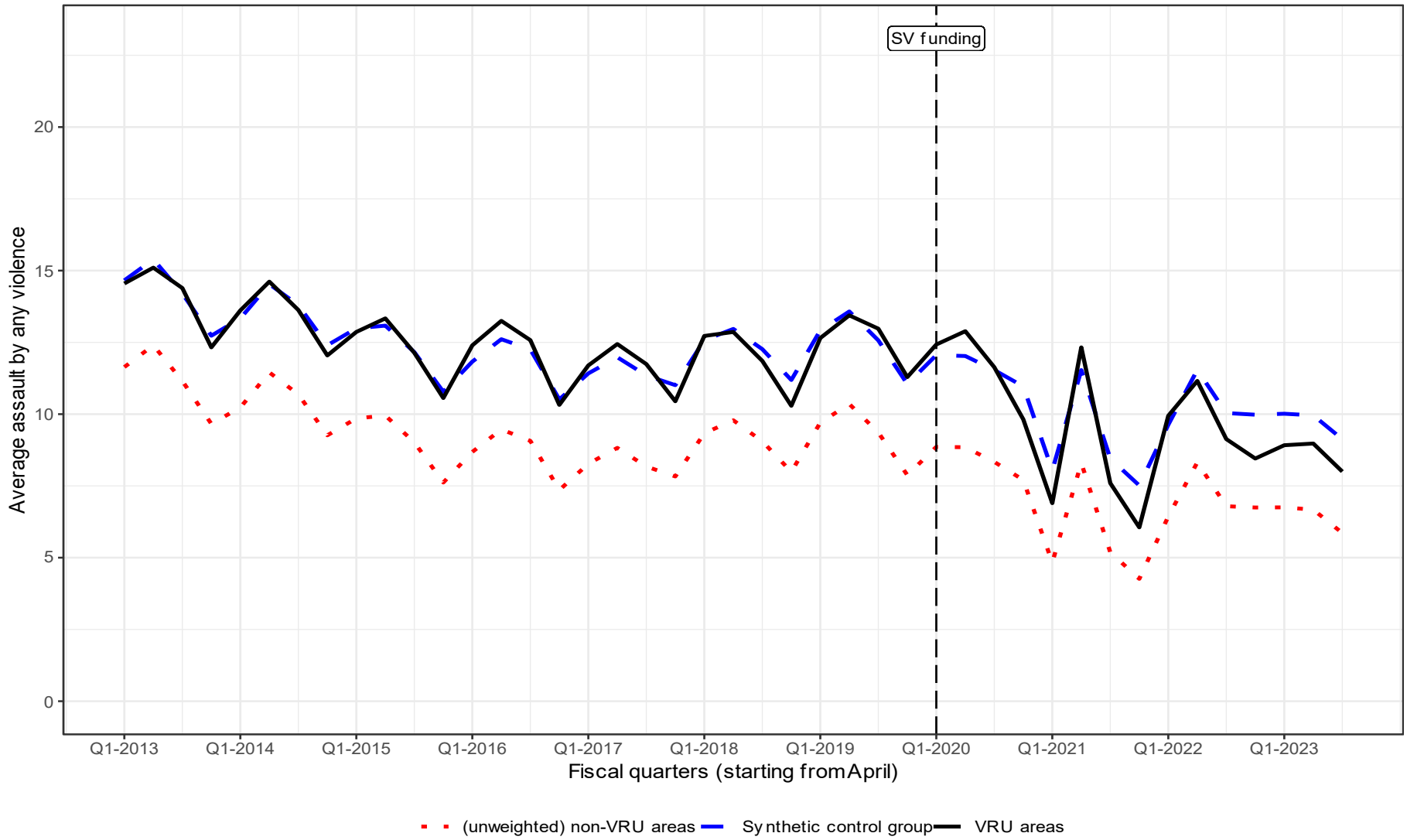
Funding for violence reduction units (VRUs) is allocated based on the amount of knife crime per area. Partly because they are more populous, the larger, more urban police forces therefore received VRU funding while smaller, less populous forces did not. This presented a challenge for evaluating the impact of VRUs on violent crime. When there are 43 police force areas and the outcome in the intervention area (VRU forces, shown as a red line in Figure 24) is, by design, different from that in the control areas (non VRU forces, shown as a black line in Figure 24), then what is a suitable control area? The solution to this problem was synthetic matching. Although VRUs operate across their entire police force area, the majority of intervention activity is in high-violence urban areas. Moreover, even though a police force may not have received VRU funding, it would likely have pockets of violence comparable to those in funded VRU police forces. Using the synthetic control technique and data from every local authority in England, the evaluators created a collection of local authorities who did not have a VRU but who had similar violence trends to VRU areas. These controls areas were then ‘weighted’ to reflect the amount of violence in the intervention areas (blue line). As can be seen in Figure 24, this technique created a much better comparison group for the VRU areas in the period before the programme was launched. It also showed a much more modest and accurate effect of the programme than would have been observed using non-synthetic control data.

Further resources

Cunningham S. (2021). ‘Causal Inference: The Mixtape’. New Haven, CT: Yale University Press

Ecorys, Ipsos MORI, Brennan I and Kelson M. (2023). **Evaluation of Violence Reduction Units, 2022/23**. Home Office. Licensed under the Open Government Licence

Figure 24: Levels of violence in VRU police forces, non-VRU police forces and in a synthetic control group.



Unit 33: Randomisation

Learning objectives

To understand the principles, requirements and challenges of randomisation for crime prevention evaluation.

Description

Being able to draw sound conclusions from an evaluation is dependent on many things, such as having good data, making sure the intervention was delivered as planned and, relevant to this unit, the similarity between treatment and comparison groups, be they people or places. As we have seen in previous units, trends in the outcome and characteristics of those groups can have implications for how suitable they are for comparison. All things being equal, the greater the similarity between treatment and comparison groups, the greater the internal validity of an evaluation, and the more confident we can be in our evaluation findings with regard to impact.

One approach that gives us a high degree of internal validity is to identify all eligible units for a crime prevention intervention and then randomly allocate some to receive the intervention and others to receive 'business-as-usual'. The reason that randomisation helps strengthen causal claims is that each unit has an equal probability of being assigned to the treatment or the control group, meaning that any of the factors that might plausibly affect evaluation outcomes are likely to be shared equally between treatment and control groups. It does not mean that both groups will be identical in every way, simply that the influence of any confounding variables is removed (or at least shared equally across treatment and control conditions). When we can be sure of this – which is a big ask – then any differences we observe in outcomes between the treatment and control groups can be more confidently attributed to the intervention.

Undertaking a high-quality randomised controlled trial (RCT) is challenging, and may not be appropriate for many localised problem solving projects. It requires a lot of planning, tight control of implementation and excellent record-keeping. Perhaps more than anything, it also requires you to convince colleagues, partners and the community that randomisation, specifically withholding an intervention from eligible groups (continuing current practices) is both ethical and appropriate. This can be

particularly tricky if you have to convince people that an intervention is a worthwhile investment while also maintaining that you are not certain that it will work, hence the desire to use randomisation. Being aware of these competing messages in advance will help you to manage expectations and to ensure that all partners feel included and committed.

There are different types of randomised design. The purest and, generally best, randomised design is to ensure that treatment and control groups are equal in size (balanced), kept entirely independent of one another for the duration of the trial – sometimes called a parallel design – and where the evaluators and the delivery team are 'blind' to whether a person or area is in the control or intervention group. Meeting this ideal is a tall order, and in most cases will not be possible for ethical or practical reasons. A variety of alternative randomised designs exist, including crossover trials and waiting list designs that may be deemed more ethically acceptable. In evaluations of policing interventions, it is rare that the team delivering the intervention can remain 'blind' to which condition a unit is in, but every effort should be made to ensure that control units receive 'business-as-usual' (or some other defined control condition). It is usually possible, with careful planning, to ensure that analysts comparing the intervention and control units do not know which is which.

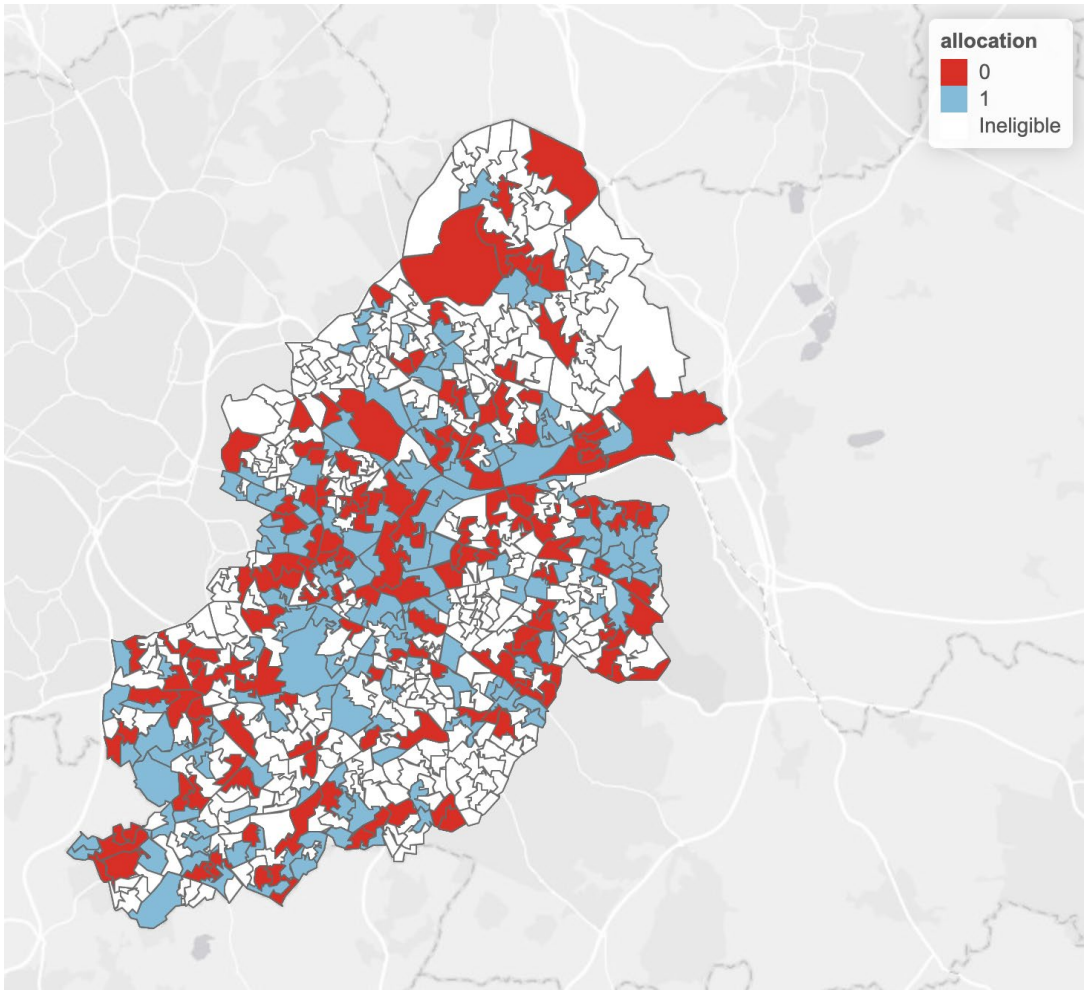
Randomisation can be done in different ways from simple random allocation (akin to tossing a coin) to using statistical software to make sure that important features of the treatment group are evenly distributed across the intervention and control conditions (known as 'stratification' or a blocked design). In principle, flipping a coin will achieve robust random allocation with two conditions, but a variety of software and platforms offer reproducible alternatives (see the further resources section).

Demonstration

Imagine you were asked to test the effect of a place-based violence intervention and you wanted to use a randomised controlled design. Because of limited resources, you decide to limit eligibility for the study to areas with ten of more violent incidents per year. Using randomisation software, you randomly allocate eligible areas to the treatment or control group. Randomisation distributes the characteristics of the sample evenly – the ones that might affect the outcome and the ones that do not (and we cannot know which will be influential). In a simulated example, shown in

Figure 25, we can check this by comparing the characteristics of the treatment and control areas, which should be similar if randomisation has worked as intended. In this example, the average number of violent incidents in the control areas was 15.00 and the average number of violent incidents in the intervention areas was 15.05 – almost identical. The treatment group received the intervention while the control group received business-as-usual. After 12 months of intervention, the distribution of the outcomes between the treatment and control groups would be compared and statistically analysed to estimate the treatment effect.

Figure 25: Distribution of treatment (red) and control (blue) sites.



Further resources

- Ariel B, Bland M and Sutherland A. (2022). 'Experimental Designs'. London: SAGE Publications
- Bland M. (2020). **Directory of randomisation software and services**

Unit 34: Samples and sampling

Learning objectives

To understand the importance of appropriate sampling when evaluating crime prevention interventions.

Description

As indicated at the start of this guide, data is central to crime analysis. Data comes in many forms, such as intelligence logs, crime records, accounts of police activity and camera footage. But almost all data sets in crime and policing are incomplete. Some crimes, even serious violence, do not get reported to the police, some people who are suitable for diversion programmes do not get offered them, and some people are more likely than others to complete community safety surveys. Consequently, the data that we work with when problem solving tends to be a ‘sample’ of the total data set. From this term, we get the process of ‘sampling’. Sampling can be ‘active’, in the form of selecting people or places to be offered an intervention, or ‘dip sampling’ from, say, a set of intelligence logs, but it can also be ‘passive’, as happens when using crime records where there are patterns in the crimes that get reported and recorded.

We take or use a ‘sample’ because including everyone or every place that is of interest to us (the ‘population’) usually isn’t affordable, ethical, or possible. It is important to note that ‘population’ does not mean everyone or every place in a region, just everyone or every place that is of interest based on the specific objectives of a given project, such as the population of victims of violence or the population of neighbourhoods in a city that do not have a community centre.

Sampling is an important and sometimes neglected part of the analysis process. The data that goes into an analysis shapes what comes out of it, and subsequent practices and policies. For this reason, who features in crime records, who engages in violence prevention support, who completes follow-up surveys and who gets included or excluded from interventions are all loaded with potential biases that should be acknowledged and, where possible, avoided. Spending time thinking about sampling and data bias at the beginning of a problem solving project will always pay dividends.

Key considerations when it comes to sampling are as follows.

Type of sampling

Probability sampling

Probability sampling is where each member of a population has an equal chance of being selected. This is easier said than done. For example, a public survey might have no restrictions over who can complete it but that does not mean that everyone has an equal probability of doing so. Those without the internet cannot complete an online survey, for example.

Non-probability sampling

Non-probability sampling is where members of the population contribute or participate in an unequal way. This is more common (than probability sampling) but requires adjustment, such as statistical weighting, if the data is taken to be considered representative and thus generalisable to the population at large.

Sampling period

When looking at changes over time, the sampling period is important. Particularly with rare events, such as homicide, taking a small sample of time (for example, number of homicides each year in a police force over four or five years) can be highly variable and can fluctuate considerably, giving a false sense of major change happening. This can be seen in Figure 26 and Figure 27, which suggest large changes in the number of knife-involved homicides in England and Wales over time (the red line in Figure 26). Eye-catching annual fluctuations of 10% are not uncommon. However, framing these homicides as a **proportion** of all homicides shows that these fluctuations may not be indicative of a major change in the nature of homicide (blue line in Figure 27) and infer an increasing trend in all homicide.

Although sample sizes can occasionally be too large, thereby giving a false sense of the importance of some findings, larger sample sizes are generally desirable as they provide more accurate and stable results that are a better reflection of the wider population. Sample size is also very important for other types of data and when trying to detect the impact of an intervention. This is discussed further in **Unit 36**.

Figure 26: Annual count of homicides involving a sharp object.

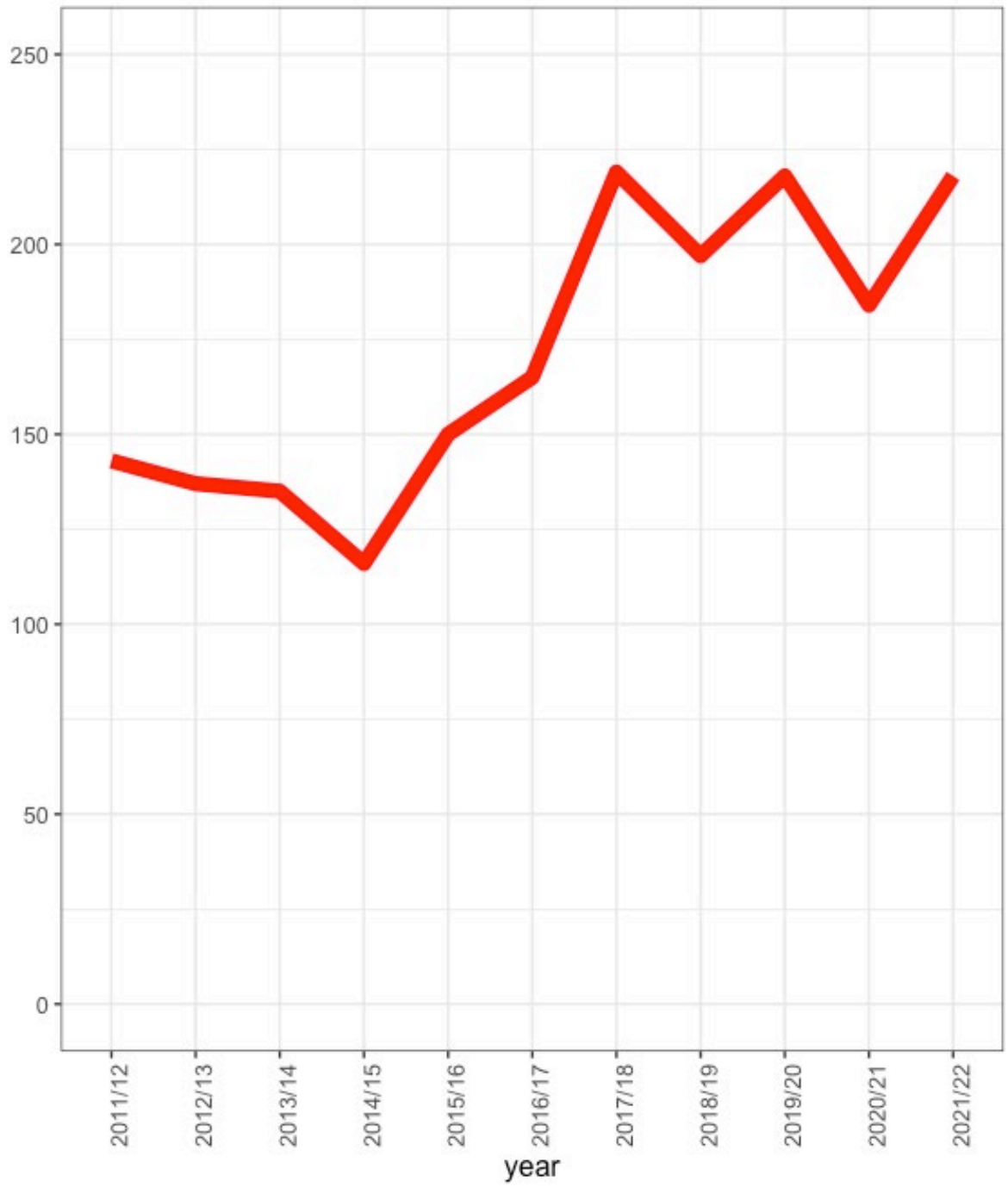
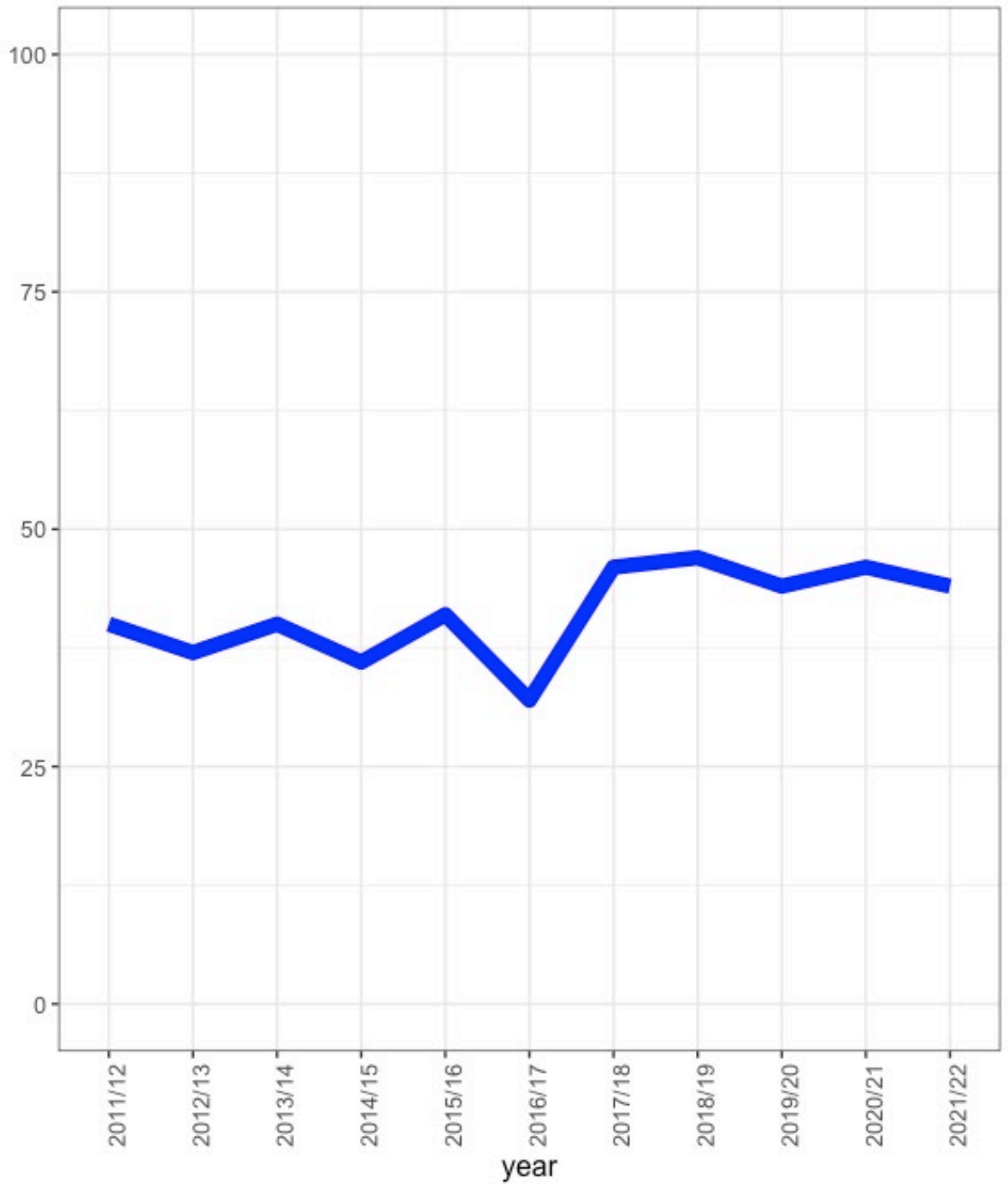


Figure 27: Proportion of all homicides involving a sharp object.



Demonstration

Consider a study examining public support for use of police stop and search powers to reduce violence. A police force launches a public survey. The survey is distributed via the police force social media account and in emails to recent victims of crime, under the title, ‘Public safety and police use of Stop and Search: Have your say’. The survey asks people if higher levels of stop and search would make them feel safer.

But by only sampling people who have engaged with policing, the survey methods have introduced several biases that may produce a misleading impression of the relationship between, say, stop and search and feelings of safety, an impression that is not generalisable to the population. Investing resources to hear from a broader range of the public would allow for more representative findings.

Further resources

Kalra N and others. (2022). **How different sampling methods paint vastly different pictures of recidivism, and why it matters for policy**. RAND Corporation

Unit 35: Meaningful differences and statistical testing

Learning objectives

To understand how statistical testing is used to interpret differences between groups.

Description

Change – generating it or demonstrating it – is at the heart of much problem solving. While change is easy to observe through police data, being confident about what caused the change is deceptively complicated, as discussed in previous units. We can overcome a lot of the complexity by thinking carefully about what we mean by change, thinking in advance about what a meaningful and cost-effective change would look like and then homing in on the data that is needed to determine if that change happened. We hope this guide can help you to think in this way. Failure to do so may mean that you are more susceptible to cherry-picking favourable results or erroneously supporting programmes that actually have little effect. This is inconsistent with effective problem solving, and risks wasting time, effort and resources promulgating ineffective violence prevention programmes.

As described in **Unit 30**, when we want to understand if something caused a change in crime, we generally compare crime data from before an intervention was introduced against data from after its introduction. If a change in crime is observed, and in the interests of working out if that change occurred as a result of the intervention (as opposed to something else), we might go beyond simple before and after comparisons by assessing crime in people and places serving as a control group (the counterfactual, see **Unit 31**). Once we have made this comparison, we will be left with a number. That number might indicate that people who received a violence intervention programme committed, say, 50% fewer crimes than people who did not receive it. Or that number might indicate that on any day the odds of a murder happening in one city is 1.1 times that of other cities. But how do we interpret these numbers? Are the purported differences meaningful?

Statistical testing is the process of attributing certainty or uncertainty to something – often a change – you see in data. In evaluation, it answers ‘how much should I believe that there is an effect of my intervention or activity’? There are a large number of statistical tests and many ways of applying them – too many to cover in

this guide. But when applied using software (or by hand), most statistical tests that are used in a policing context share the following common features.

Firstly, there will be a **test statistic**, which is often difficult to interpret but is used to give us the second statistic, a p-value. The p-value is a statement of the probability that we would have found a result as extreme as that observed (or greater) if there was no real effect. The p stands for probability and, like all probabilities, can range from 0 to 1. The convention in statistics is that we reject the null hypothesis – that the intervention had no impact – if the probability of obtaining these results is 5% or less (represented as $p<0.05$). When we observe a p-value like this, we have a statistically significant result. Put differently, the results are unlikely to be down to chance.

It is important not to interpret the p-value as an indicator of the importance or magnitude of an effect. Some evaluation findings might be statistically significant but mean little in practice. Likewise, a non-statistically significant result might still be of interest if, say, the outcome of interest is lives saved. To gauge the magnitude of an effect, we need to compute an **effect size**. An effect size is a numeric indication of the difference between one group and one or more other groups. The 50% fewer crimes and the 1.1 odds of a murder are examples of effect sizes. However, statistics is nothing if not conservative and because there is so much potential for random variation in data, statisticians rarely bank on a single number to report effects. Usually, an effect size is accompanied by numbers that lie above and below this effect size. These are known as **confidence intervals**. They represent a hedging or margin of error around the computed effect size that is very likely (usually with 95% confidence) to contain the true effect.

While p-values and statistical significance are the concepts most familiar to analysts, statistical significance should be interpreted in the context of the phenomenon under examination, the sample of data and the population from whom it was drawn. As shown in other units, sufficiently large sample sizes, for example, can be difficult to achieve, particularly in local problem solving projects. In some cases, the effect size of an intervention may be small but it could still represent meaningful outcomes, such as injuries avoided and improvements to quality of life. While the p-value can give us confidence in our hypothesis, we may have to accept a little uncertainty. In such cases, a sensible approach is to repeat the analysis or evaluation using a new sample or in a new place and to look for consistency in the results.

Demonstration

In 2021, Brennan and colleagues wanted to understand if force-wide training about coercive control led to an increase in police use of new powers of arrest for the recently criminalised offence of coercive control. The second paragraph of the results section describes the effects of the training:

> '… the training was associated with a statistically significant increase in arrests for controlling or coercive behaviour. The incident rate ratio … was 1.413 (95% CI 1.235 to 1.617) when all trained forces were included and 1.401 (95% CI 1.212 to 1.621) when the treated sample was restricted to those forces that underwent the full Domestic Abuse Matters training. In both cases, this was a statistically significant effect. In absolute terms, the training was associated with an average of 3.31 additional arrests per force per month.'

As can be seen from this extract, the study results included an effect size (1.413) and confidence intervals (95% CI 1.235 to 1.617) and an interpretation of what the effect size actually means in practice, namely 3.31 additional arrests per force per month.

Further resources

Wooditch A and others. (2021). 'A Beginner's Guide to Statistics for Criminology and Criminal Justice Using R'. New York, NY: Springer

Unit 36: Statistical power, samples and effect sizes

Learning objectives

To understand the relationship between sample size, thresholds for statistical significance, effect sizes and statistical power.

Description

When analysing the effectiveness of a crime prevention intervention, it is rarely enough to say that a response was ‘effective’. Police leaders and the public will want to know about the scale of the impact, such as what was the percentage decrease in violence? This metric, which comes in a variety of forms, is known as an ‘effect size’ and along with sample size and statistical power make up a trio of related concepts relevant to impact evaluation.

When considering the relationship between sample size, effect size and statistical power, it is helpful to picture a scientist using a telescope to view a star. The bigger the star (effect size), the easier it is to see (statistical power) with a low magnification (smaller sample size). To avoid missing a smaller star when you look in the right place, you should use more magnification.

Sample size is the number of units in an analysis. Typically, in policing, these are defined areas or people, but could be crimes, groups, vehicles, or some other entity. In statistics, the **threshold for statistical significance** (known as ‘alpha’) is the acceptable risk of obtaining a false positive result – in other words, falsely concluding that an intervention was effective when it was not. This threshold is almost always 5% (or $p<0.05$), and this is the default on most statistical software. An **effect size** is the difference between two conditions, such as the difference in the amount of serious violence in an area that received an intervention and an area that did not. **Statistical power** is the ability of a statistical test to reject a ‘no effect’ hypothesis if there actually is an effect. The more statistical power the better – either through a big effect or a big sample – but often 80% power is taken as a minimum requirement to reduce the probability of missing a signal amid the noise.

As described in **Unit 30**, an impact evaluation is about detecting change, in our case, change in violence and associated harms. In order to be confident of detecting effects in data, should an effect exist, we need to balance effect size and sample

size. If we expect an intervention to have large effects on a problem, we can use fewer cases or smaller sample sizes. If we are less confident in how the intervention will affect the problem, it is wise to be conservative and to strive for a larger sample size. Identifying a suitable balance between meaningful effect size and the effort required to achieve sufficient statistical power requires some careful thought. The research literature on types of intervention might give you an insight into what size effect to expect, but other considerations such as expected value for money or costs to community relations are also relevant. For example, a change to shift patterns might have the potential to yield small improvements in community relations. This relatively inexpensive intervention would require a large sample size to detect the anticipated small effects but could well be worth the effort.

How an effect size can be expressed depends on the nature of the outcome being measured. When comparing continuous measures, such as Crime Harm in the intervention and control conditions, we can use a standard metric, such as Cohen's **d** which is the 'standardised mean difference' (the difference in averages in the two groups divided by the standard deviation of the two groups combined). A rule of thumb is that Cohen's **d** of 0.2 indicates a small effect, 0.5 indicates a medium effect and 0.8 indicates a large effect. There are other types of effect size that are more interpretable. For example, a percentage difference in the number of violent crimes committed by two groups is easier to understand than a value of **d** but the compromise is that this difference is context-specific. Other effect sizes that you might encounter include the odds ratio or relative risk ratio, both of which describe the likelihood of an outcome occurring in one condition (for example, intervention) compared to another (for example, control).

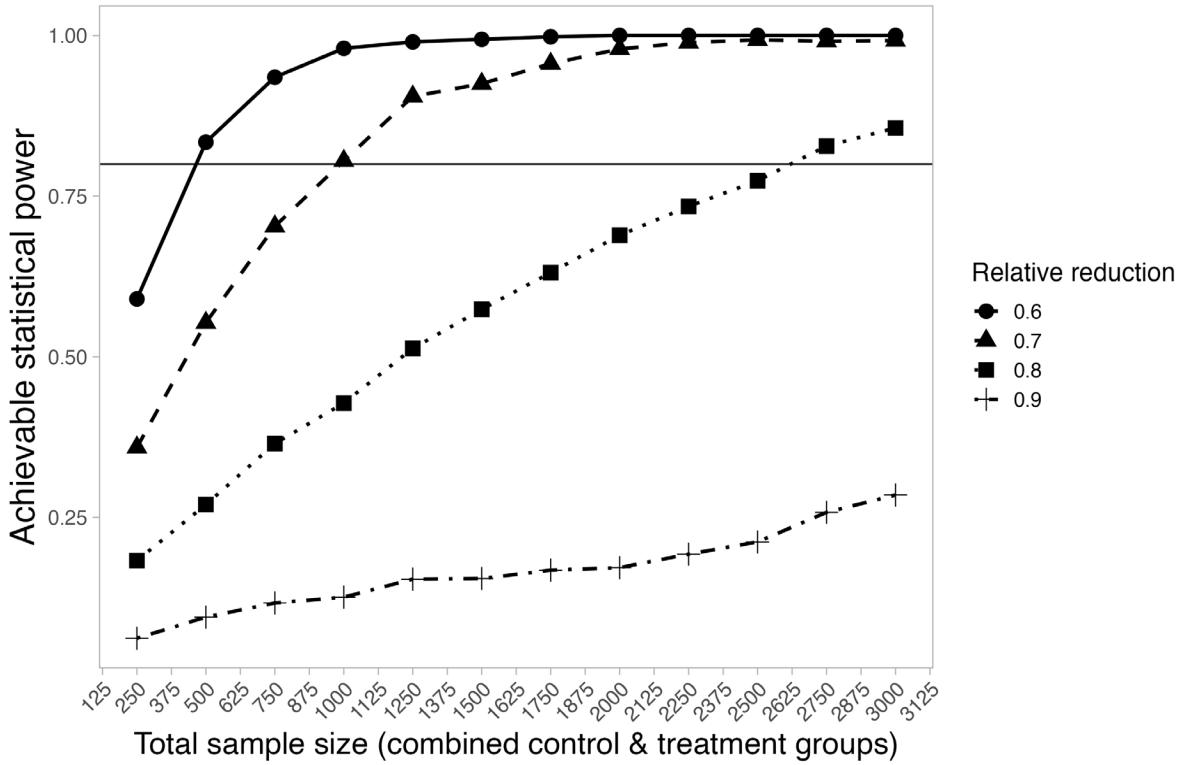
For larger scale evaluations where there is an interest in learning lessons, it is important to consider what statistical power you will need. There are different ways to determine this such as a power calculator or simulations. Simulations are easier to understand but simulating data can be difficult. Software such as **G*Power** offers a more user-friendly way to calculate effect sizes, but are less flexible than simulation.

Demonstration

Effect size can have major repercussions on how easy it will be to say that an intervention is 'effective' in statistical terms. As Figure 28 demonstrates, the

influence of effect sizes is far greater than that of sample size. Using data based on offending rates in young people aged between 14 and 25, simulated data and analyses with a range of effect sizes can show how frequently we would expect to detect an effect if one existed in the data. The lines represent different effect sizes (in this case, the relative reduction in the amount of violence in the intervention group compared to the control group). To reach 80% power to detect a 40% reduction only requires a total sample of around 300 participants, while detecting a 20% reduction requires over 2,000. The results of these simulations are sobering and suggest that many evaluations we undertake are underpowered. Addressing this issue of underpowered studies in the future is likely to require cooperation between different police forces through multicentred evaluations where the same intervention is run in several places and the results are combined to create a larger sample and hence sufficiently powered evaluation study.

Figure 28: Statistical power across four effect sizes, based on 1,000 simulated tests per data point.



Further resources

Lakens D. (2022). **Improving your statistical inferences**

Unit 37: Crime displacement and diffusion

Learning objectives

To know what is meant by crime displacement and the diffusion of crime control benefits, and what the research evidence says about their existence.

Description

Consider the problem of on-street robbery. Imagine that your analysis has identified several persistent robbery hot spots. Digging deeper into the data, you have identified a handful of streets within those hot spots where robbery offences are taking place in greater number. Now imagine that in an effort to reduce robbery, responses have been put in place in those specific streets and at the specific times where robbery is most common. Preliminary analysis suggests that levels of robbery in the targeted streets have declined. The project is hailed as a success. Time to celebrate? Best hold on …

The threat of crime displacement looms large when problem solving. Displacement refers to a shift in crime following an intervention. Research identifies various forms of crime displacement (Johnson, Guerette and Bowers, 2014).

- Spatial: crime went down here but went up there.
- Temporal: crime went down during this time period but went up during that time period.
- Target: crime against these targets went down but crime against those targets went up.
- Tactical: crime using these methods went down but crime using those methods went up.

There are many who subscribe to the idea of crime displacement. Ron Clarke and John Eck (2003) refer to these people as ‘displacement pessimists’, who believe that efforts to reduce crime invariably just push it round the corner. Displacement pessimists tend to be most vocal about situational crime prevention measures that seek to reduce opportunities for crime, as opposed to interventions that seek to change the motivation of offenders. This reflects a view that offenders are like water – block an opportunity here and they will simply go and offend elsewhere. Real

reductions in crime are only realised, so say the displacement pessimists, by changing the motivation of offenders.

To what extent should we listen to displacement pessimists? Perhaps not as much as they would let you believe. Both theory and evidence confirm that crime displacement is neither inevitable nor absolute. Let's cover each in turn. Theory (**Unit 7**) tells us that crime follows opportunity. The reason why your robbery problem concentrated at certain streets and at certain times is exactly because those streets and times furnished sufficiently attractive robbery opportunities. But crime opportunities are not equally distributed across space and time – this is why we see hot spots and hot times. Removing or reducing crime opportunities at one location does not mean that offenders are just pushed round the corner because round the corner may not furnish the same level of suitable opportunities. If the location round the corner had the same opportunities, that too would have been a hot spot. Theory also tells us that offenders prefer to commit crime in areas that they are familiar with and where they have a better grasp of attendant risks and opportunities. It follows that blocking crime opportunities in one area does not inevitably lead to offenders foraging elsewhere, because all things being equal, offenders hold preferences for where and when they offend.

Research evidence backs up the theory. In a review of over one hundred crime prevention studies, Rob Guerette and Kate Bowers (2009) found that crime displacement was observed in just 26% of cases. That displacement which did arise was often limited, so the crime which was displaced was less than the crime which fell in the target areas. Net gains were hence realised. Moreover, Guerette and Bowers also found that in 27% of cases they observed a so-called **diffusion of benefits** effect. This is the term given to any positive crime reduction effects which extend beyond the operational range of your intervention. Continuing our focus on street robbery, an example of a diffusion of benefits effect would be reductions in robbery beyond the streets in which the interventions were implemented.

This evidence and theory are not licence to dismiss displacement. No study can conclusively rule out all types of crime displacement. Much more is known about spatial displacement than other types of displacement. Moreover, there are of course some highly motivated offenders who do seek out alternative crime opportunities. Good problem solving embraces the displacement pessimist and puts

measurements in place to check for the existence of displacement or diffusion of benefits. **Unit 38** and **Unit 39** describe practical approaches to do that.

Demonstration

It is now well-established that crime tends to concentrate in hot spots. It is also well-established that crime can be effectively reduced by focusing police attention at crime hot spots, often referred to as ‘hot spots policing’. In 2019, a group of US researchers reviewed the evidence base on hot spots policing (Braga and others, 2019). Synthesising the evidence from 65 high-quality research studies from both the UK and internationally, they concluded that hot spots policing is associated with a modest but statistically significant reduction in crime. But what of crime displacement? Are the reductions in crime hot spots simply offset by increases in crime in nearby areas? Do offenders move to proximate locations which are not receiving hot spots policing?

Anthony Braga and colleagues tested for spatial displacement, using data from 40 of the 65 studies. They did not find much. More specifically, when synthesising the results across these 40 studies, the results suggested a small but statistically significant diffusion of crime control benefits. That is, following the implementation of a hot spots policing programme, rather than crime going up in nearby areas that did not receive the intervention, it went down. The positive effects brought about by hot spots policing diffused to neighbouring streets.

Further resources

Bowers K. (2023). ‘Measuring displacement’. In Groff ER and Haberman CP. ‘Understanding Crime and Place: A Methods Handbook’. Philadelphia, PA: Temple University Press

Unit 38: Weighted displacement quotient

Learning objectives

To know how to apply and interpret the results from the Weighted Displacement Quotient for measuring the effects of crime prevention interventions.

Description

Unit 37 described what crime displacement is and what the research evidence says about its existence. It did not say how you can measure crime displacement (or diffusion of crime control benefits). That is the purpose of this unit.

The first step in measuring spatial displacement is to draw a buffer zone around the area where your problem solving responses are to be implemented (the treatment area). The size of this buffer zone should be similar to the size of the treatment area. Note that the buffer area is different to your control area. The latter, as described in **Unit 31**, should be similar in meaningful ways to the treatment areas, and does not need to be proximate to the treatment area. Indeed, in some cases the control area will not be proximate to where interventions are being implemented due to fear of contamination between treatment and control areas. The buffer zone, by contrast, is the immediate area surrounding the locations where responses have been implemented.

Once you have determined your treatment areas, control areas and buffer zones, you are ready to compute the **weighted displacement quotient** (WDQ). The WDQ is a simple measure for determining the impact of an intervention and if any displacement has occurred. The WDQ can be calculated in Excel and can use counts or rates of crime (**Unit 6**).

The WDQ works by comparing a success measure to a buffer displacement measure. The **success measure** (SM) can be calculated as follows:

$$SM = T2 \div C2 – T1 \div C1$$

where T1 and T2 refer to the level of crime in the treatment areas before (T1) and after (T2) the introduction of the intervention, and C1 and C2 refer to the level of crime in the control areas before and after intervention. If the success measure is negative, it indicates that the intervention was successful (crime reduced in the

treatment areas relative to the change in crime in the control areas). If the success measure is positive, this indicates the intervention was not successful (crime increased in the treatment areas relative to the change in crime in the control areas).

The second step when using the WDQ involves calculating the **buffer displacement measure** (BDM). This indicates if crime displacement has occurred or if there has been a diffusion of crime control benefits to the buffer zone. The BDM is calculated as follows:

$$BDM = B2 \div C2 – B1 \div C1$$

where B1 and B2 refer to the level of crime in the buffer zone before and after intervention, and C1 and C2 being as described previously. If the BDM is positive, this signals the presence of crime displacement. If the BDM is negative, this indicates that a diffusion of crime control benefits has occurred.

The WDQ is then calculated as a ratio of the BDM and SM, as follows:

$$WDQ = BDM \div SM$$

The WDQ result can be interpreted as follows.

- **Greater than 1**: Diffusion of benefits has been experienced in the buffer zone and this diffusion effect is greater than the impact of the intervention in the treatment area.
- **Between 0 and 1:** Diffusion of benefits has been experienced in the buffer zone but it is less than the impact of the intervention in the treatment area.
- **0:** No diffusion of benefits or displacement in the buffer zone. Review the success measure to determine the impact of the intervention in the treatment area.
- **Between 0 and -1:** Displacement has occurred to the buffer zone but this is less than the impact of the intervention in the treatment area.
- **Less than -1:** Displacement has occurred to the buffer zone and it is more than the impact of the intervention in the treatment area.

Demonstration

Table 18 shows data on robbery offences for a treatment area, a control area and a buffer zone for a three-month period following the implementation of an intervention and the equivalent three-month period for the year before the intervention began.

Table 18: Data on robbery offences before and after intervention.

Area	Robberies pre-intervention	Robberies post-intervention
Treatment area	33	19
Control area	22	23
Buffer zone	16	11

Using these statistics, we are able to compute the WDQ, as follows:

- success measure = (19 ÷ 23) – (33 ÷ 22) = -0.67
- buffer displacement measure = (11 ÷ 23) – (16 ÷ 22) = -0.25
- WDQ = (-0.25 ÷ -0.67) = 0.37

The WDQ result indicates that the intervention has had a positive impact on robberies in the treatment area. There was also evidence of a diffusion of crime control benefits to the buffer zone, but this was less than the impact in the treatment area.

Further resources

Bowers KJ and Johnson SD. (2003). ‘Measuring the geographical displacement and diffusion of benefit effects of crime prevention activity’. Journal of Quantitative Criminology, volume 19, pages 275-301

Unit 39: Weighted displacement difference test

Learning objectives

To know how to apply and interpret the results from the Weighted Displacement Difference test for measuring the effects of crime prevention interventions.

Description

There are many mathematical techniques to assess the impact of crime reduction interventions. The **weighted displacement difference** (WDD) test is one such technique. It is straightforward to use. The WDD test can be used to evaluate if a geographically targeted intervention has resulted in a statistically significant change in crime (**Unit 35**), while controlling for possible changes in crime in (1) a selected control area and (2) a selected buffer area that surrounds the intervention zone. The WDD test generates several results, including the following.

- The **weighted displacement difference**. This is calculated as follows:

  $$WDD = (T2 – T1) – (C2 – C1) + (B2 – B1)$$

  - T1 is the number of crimes in the treatment area before the intervention
  - T2 is the number of crimes in the treatment area after the intervention
  - C1 and C2 are the number of crimes in the control area before and after the intervention
  - B1 and B2 relates to the number of crimes in the buffer area before and after the intervention

  If crime statistics are not available for the buffer area, this WDD formula can still be applied. The result from the calculation of the formula is the change in crime in the treatment area post intervention while controlling for changes in crime in the control area (and buffer area, if included).

- The **standard error of the WDD**, which can be calculated as follows (using this formula in Excel, where SQRT refers to the square root):

  $$SE\ of\ WDD = SQRT((T1+C1+B1) + (T2+C2+B2))$$

  Again, if data for a buffer area is not available, this can be omitted.

- The **WDD z-value**. This is calculated by dividing the WDD by the standard error of the WDD (WDD ÷ SE of WDD). If this statistic is negative, it suggests there has been a net decrease in crime across the selected geographic areas.
- The **one tailed p-value**. This is a measure of statistical significance. This can be calculated by applying the following formula in Excel to the calculated WDD z-value:

  = NORM.S.DIST(<WDD z-value>,TRUE)

  For example, if the p-value is less than or equal to 0.05, the WDD test result is statistically significant. The smaller the p-value, the more statistically significant the result.

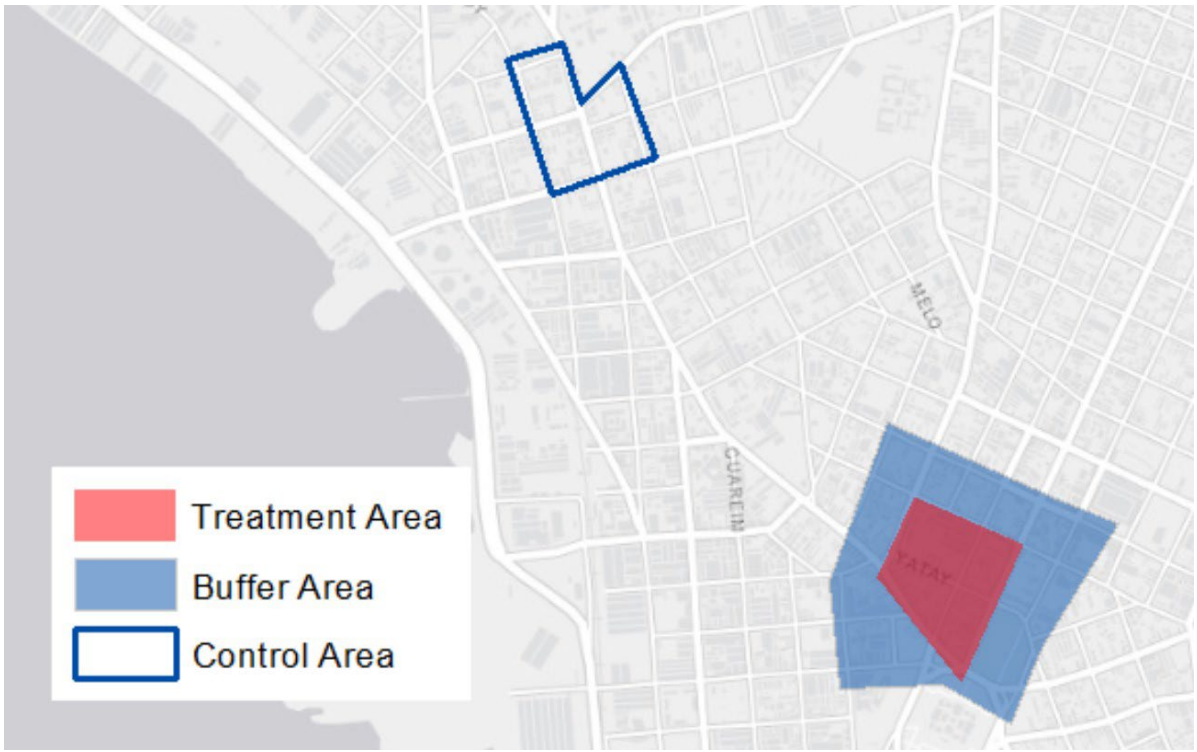
Demonstration

Table 19 uses the same data as that in **Unit 38** – robbery against the person offences for a treatment area, a control area and a buffer area. In the three months that followed the intervention, there were 19 robberies in the treatment area, down from 33 robberies in the equivalent period in the year before. Table 19 also lists the robbery statistics for the control and buffer areas before and after the intervention. These areas are mapped in Figure 29.

Table 19: Data on robbery offences before and after intervention.

Area	Robberies pre-intervention	Robberies post-intervention
Treatment area	33	19
Control area	22	23
Buffer area	16	11

Figure 29: Map showing the location of treatment, control and buffer sites.



Performing the weighted displacement difference test using these crime statistics and the formulas described previously generates the following outputs.

- WDD = (19 – 33) – (23 – 22) + (11 – 16) = -20
- Standard error of the WDD = √(71 + 53) = 11.14
- WDD z-value = -20 ÷ 11.14 = -1.795
- One tailed p-value is 0.036. That is, the result is statistically significant ($p < 0.05$).

The WDD test results suggest that the intervention was successful in reducing robberies. Moreover, the decrease in robberies in the treatment area was statistically significant while controlling for changes in robberies in the control and buffer areas.

Further resources

Wheeler AP and Ratcliffe JH. (2018) ‘A simple weighted displacement difference test to evaluate place based crime interventions’. Crime Science, volume 7, page 11

Unit 40: Economic analysis for crime prevention

Learning objectives

To understand the importance of economic analysis in crime prevention and know about the data and tools available to support economic analysis.

Description

Crime carries costs. It was estimated that in England and Wales in 2015/16, the cost of crimes against individuals totalled some £50bn. These relate to costs incurred in efforts to prevent crime (such as the installation of CCTV cameras), costs incurred as a consequence of crime (such as health service costs for victims of violence) and costs incurred in response to crime (such as expenditure by the police, courts and prisons).

Cost is also an important consideration in crime prevention. The resources available for reducing crime are always finite and could be put to alternative uses. Generating knowledge about the costs and cost-effectiveness of crime prevention interventions can therefore help make the most efficient use of resources, help decide between competing crime prevention interventions, and provide accountability for spending on violence reduction. Despite the obvious importance of economic analysis, studies show that information on expenditures and returns-on-investment are seldom reported in the crime prevention literature (Tompson and others, 2021).

There are numerous kinds of economic analysis. In a 2023 report produced for the National Police Chiefs' Council (NPCC), Stuart Kirby identifies three economic approaches most commonly used in crime prevention.

- **Cost feasibility analysis**, which reports the estimated monetary cost of a crime prevention measure. This simple kind of economic analysis helps make decisions about the affordability of (alternative) interventions. It is silent on the impact of interventions.
- **Cost effectiveness analysis** helps estimate value for money. It takes a meaningful outcome measure (for example, the number of knife crime incidents) and compares the costs of achieving that outcome through two (or more) courses of action (for example, the installation of knife bins versus increased use of police

stop and search powers). Cost-effectiveness analysis is most useful when deciding what response plan to go with.

- **Cost benefit analysis** estimates whether the net benefits resulting from an intervention are greater than the net costs. This is usually reported as a cost-benefit ratio, such as the monetary amount returned (or not) for every £1 spent. Cost benefit analysis is the most comprehensive of the three approaches described here. It requires you to monetise all inputs and outcomes associated with a given intervention.

Good problem solving is attentive to economic costs and benefits. However, there are no hard and fast rules for the kind of economic analysis to use in different circumstances. The level of resources you devote to assessment should be proportional to those invested in the problem solving initiative overall. It is unrealistic to assume that each and every local problem solving project will involve a robust cost benefit analysis. However, for larger-scale projects, particularly those that may attract national attention, it is worthwhile considering economic analysis.

Perhaps most important for economic analysis is the need to be clear, transparent and to take a broad view of a project's costs and benefits. Economic analysis does not need to be sophisticated. There is much to be learned from keeping tabs on the resources invested as part of a particular response plan, such as costs relating to police time, transportation, office space, as well as the type and number of interventions put in place. Once monetised, these broad costs of problem solving can be assessed against possible economic benefits, most obviously the cost savings associated with any crimes prevented. For this, you can helpfully draw on Home Office data on the estimated social and economic costs (as of 2018) of thirteen crime types, as shown in Table 20 for violent crime (Heeks and others, 2018).

Table 20: Home Office data on estimated social and economic costs (as of 2018).

Crimes	Total estimated costs per crime
Homicide	£3,217,740
Violence with injury	£14,050
Violence without injury	£5,930
Rape	£39,360
Other sexual offences	£6,520
Robbery	£11,320

In addition to data on the costs of crime, there are several tools to support economic analysis when problem solving. One such tool is the **Manning cost-benefit tool**, available on the **practical evaluation tools** section of the College of Policing website. This tool comprises a computer package into which you can enter relevant cost figures in order to generate various economic outputs including the average, best- and worst-case cost-effectiveness scenarios.

Demonstration

In 2013, a project led by Enfield Community Safety Partnership won the Herman Goldstein Award for Excellence in Problem-Oriented Policing (Broca and Agar, 2013). The project focused on reducing robberies against school children in Enfield, London. Problem analysis revealed several ‘pinch points’:

- victims tended to be vulnerable teenagers in possession of mobile phones
- offenders were typically (older) school children operating in groups
- offences concentrated in the hours immediately after school and within close proximity to identified high schools

A wide-ranging response plan was implemented. A subsequent before-and-after assessment found that youth street robbery fell by 59% in the three years following intervention (from 537 robberies to 291). Importantly, the authors carefully tracked the costs associated with this project, equating to about £765,000 between 2010 and

2013. The study authors then compared this expenditure to the estimated savings resulting from the robberies averted, based on Home Office cost of crime figures. Taken together, the authors concluded that the reduction in robberies equated to over £2 million in savings.

Further resources

HM Treasury. (2014). ‘Supporting public service transformation: cost benefit analysis guidance for local partnerships’. London: HM Treasury

Presenting analysis effectively

Unit 41: Data literacy

Learning objectives

To be aware of the challenges that can undermine analysis when working with rare events such as serious violence.

Description

Serious violence is rare. Specific forms of serious violence, such as homicide, even rarer. While this is a good thing for society and policing, analysing this type of rare data introduces certain challenges which need to be recognised and accommodated. Meeting these challenges requires data literacy, so as to able to interpret and communicate effectively with data, both numeric and written. This unit describes some of the key components of being data literate. You will no doubt be familiar with many of these components, but they are prone to being neglected as the day-to-day pressures of the job take over.

Understand the basics of data analysis

A crime analyst studying violent crime should be familiar with the basic principles of data analysis, such as data collection, cleaning, manipulation and visualisation. For example, they might need to clean and process raw crime data to remove duplicates or missing values, or calculate crime rates to compare trends across different time periods or geographic areas. To do this, crime analysts should be proficient in using data analysis tools such as Microsoft Excel, R, Python, SQL and/or GIS. Ideally, an analyst will use reproducible code that is well annotated. As opposed to point-and-click software such as Excel, code or syntax can be used to quickly and faithfully reproduce analyses or be adapted to incorporate new data.

Know your data sources and data generating process

Crime analysts studying violent crime should understand the data sources available to them and their limitations. For example, they might need to know how crime data is collected and what types of violent crime are included in the data. More importantly, but harder to imagine, is recognising what data is *not* collected, and why. This might relate to crimes not being reported to the police, but it could also

relate to biases in the crime recording process. For example, if patrol cars spend longer in high-violence areas, then all else being equal, they will record more crime and learn more about the population in that area, which makes its way into intelligence logs and affects arrest rates. It is crucial that everyone involved in using violence data know the processes by which it is created. Observing these processes through, say, ride-alongs, observations and talking to police colleagues is a vital part of working with violent crime data.

Ask the right questions

It goes without saying that someone examining violent crime should ask the right questions to guide their analysis. But asking the right questions is sometimes more complicated than it sounds. For example, with an evaluation, do we want to know if offering an intervention has an effect or is it actually the extent to which people engage with the intervention that is important? Similarly, do we want to know if the intervention works for everyone or focus on how it differs across groups and contexts? We might want to know the answer to all of these questions, but it is difficult to address them in retrospect. Therefore, considering data and analysis right from the beginning of a problem solving initiative is essential.

Be aware of ethical considerations

It is essential that personal information about victims and suspects is protected and that analysis does not perpetuate any biases or stereotypes about certain demographic groups or places. Biases can result from using data in a way that is naïve to the data generating process, such as using arrest data to test hypotheses about the whole population of offenders. Biases can also arise from the analysis question itself, such as examining the relationship between breaches of Domestic Abuse Protection Orders and nationality without accounting for the impact of language barriers on understanding the order.

Data privacy and statistical disclosure

When working with sensitive and rare data, data protection and statistical disclosure should be considered. Although a single piece of information might not be enough to identify an individual, combining two pieces of information might create a disclosure risk. When presenting data, use only enough to make your point. If data can be summarised or aggregated with no loss of information, do it.

Stay up to date

Crime analysts studying violent crime should stay up to date with the latest data analysis techniques and tools, as well as developments in crime trends and patterns. They might need to be aware of new types of violent crime that are emerging or changes in the patterns of violent crime across different geographic areas. They might also need to be familiar with new data sources or reporting practices that can provide more accurate or comprehensive information about violent crime.

Demonstration

In July 2021, the Washington Post ran a story titled '**Is opening more strip clubs one way to reduce sex crimes**?' What is your first reaction to this headline? Maybe you thought, 'this makes sense, as giving someone a substitute for sex will reduce desire'? You may have thought, 'obviously, strip clubs keep potential perpetrators off the streets'. Or maybe your reaction was 'definitely not'. If your reaction resembled the first two statements, you may have been demonstrating 'hindsight bias'. This is a common type of cognitive error where we 'reason after the fact'. While the Washington Post headline is plausible, most people experienced with the night-time economy would have expected the opposite. Occasional hindsight bias might not be a problem – science can throw up surprises – but accepting counter-intuitive findings may be a symptom of not critically evaluating evidence. When done routinely, this can result in poor intelligence analysis, planning and responses.

The Washington Post headline is based on the findings of a study that linked data on police stops in New York City with business registration records, and concluded that the opening of a strip club coincided with a 13% reduction in sex crimes in that area (Ciacci and Sviatschi, 2022). This conclusion brought about strong criticism from policing researchers familiar with the process for making and recording police stops, who stated that police stop data bears no relation to perpetrated crime in an area. We will let you decide what you think about the validity of this claim but, whatever your conclusion, reviewing evidence critically and understanding how data is collected and why is a fundamental responsibility of an analyst.

Further resources

Blastland M and Dilnot,A. (2007). 'The Tiger That Isn't: Seeing Through a World of Numbers'. London: Profile Books

Unit 42: Fallacies to avoid

Learning objectives

Be aware of the common fallacies that can undermine crime analysis.

Description

When working with police and violence data, we often look for emerging patterns, test hypotheses and try to tell a story with the information available to us. While these are crucial skills for making policing more effective, fair and efficient, we must always remain sceptical about what our data is really telling us. More specifically, we must try to avoid falling foul of the many fallacies which can give rise to misleading interpretations of data. This unit is about those fallacies most relevant to the study of violence, and how you can avoid them.

Confirmation bias

Confirmation bias is the most common fallacy affecting analysts. It takes many forms, but its common feature is a failure to consider or seek out that which contradicts pre-existing ideas. Confirmation bias occurs when we stop challenging our own assumptions and conclusions. Almost every fallacy is a variant of the confirmation bias. In evaluating the causes of serious violence, for example, a pre-existing idea might be that drug use is a major cause of violent crime. Someone examining patterns in homicide might suggest that because a high proportion of homicide perpetrators had a history of drug use, then it follows that drug use **is** the cause of violence. However, they may have failed to look at general rates of drug use in society, and not worked out how many with a history of drug use do **not** go on to commit homicide, or indeed any crime type. It is therefore important to bring a healthy scepticism to any analysis you perform.

Sharpshooter fallacy

Sharpshooter fallacy is a specific form of confirmation bias that is common when working with visual information, but that can also happen with statistical or written information. Humans are excellent – too good, in fact – at seeing patterns in the information they have about the world and this can lead to our seeing clusters and patterns where none really exist. The name comes from a hypothetical story where a

person fires shots randomly at a barn door and then draws a circle around a cluster to show the accuracy of their shooting.

Sampling and selection bias

Sampling and selection bias occurs when some individuals or areas that could provide information about a subject are over- or under-represented in data. When using routine data, like crime records, we should pay close attention to this issue as it hides a multitude of sins. For example, if we use a data set of arrested people to look at the relationship between drug use and violence, we may see a relationship but that relationship may be artificial because both drug use and violence make someone more likely to be arrested (this case is also known as the 'collider bias'). Another example might be if we run an arrest diversion programme and use a survey about self-reported offending one year later to test if our programme was successful. It is unlikely that everyone in the treatment and control groups will complete the survey. The people who completed the programme and engaged with the diversion programme are the most likely to complete it, thereby producing an overly optimistic sense of the effects of the programme.

Fundamental attribution bias

Fundamental attribution bias occurs when someone attributes behaviour to personal attributes (such as personality traits) and neglects the causal influence of external or situational factors. This bias is often seen in popular accounts of why violence occurs and how it should be combatted, where the focus is overwhelmingly on changing the person and their propensity for violence as opposed to changing the environment in which violence occurs. This tendency to explain violence by way of individual characteristics risks overlooking a large body of evidence which consistently shows that crime, including violence, can be reduced through limiting opportunities, and without the need to alter the motivation of individuals.

Correlation does not imply causation

Correlation does not imply causation is touched in earlier units of this guide and underpins almost every threat to internal validity (**Unit 29**). In essence, this fallacy simply means that just because two factors, such as violent crime and the number of community police officers appear to be connected (as one goes up, so does the other, or as one goes up, the other goes down), does not mean that one **caused** the

other to change. Levels of violence and ice cream sales are positively correlated, not causally related. But in the hot summer months, community violence tends to increase. So too does the sale of ice creams.

Law of small numbers

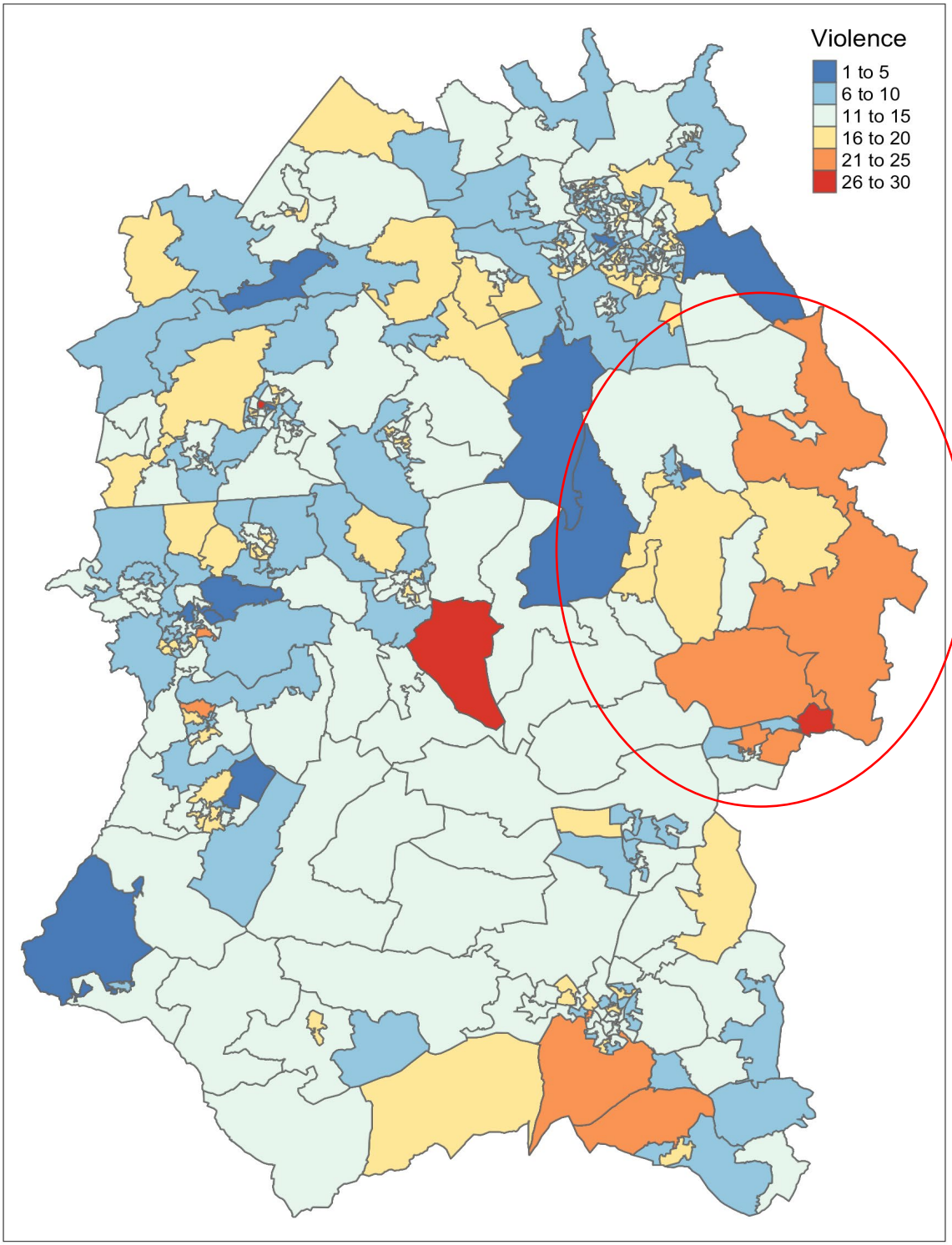
The ‘law of small numbers’ is not a statistical fallacy, but is a common cause of drawing incorrect conclusions from data. It arises from the mistaken belief that small samples are necessarily representative of the wider population. In reality, small samples are subject to greater variability and sampling error than larger samples and may not accurately reflect the characteristics of the population of interest. This problem is particularly acute when dealing with rare events like homicide. Focusing solely on this type of offence can mean that trends fluctuate wildly (noise) or that clusters of characteristics can appear that are not an accurate reflection of serious violence in the community.

How, then, to reduce the impact of these fallacies? There are two common strategies. First, get out and see the ‘data generating process’ in action. Doing so often highlights issues that need to be considered in subsequent analyses and interpretation. Second, think carefully and critically about your data sources and how they might be wrong. All data is imperfect. It is better to know and, in writing up analysis reports, faithfully acknowledge the limitations in your data rather than ignore or be naïve to them.

Demonstration

The sharpshooter fallacy is common when making sense of visual information. We seem ‘hardwired’ for pattern recognition. The image here is a simulated example of violent crime rates within neighbourhoods in Wiltshire. The crime rate data is completely random and there is no underlying pattern. Nonetheless, there appears to be a cluster of violence in the central eastern part of the county. Combining this cluster with local knowledge that it is a sparsely populated, rural area, we might misconstrue this cluster as a sign of, say, emergent county lines activity when, in fact, it is simply noise in the data.

Figure 30: Simulated violent crime patterns in Wiltshire.



Further resources

Mlodinow L. (2008). 'The Drunkard's Walk: How Randomness Rules Our Lives'. London: Penguin

Unit 43: Openness and reproducibility

Learning objectives

To know about the current movement towards (and importance of) openness and reproducibility in crime analysis, and how you can be part of it.

Description

Crime and policing is highly political. The performance of individuals, police forces and policy makers are often judged by how well they tackle specific issues. When serious violence is used as an indicator of performance, its analysis can become politicised, with pressure to produce evidence that supports certain agendas or presents an overly optimistic take on a given policy or practice. Such pressure can be difficult to withstand. There are, however, a few simple strategies on hand to help. Applying these strategies will also help ensure a more robust and accurate evidence-base around serious violence and its prevention.

We start by describing the so-called **file drawer problem (or bias)**. Researchers have long known that not every experiment or analysis is written up and shared. Positive results are more likely to be shared than null or negative results. The tendency to publish only success stories breeds problems. If everyone engages in this practice, over time, the evidence-base will seem like almost everything 'works' because evidence to the contrary is buried in a file drawer or was not written up.

Pre-stating your analysis

As discussed in **Unit 42**, we are all prone to **confirmation bias** where we emphasise evidence for the things we already know and ignore evidence to the contrary. This can happen simply because we are not thinking critically but, also, because of organisational pressures that consciously or unconsciously encourage us to lean towards some results and away from others. There are a few techniques we can use to help us overcome the tricks we play on ourselves. Both involve careful planning of our analyses and, crucially, writing these plans down.

Pre-registration

Pre-registration is the more formal method used in evaluation. In pre-registration, a researcher will complete a template that requires very clear information about the

analysis question (for example, what you want to know), the analysis method (for example, what data you will use and how you will analyse the data) and interpretation (for example, what would constitute a meaningful difference). Importantly, pre-registrations are published in advance of collecting or analysing the data, making it harder to deviate from. The **College of Policing Research Map** is one place to pre-register problem solving projects. Here you can provide a brief description of a planned evaluation – it only takes a few minutes – and then follow up that description with results once the work has been completed, which can also help overcome the file drawer bias.

Not all analysis requires or is amenable to pre-registration. However, the threats of confirmation bias are no less acute for quicker, smaller scale or more localised projects. It is still best practice to write down your analysis plan before you do the analysis because it encourages you to think carefully about what you actually want to know and how you will analyse the data. Doing all this thinking up front can often help you anticipate problems and to mitigate for them in advance. Even if you do not plan to publish a research plan, the **College of Policing Research Map** offers a useful and accessible template for writing down analysis plans.

Outcome switching

When we select an outcome for an intervention, we are committing to a theory that the intervention will cause a particular change in a particular outcome or set of outcomes. We might theorise, for example, that a series of weapons sweeps will lead to a reduction in knife crime in an area. If the evaluation does not show any difference in knife crime in the study area, it can be tempting to look for other things that the intervention might have affected, and which might be reported in a positive light. For example, maybe you did not find a statistically significant change in knife-related violent incidents but there was a reduction in the average crime harm. While this might seem like sensible exploration of the data and it is not prohibited, these results should be regarded with caution and reported accordingly because they have a higher likelihood of being a false positive result than the original outcome. This pattern of results also suggests that the theory of what the intervention is doing is incorrect. In these situations, you should be led by the theory – ask yourself, do I believe that the intervention would cause a reduction in harm but not the number of

offences? If you are not sure, be sceptical about the results, present both in any report and highlight any potential issues that readers should note.

Openness and transparency in policing and crime analysis

While we recognise the pressures that crime analysts, police leaders and police forces as institutions face to present positive stories about their activity, there is an ethical argument for thinking beyond short-term public wins and focusing on the longer-term benefits that a strong, dependable evidence-base will generate for policing and the public. With that in mind, we propose the following set of principles to guide good crime analysis and evaluation.

- **When planning analysis:** Write down your hypotheses before looking at your data. Share your hypotheses and methods as openly as possible.
- **When doing analysis:** Stick to your planned methods**.** Do not change outcomes**.** Judge analysis on quality, not results**.** Use strategies to avoid confirmation bias.
- **After the analysis:** Write it up and share it. Where possible, share data and code**.** Seek to replicate results.

Demonstration

In 2020, Brennan and colleagues sought to examine if training police officers to recognise the signs of controlling or coercive behaviour in domestic abuse settings led to increases in arrest for this offence. They sought to maximise the transparency and trustworthiness of their evaluation by using open research methods. They created **a project space** on the **Open Science Framework** webpage and registered the study. The registration included a statement of what they hypothesised would be the effect of the training and what the outcome would be. All this was done before any data was collected and analysed. Once they had collected their data, this was also uploaded and when they had completed their analyses, they uploaded the statistical code so that others could check their analyses and conclusions. Finally, they wrote up the evaluation and posted it in the project space as a pre-print so that anyone can access the results for free.

Further resources

Chambers C. (2017). ‘The Seven Deadly Sins of Psychology’. Princeton, NJ: Princeton University Press

Unit 44: Tables

Learning objectives

To know when to use tables and what makes a good table.

Description

A table is a means of presenting information, particularly statistical information. Tables are a common feature in analytical products. But not all tables are created equally. Good tables can attract readers to your work, and help communicate information quickly and effectively. Bad tables can bring down good analysis. The craft of table design therefore deserves attention. It should not be an afterthought. Nor should we be satisfied with the default table design of common analytic software packages. This unit is about crafting good tables. It considers three basic questions:

- Why are tables important?
- When should we use tables?
- What makes a good table?

Tables are important for several reasons. Good tables draw the attention of the reader. They help you tell a story with your analysis. Good tables can also help you to identify (and correct) any flaws in your working that can easily be missed in written passages. The effective use of tables can also make reports more readable, and help break-up lengthy sections of text.

Tables should complement text. They should not simply duplicate that which is reported in text. Tables need to add value. Of course, much of the information that is presented in tables could be presented as a written passage. There are, however, several areas where tables are generally superior to text. Tables are a better bet when presenting statistical information, especially detailed or complicated statistics. Tables are also usually better in highlighting trends or patterns in data. Tables are less well suited to defining or explaining key concepts, given the inevitable size constraints of table rows and columns.

What, then, makes for a good table? According to Marcus Felson and Mary Eckert (unpublished), there are five general principles to producing well-crafted tables.

1. Make tables tell a clear story.

2. Ensure that tables stand alone and are understandable without reference to the main text.
3. Prepare each table so that it is understandable to a general audience.
4. Put the time in and be prepared to revise and refine tables in the same way you would your written text. Trial and error are a common component of table design.
5. Ensure that tables are visually appealing.

Beyond these five general principles, there are **various practical steps that you can follow when constructing tables**. First, be brutal. Omit redundant material. This can be challenging. You have taken the time to produce a range of statistical outputs and you are keen to show them off. But critical thinking is required – do all these statistics add value? Is the information contained in the table necessary to convey the story you want to convey? On this point it is worth repeating the advice of Edward Tufte (1983) on effective data visualisation – maximise the data-ink ratio. In the context of this unit, that means removing all unnecessary material (ink) to arrive at a table which tells a story (data) in as simple a way as possible. The checklist in this unit's demonstration section identifies some of the ways in which you can remove clutter from your tables.

Second, be sympathetic. Put yourself in the shoes of the intended audience. What do you want them to take away? Are there any distractions which are diverting the readers from the central message? In this sense, producing good tables is little different from the art of producing clear text. Felson and Eckert put it best:

> 'the presenter should work hard so the audience does not have to. Most people are busy or lazy and will gladly throw something away. If you want their attention, you have to earn it. A good and clear table does just that' (Felson and Eckert, unpublished).

Demonstration

The following checklist, adapted from Felson and Eckert's checklist for effective tables, can assist in the production and evaluation of table design. Not every checkbox will be relevant to every table that you produce. However, working through this checklist will help ensure that the tables you create are the best they can be.

Checklist for effective tables

General

- Table can stand alone, is understandable without the text ☐
- Table serves one clear purpose ☐
- Table can be understood by a non-expert ☐
- Ask yourself, “Should this be split into two tables?” ☐
- Ask yourself, “Should two tables be combined?” ☐
- Don’t let the table look like default computer output ☐
- Make table fit on one printed page ☐
- Make tables consistent in type, format and variable names ☐
- Keep variable names close to what’s really measured ☐
- Make variable names consistent with body of text ☐

Body clarity

- Keep table uncluttered, easy to follow visually ☐
- Avoid too many or too few internal divider lines ☐
- Use internal divider lines to organise the table ☐
- Use internal divider lines to direct the reader’s eye ☐
- Sometimes use bold or italics to direct the reader’s eye ☐
- Just one digit to right of decimal, unless a good reason ☐
- Line up decimal points perfectly vertically ☐
- Line up all digits perfectly vertically ☐
- Avoid abbreviations or make meaning obvious ☐
- Avoid repeating labels if they can do double duty ☐
- Give exact data source at bottom of each table ☐

Title

- Make sure title tells exactly what's in this table ☐
- Include in table's title its exact timespan ☐
- Include in table's title its exact place or geography ☐
- Don't try to give the table a cute title ☐

Numerical clarity

- Mention any missing data in the table notes ☐
- In table notes, clarify exactly how percentages total ☐
- Use raw 'n's, not percentage when table 'n's are tiny ☐
- Do not repeat 'n's if percentages let you compute them ☐
- Avoid redundancy, for example by using one % sign ☐
- Make units of measurement clear ☐
- Clarify base 'n's, but don't keep repeating same one ☐
- Clarify which numbers are numerator vs denominator ☐

Organising a complicated table

- Switch rows with columns or change table plan ☐
- Divide table into panel A, panel B, and so on ☐
- Reorganise order of rows or of columns ☐
- Order rows and columns for central substantive reason ☐
- Number each column and letter each row ☐
- Make clear how percentages and 'n's total ☐
- Make subtotals clear within a complicated table ☐
- Use a few indentations and lines for visual clarity ☐
- Make most important point stand out visually ☐
- Put key comparison columns next to each other ☐

Further resources

Eck JE. (2022). 'Writing with Sweet Clarity'. Routledge: New York, NY

Unit 45: Graphs

Learning objectives

To know the key features of clear and effective graphs**.**

Description

There is a science to producing good graphs. Edward Tufte (2001), a world leader in data visualisation, argues that

> 'graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space.'

Graphs are a staple feature of analytical reports. It is therefore important to know the key features of a good graph and be aware of the common pitfalls. That is the purpose of this unit.

There are hundreds of different kinds of charts and graphs. The most common graphs used in crime analysis are bar graphs and line graphs. Like the tables discussed in **Unit 44**, there are certain general features that make for a good graph:

- conveying a clear message
- being relevant to the reader
- being easy to understand, and so on (see the **Government Analysis Function guidance on data visualisation in charts**)

With graphs, like all forms of data visualisation, clarity, accuracy and relevance remain paramount. There are, however, other more specific features that tend to be seen in effective graphs. Good graphs tend to:

- Have a **clear title** that provides some background to the reader (for example, source of data, date range, location) and leaves them with no doubt what the graph is showing (for example, main finding).
- Use **clear labels** on both axes (vertical and horizontal) to indicate the unit of measurement represented.
- Use an **appropriate and consistent scale** on each axis which is faithful to the data presented.

- Use a **clear and sensibly placed legend** to explain the different datasets or categories represented.
- Use **subtle gridlines** to provide the reader with a reference to aid interpretation
- Use **clear and distinct colours** to distinguish between different datasets or categories, ideally using colour-blind-friendly combinations such as blue and orange.

Crucially, a good graph is **clear** and **uncluttered**, devoid of any unnecessary graphics or decoration which might look pretty but which make it harder for the reader to discern points and patterns. Quoting Edward Tufte again,

> 'Cosmetic decoration, which frequently distorts the data, will never salvage an underlying lack of content.'

John Eck goes further in his excellent chapter about graphs (2022, pages 166-183), where he argues the following.

- **Do not use pie charts**. They are often difficult to interpret and place a burden on the reader by requiring them to compare pie segments
- **Do not use 3D effects**. They offer little value and are may misdirect the reader.

Demonstration

Locating bad graphs has become something of a hobby for some people. There are webpages, such as **Junk Charts**, that are dedicated to showcasing bad graphs. In this tradition, Figure 31 and Figure 32 show two line graphs. They present the same data: violence with injury offences between 2012/13 and 2021/22. Figure 31 includes the following issues, which are addressed in Figure 32.

- The vertical (y) axis for Figure 31 is non-zero. It starts at 50,000. This can mislead the reader by exaggerating any changes over time.
- Figure 31 has no title. This can create problems if the graph is ever reproduced and used elsewhere
- Figure 31 has no gridlines. This makes it harder for the reader to identify corresponding quarters in the time period covered here.
- The vertical labels on the horizonal (x) axis of Figure 31 are tricky to read.
- Figure 31 has no title for the horizontal (x) axis.

Figure 32 addresses these issues and, consequently, presents the same data in a clearer manner.

Figure 31: An example of bad practice for creating a graph.

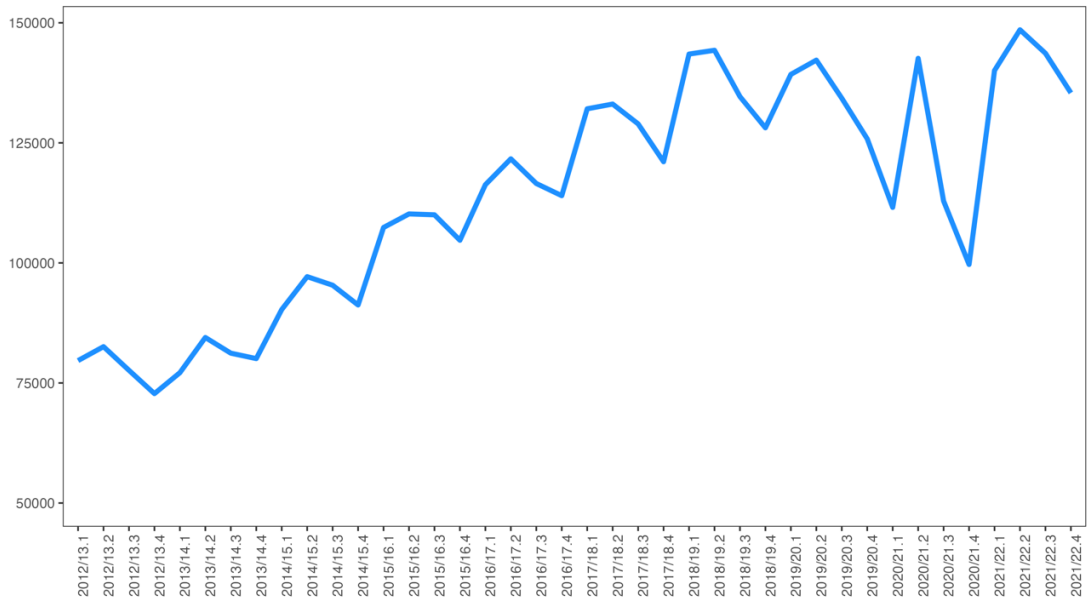
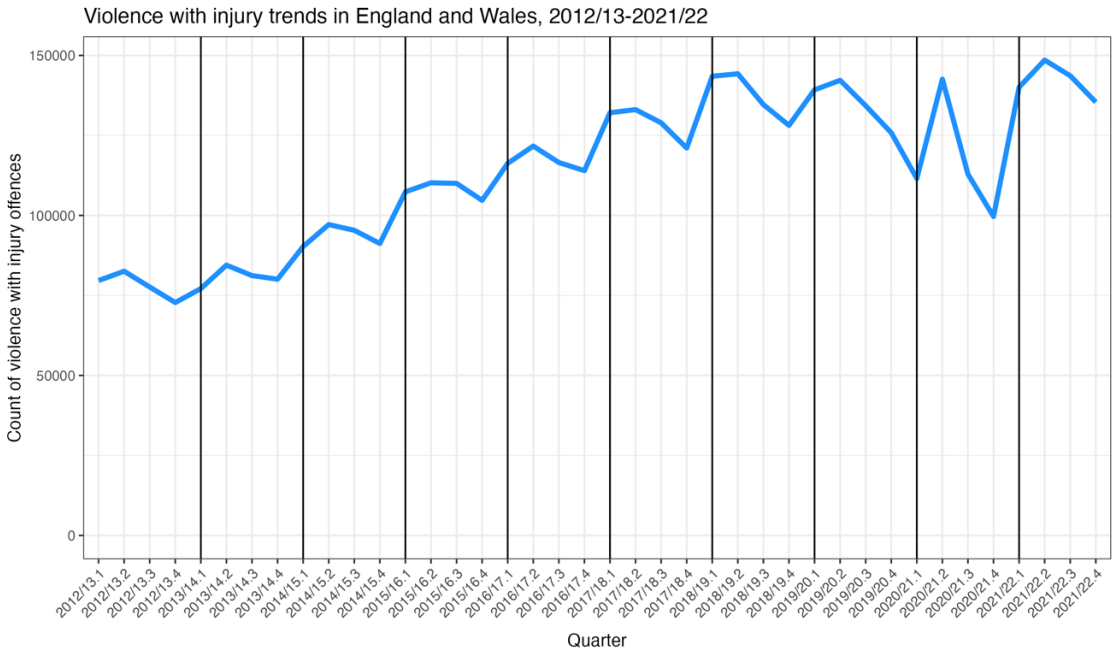


Figure 32: An example of good practice for creating a graph.



Further resources

Eck JE. (2022). 'Writing with Sweet Clarity'. Routledge: New York, NY, pages 166-183

Unit 46: Maps

Learning objectives

To understand how to produce effective and compelling maps.

Description

Maps are a useful way for presenting data. But maps can vary in their quality and impact. Good maps can act as the centrepiece of an analytical product. Poor maps can confuse and mislead. Following the **suggestions of Jerry Ratcliffe**, here are ten tips for producing effective and compelling maps.

Tip 1: Decide on the purpose of your map

Maps can serve different purposes, from showing patterns of crime to indicating how crimes are distributed relative to other geographic features. Know the key purpose of a map, and design your map around that purpose, ensuring that the intention is clear and requires little explanation.

Tip 2: Understand your data and its limitations

If the precision of geocoded points of crime is only specific to street segments, take care in how this data appears on a map. For example, often it is not clear where robberies took place on a specific street, so avoid creating point maps that show robberies positioned on a specific building. Also be careful that what looks like a single point may actually be multiple points on top of each other. If this is the case, use techniques such as graduated symbol sizes, kernel density estimation (KDE) or label the location with details about the number of points at that location.

Tip 3: Use colour, but use colour sensibly

Hot spots, for example, should be displayed in warm or hot colours (for example, red and orange). Do not use blue or violet to represent crime hot spots.

Tip 4: Consider how to show background details

Information such as the street network, parks, buildings and jurisdictional boundaries are useful points of reference and provide valuable geographic context, but they should usually appear on a map as background details. Use pale colours to

represent these features so that the patterns of crime or other data you show are centre stage – remember tip 1.

Tip 5: Limit the information you show

Avoid showing too much information on a single map. Often, two or three maps may be better than a single map, especially if you are showing something that is complex or represents a sequence of events. Omitting redundant information and decluttering busy maps is good practice.

Tip 6: Be careful with your choice of thematic classification methods

Thematic classification methods represent how crime (or other values) vary across space. These methods include equal range, quantile and standard deviation. Experiment with different thematic classification methods and select the one that helps best convey the key purpose of your map.

Tip 7: Include a legend

Legends are essential when your map is showing patterns or has symbols. Use sensible descriptions for legend items. For example, when producing a KDE map, this usually generates density values for each thematic class. These density values mean nothing to most readers. Labelling using ‘high crime density’ for the highest thematic class and ‘low crime density’ for the lowest thematic class is easier to understand.

Tip 8: Include a scale bar

Use sensible numbers (for example, 0 to 500m to 1km).

Tip 9: Include a North arrow

Tip 10: Consider how the map will look in greyscale

Some of those who might use your map may want to print it but do not have access to a colour printer. Make sure the key purpose of the map (Tip 1) is clear even when your map appears in greyscale. If you have many legend items, it may be difficult to do this so state that the map should be viewed in colour.

Demonstration

Figures 33 to 35 illustrate the tips in this unit's description section. Figure 33 is a kernel density hot spot map of assaults. It is a good illustration of the use of colour. The street map is shown using pale colours so that it sits in the background and provides useful context to where the hot spots are located. Figure 34 shows how risky facilities can be mapped (**Unit 20**). This example relates to the offence of driving off without payment for fuel from petrol stations. It uses graduated symbols to bring attention to the riskiest facilities and includes the main motorway network to show the association between these petrol stations and proximity to major roads. Figure 35 is a good illustration of how to use multiple thematic classifications. This example shows different classifications of space-time patterns of robbery in the London boroughs of Camden and Islington – using cooler colours to represent cold spots and warmer colours to represent hot spots and areas where high levels of crime persist. Visit the links in the further resources section to review other ways of effectively presenting data on maps.

Figure 33: Kernel density hot spot map of assaults.

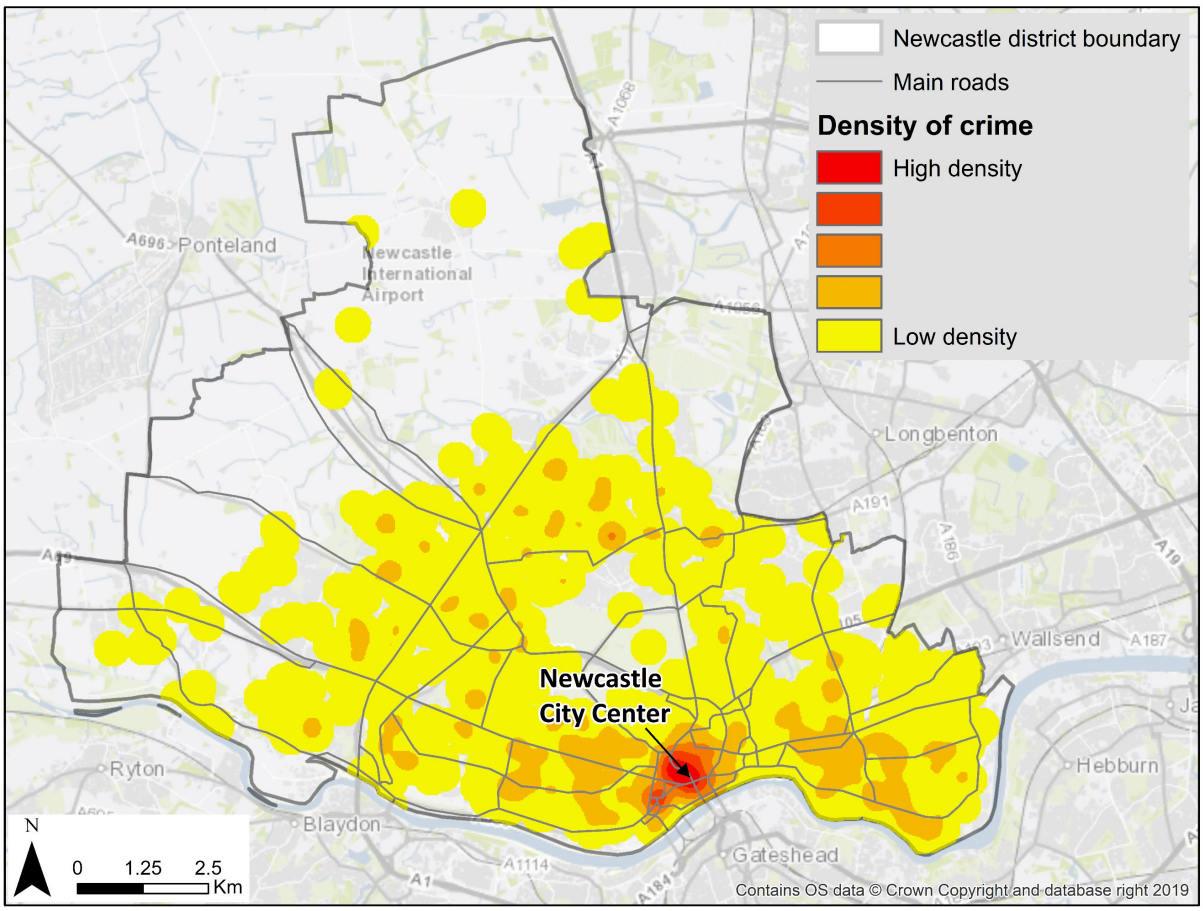


Figure 34: An example of how risky facilities can be mapped for individuals driving off without payment for fuel from petrol stations.

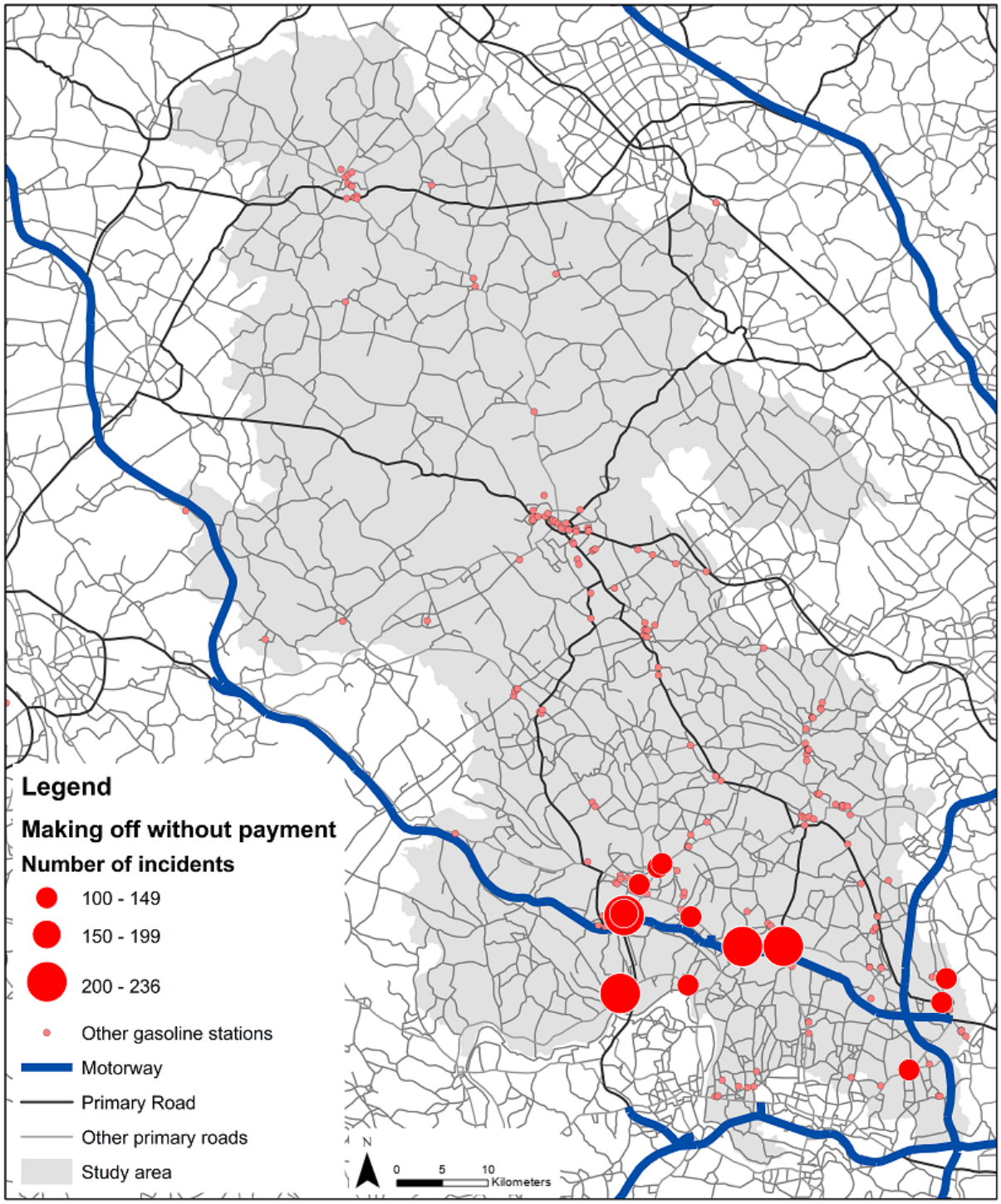
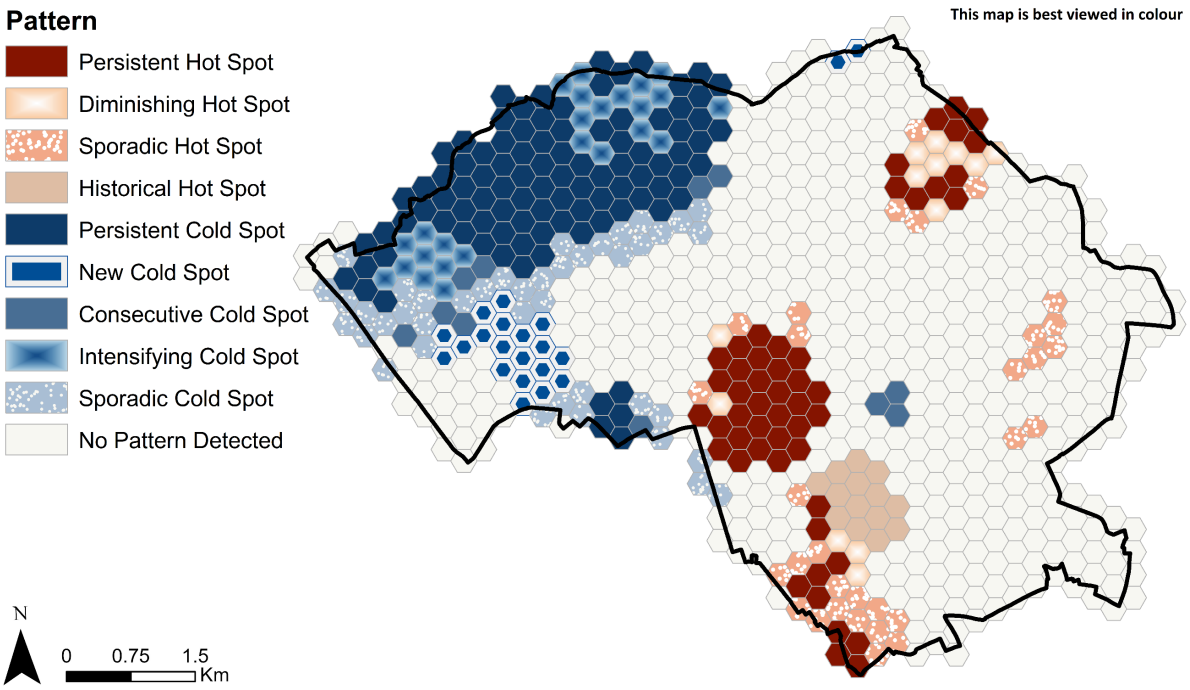


Figure 35: An illustration of how to use multiple thematic classifications.



Further resources

ESRI. (2024). **Map Gallery Award Winners**

Unit 47: Infographics

Learning objectives

To understand how to produce effective and compelling infographics.

Description

Infographics present information as a visual story. They can be produced in PowerPoint or Word, or using specialist software, and can be used to present information on slides, posters or included in an analysis report to describe the methods used or present findings. They are becoming increasingly common in policing and crime prevention. This unit describes different types of infographics and provides tips on **crafting effective infographics**.

There are three general types of infographics.

Statistical infographics

Statistical infographics are based on data and numbers. A statistical infographic should use large bold text and appropriate graphics to ensure the story being presented is clear and unambiguous (such as in Figure 36).

Figure 36: Infographic on knife and gun crime.

Process infographics

Process infographics are used to show how a process operates, whether it be in a linear, recursive or circular order. This type of infographic is often used to break down complex processes. This type of infographic requires you to clearly label the direction of the steps or sequence of concepts that you want the reader to follow. An example can be seen at **Unjust: How the broken criminal justice system fails LGBT people**.

Informational infographics

Informational infographics use text-based information. Any text should be kept to a minimum and is best presented as a series of bullet points, such as **this KIS Finance infographic about fraud**.

Tips for infographics

Like all forms of data visualisation, care should be taken to maximise the impact and clarity of any infographic you produce. To that end, listed here are eight tips for crafting effective infographics.

Tip 1: Decide on the key messages you want to convey

Think of your infographic as a storyboard and decide on the essential elements of the story. Start by creating an outline with details of the key messages about your violence problem. Then create a layout that organises how you plan to tell your visual story. If there is a start, middle and end to the story that you are trying to present, use this to consider how to present the information. Place the most important and prominent information at the top of your infographic and organise the information so it is read from left to right. If you present information from top to bottom, make sure this is clear to the reader.

Tip 2. Have a clear title

Use a short and catchy title that is easy to understand and gets the attention of the audience. The title should clearly state what the infographic is about.

Tip 3. Keep sentences short

An infographic is a way to present information quickly. Make sure that any text you include is specific, clear and concise so to as to reduce the risk of misinterpretation.

Tip 4: Choose the right fonts

Limit yourself to a small number of fonts. Use one font for the title and another font for the body text or numbers in the infographic. Keep the fonts clean and simple, such as the Calibri font, so that material is easy to read. Use font weight and size to place emphasis on important elements of your messaging.

Tip 5: Emphasise any numbers

Use numbers as a central focus of your infographic. Make sure numbers are bold and use larger fonts than for other text to add emphasis.

Tip 6: Choose the right colours

Use no more than three or four colours that work well together. Think about using colours that complement the messages you are making. For example, if you are distinguishing between crime going up or down, use red and green. If you are emphasising a group within a larger population, use a bold colour for the group of interest and a paler colour for the rest of the population.

Tip 7: Keep it clean and simple

Your infographic should not be cluttered or overwhelming to the reader. You should use graphics and visual elements to communicate your information. Leave plenty of 'white space' between graphics, statistics and text.

Tip 8: Use an online graphics library

Rather than creating all your own graphics, source or review examples of graphics on online libraries (see further resources). When choosing graphics, make sure that they look like they belong together.

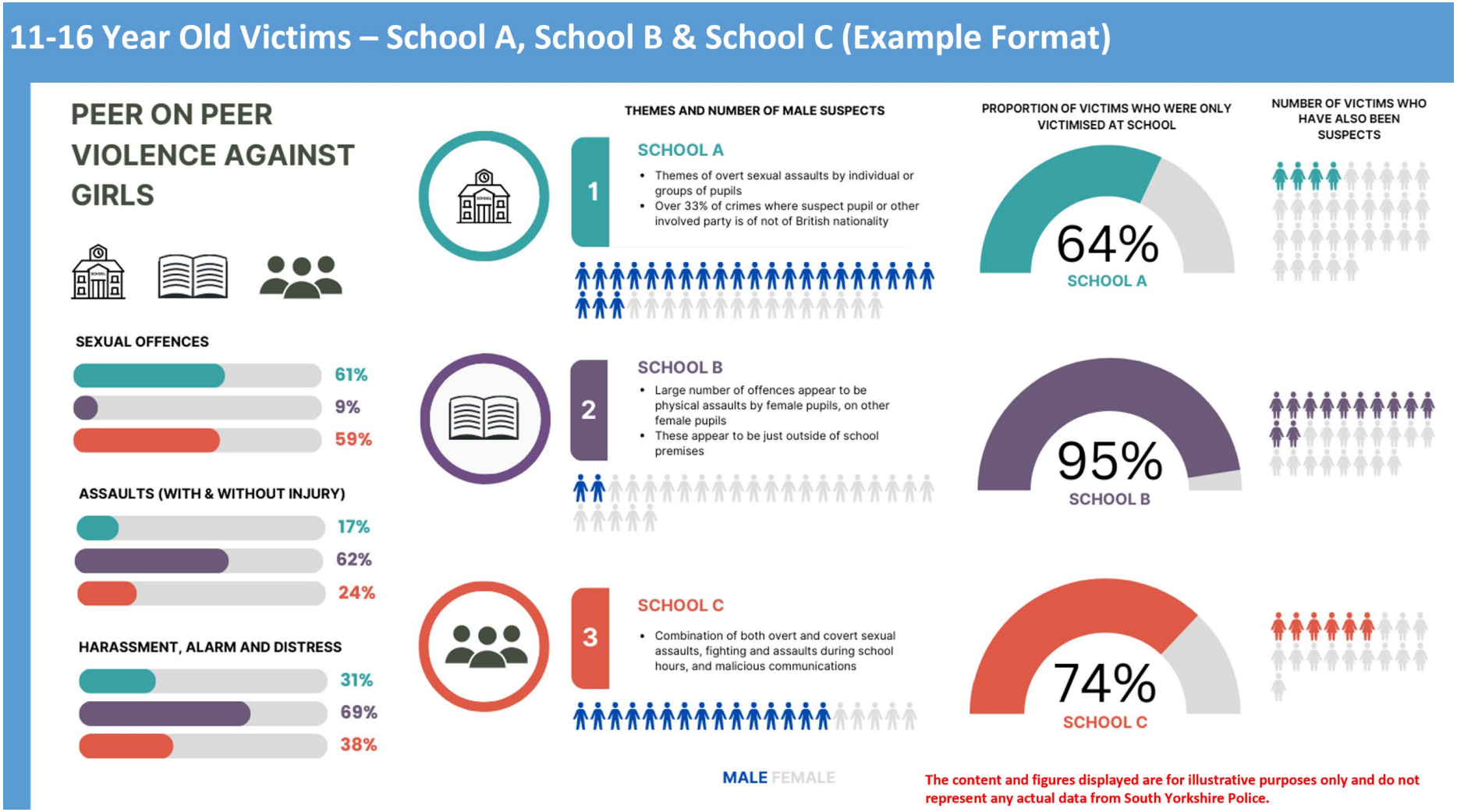
Demonstration

This infographic was created by analysts in South Yorkshire Police to communicate key messages about violence experienced by school children. Three particular schools were identified on the basis of high levels of violence against girls. Infographics were an excellent way to present to senior officers a large amount of information on a single PowerPoint slide. Figure 37 shows differences in the types, levels and characteristics of violence in each of the three selected schools.

Further resources – infographic libraries

- **Freepik**
- **Piktochart**
- **Visme**

Figure 37: Infographic on violence against school children in South Yorkshire.



Unit 48: Analysis reports

Learning objectives

To know how to effectively write-up analysis findings.

Description

There are several standard formats for analysis reports. Common formats include the problem profile or target profile, introduced under the National Intelligence Model. Although these formats are useful for improving the consistency across analysis reports, these formats often fall short when it comes to providing details about why crime occurs and why it displays observed patterns. These important omissions are partly because of the way these profiles are structured. A vital role of any analyst is to draw inferences, from the patterns they observe and through premise building, and use these to suggest how crime could be reduced and how offending activity could be countered. A well-structured analysis report is crucial to fulfilling this role.

Empirical studies that are produced in scientific research seek to contribute new knowledge to a discipline. These studies involve presenting results based on an analysis of data, discussing what these results mean and their implications. In this unit we describe how analysis reports could be structured in a way that resembles a scientific study. Doing so will help ensure that analysis reports are richer and more meaningful.

Most analysis reports are about 10 pages and around 5,000 words in length. Working with these averages, a recommended structure for an analysis report is as follows.

- A **structured abstract** or executive summary (maximum 250 words) containing some background about the topic, aims of the analysis, methods used, results, and conclusions.
- **Introduction**, providing background details about the topic and the aims of the analysis.
- A short review of **what we know already**, referring to results from previous studies about the topic and how the analysis will offer new insights.

- A description of **data and methods** used and to a level of detail that allows others both to assess and replicate your analysis.
- **Results**, presented in a sensible order.
- **Discussion**, stating what the results mean in practice, their implications and limitations with the data and/or analysis. This section should always address the 'so what?' question.
- **Conclusions**, restating the main findings, what confidently can been concluded from them and what the next steps should involve.

Demonstration

Imagine you have been tasked to conduct an analysis of robbery of personal property. This example sets out the suggested structure and content of the resulting analytic product. This general template could be applied to other problems of violence.

Structured abstract

- Background: police recorded incidents of robbery of personal property have increased by 17% over the last year compared to the previous year. Robberies of school children is believed to be the main contributor to this increase.
- Aim: to determine reasons for the observed increase in robbery of personal property and identify practical opportunities for intervention.
- Method: spatial and temporal analysis of robbery of personal property, analysis of items stolen, offenders and suspects, and how stolen items are disposed.
- Results: school children aged between 11 and 13 accounted for 43% of all robbery of personal property victims and for 79% of the observed increase in robberies in the past year. Most victims were affiliated with two of the ten schools in the district. The main hot spots of robbery of personal property were close to these two schools in the hours immediately following the end of the school day. Offenders were also mostly school children excluded from local schools who sell stolen items (mostly mobile phones) to local pawn shops.
- Conclusions: The increase in robberies of personal property is mainly associated with an increase in victimisation against school children, particularly those attending two schools in the area who were targeted for their mobile phones.

Suggested interventions include a school inclusion programme for excluded offenders, a victim awareness campaign targeting young people transitioning to secondary school, a collaboration with Trading Standards to disrupt stolen goods sales in local pawn shops and targeted hot spots policing patrols.

Introduction

This section should include details about recent robbery trends and other information that justifies its selection for analysis (for example, a concern associated with the increasing use of knives in the commission of robberies). It should also describe the objectives of the analysis, such as identifying the conditions that contribute to the robbery of personal property problem and ways that robbery could be reduced.

What we know already

The purpose of this section is to review other analyses of robbery, including a review of the techniques that others have used and an identification of interventions that have reduced this type of crime. At the end of the section, the plans for the analysis should be described, such as stating hypotheses to test, for example, the increase in robberies is associated with an increase in victimisation against school-aged children.

Data and methods

This section should describe the data (for example, police recorded crime) and analytical techniques used in the report (for example, hot spot and temporal analysis, the analysis of victim age and a risky facilities analysis of stolen phones found in pawn shops).

Results

This section should report the key results, using a combination of text, maps, graphs and tables as relevant – for example, a map showing where school children were robbed on weekdays after school and the proximity of these hot spots to schools and other points of interest.

Discussion

This section should review the main findings, followed by a discussion about what they mean and their implications for intervention and further analysis, including knowledge gaps. For example, half of the offenders identified in the analysis were of school-age and at the time of the offence were excluded from school. It appears likely that their exclusion from school gave them time to offend and/or dispose of stolen items. In other cities where analysis had identified similar types of offenders, school inclusion programmes for excluded pupils (that require these pupils to still attend school, albeit under supervised detention) have been found to be effective in reducing offending. The discussion should also explain any limitations with the data and analysis.

Conclusions

This section should bring the report to a close, highlighting briefly the purpose of the analysis, restating the main findings and setting out where we go from here, such as the following.

> ‘The increase in robberies is almost certainly associated with an increase in victimisation against school children aged between 11 and 13. A victim awareness campaign targeted at those transitioning to secondary school has proven to be effective in other districts.’

Further resources

Eck JE. (2022). ‘Writing with Sweet Clarity’. Routledge: New York, NY

Unit 49: Briefing notes

Learning objectives

To know how to effectively write a briefing note with details about analysis findings.

Description

Unit 48 described how to write a comprehensive Analysis Report. But many police officers, policymakers and partners may not have the time (or motivation) to read a full Analysis Report. How, then, to make sure that the right people receive the right information?

A briefing note is designed to provide information quickly and effectively. It can act as a summary of an Analysis Report or can be a stand-alone document. It should provide pertinent and complete information based on analytical findings, and contain content that you want the reader to grasp quickly. It should contain sufficient information so that the content has the potential to influence decision-makers, and include recommendations that are linked to your analytical findings. A briefing note is generally no longer than two pages in length.

A recommended structure for an effective briefing note is as follows.

- **Purpose**: a statement about the issue or problem in one or two lines. This could include a headline statistic about the presenting problem.
- **Main body**: this should include background information about the problem, the key findings from the analysis and the options available for moving forward. The information given should be specific, clear, concise, factual and substantiated. You should consider whether pictures, maps, graphs, tables and/or infographics would be more suitable than text, but ensure, if used, these are easy to understand, drawing on the advice provided in previous units of this guide. You should state what the analysis results mean and their implications so as to inform decisions about how the problem can be tackled.
- **Conclusions and next steps**: the insights provided in the main body should be sufficiently detailed so that decision-makers reading the briefing note can themselves draw sound conclusions. The conclusions you provide should leave

the reader with clear take-away messages. You should also recommend how to proceed so that the problem receives an actioned response.

In addition to the recommended structure, there are three key principles to keep in mind when producing briefing notes.

- **Why is the identified issue important to the community?** What does this issue mean for the community you serve? In what ways does it harm the community?
- **Why is the identified issue important to your agency?** How does acting on this issue align with the interests, priorities and expectations placed on your agency?
- **What do you believe needs to be done?** Outline an immediate course of action that the police (and partners) can feasibly do to address the problem based on your analysis.

There are also some key **things to avoid** when producing briefing notes.

- Not all detail is appropriate for all audiences. Consider your audience and include content that will be helpful and relevant to them.
- Do not include details about data used and details about methods or techniques you applied. If readers of the briefing note have questions about these details they can ask you, which you may be able to answer by referring to the information documented in the Analysis Report.
- Avoid including information that readers are already likely to know. Some of this information may be included as background information, but ensure you keep this to a minimum.
- Avoid jargon or acronyms that few will know.

Demonstration

After completing an analysis of violence against women and girls (VAWG) not related to domestic abuse, analysts from South Yorkshire Police produced a briefing note to communicate their findings and recommendations to key stakeholders (see Figures 38 and 39). Note that the content and figures displayed are for illustrative purposes only and do not represent any actual data from South Yorkshire Police.

Most briefing notes focus on only one specific issue. In their analysis in South Yorkshire, the focus was on examining three aspects of violence against women and girls (VAWG), with specific emphasis on repeat victimisation and groups that experienced high levels of victimisation. The first section of the briefing note concisely described the issue using a mix of text, infographics and maps (shown in Figure 38). The rest of the briefing note provided some key findings about each of the three key themes that were the focus of the analysis (see Figure 39, about violence against female workers employed in the medical and health sectors). The final part contained conclusions and recommended next steps that key stakeholders could then act upon.

Figure 38: Key messages from a briefing note on repeat victims of VAWG not related to domestic abuse.

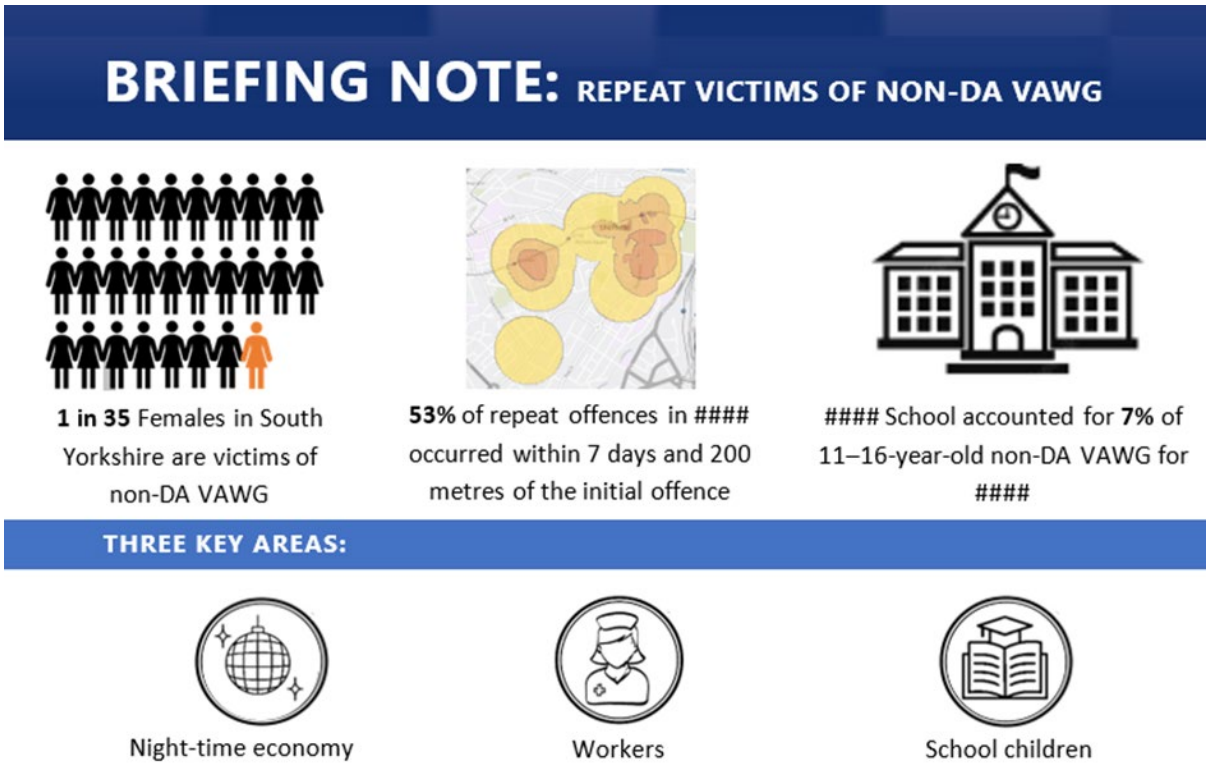
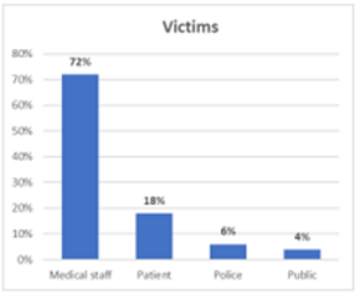


Figure 39: Key messages from a briefing note on violence against female workers employed in the medical and health sectors.

Workers victimised by the public:

We found that some women were repeatedly victimised at their place of work. This could be any public facing role, however women working in the medical field were mostly likely to report being victims at work.



Key contributors: #### Hospital

A&E and #### accounted for 42% of non-DA VAWG offences at ####. About half of offences are assaults – violence with and violence without injury. 19% of outcomes are Action Taken – relatively high (13% average)

Recommendations:

- Hospitals to review the environment in which patients wait in prior to treatment.
- Staff to report all instances of violence directed towards women to fully understand the magnitude of the problem in this setting.
- Review pop plans the locations, clear assessments in place to see if they are working
- Ensure hospital security staff are placed in an area where they can be most effective.

Further resources

Eck JE. (2022). ‘Writing with Sweet Clarity’. Routledge: New York, NY

Unit 50: BLUF for busy decision makers

Learning objectives

To know what is meant by BLUF – bottom line up front – and how this concept can help you effectively convey the most salient findings when reporting analysis and solutions to busy decision makers.

Description

It is sad but true that some crime analyses go unread. In the hustle and bustle of contemporary policing, decision-makers may not always have the time to review the entirety of your analyses. Producing work that fails to land or address the needs of the audience is an enduring challenge for data and intelligence professionals.

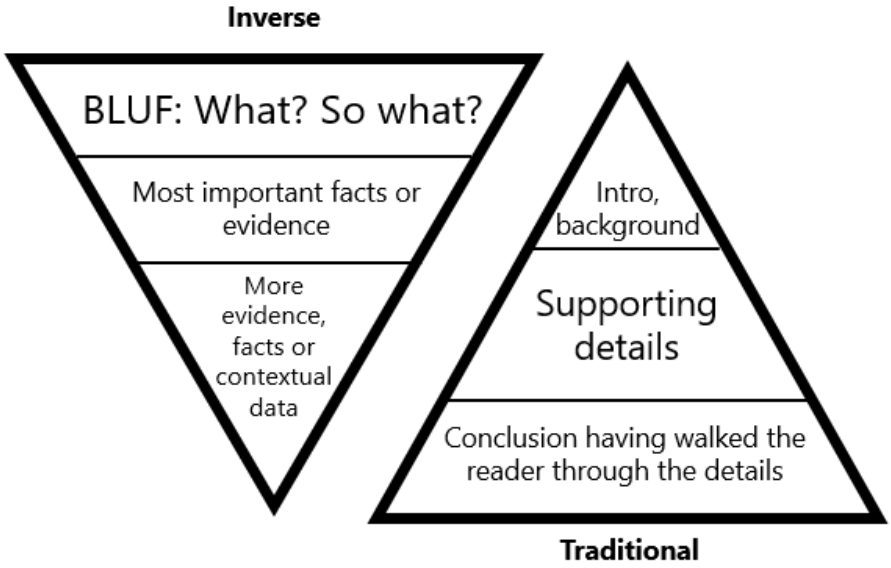
There are many different methods on how to present data analysis effectively. These approaches are driven by different aims, purposes, and audiences. Here, we are focusing on effectively communicating written and verbal assessments to busy senior leaders where there would be an opportunity to influence decisions, be that locally or across the whole police service. This might include, for example, proposals on trialling a new crime prevention intervention or modifying current practices to improve effectiveness.

BLUF is a technique commonly applied in intelligence assessments but can be used to communicate the key points from any kind of analytical product. Traditionally, the bottom line is a discussion or conclusion with next steps presented at the end of an analysis product. BLUF is the inverse of this traditional approach. It sets out findings by order of relevance and importance. Using BLUF as an approach, the first points we'd want readers to digest, and more importantly retain to memory, are:

- What?
- So what?
- What's next?

These key points can be followed by the most important findings or evidence to support your bottom line and continue with further evidence or contextual data that was discovered during the analysis (see Figure 40).

Figure 40: The bottom line up front approach. Adapted from Cariens D. (2016). 'A Handbook for Intelligence and Crime Analysis'. Deltaville, VA: High Tide Publications.



Demonstration

Let's have a go at BLUFing. Box 1 summarises the results from a large UK policing study. Now suppose that these results have been summarised with the intention of seeking further funding to continue the project. The various statistics and use of long, detailed sentences are less likely to hold a reader's attention. Keep in mind that funding is competitive, and so the authors of this box are competing against other authors of other reports all of which are being assessed by funders over relatively short spaces of time. The lengthy paragraph format requires more time and effort for the reader to understand and extract the salient points. Simply put, a lot is being asked of the reader.

Box 1: Summary of a results analysis product

Among males arrested for an intimate partner violence common assault offence, we assigned a requirement for some offenders to attend a behavioural change programme. The courses were led by experienced professionals with the aim of reducing violent recidivism. Of those offenders eligible to take part in the study, 500 were required to attend the behavioural change programme and 450 were not. Police contacts of these individuals were tracked for a period of 365 days after their initial offence. Offenders assigned to the intervention were re-arrested for similar

crimes 27% fewer times than those who were not required to attend. Measured in terms of crime harm, the intervention group members were arrested for crimes totalling an average of 7 days of recommended imprisonment under English sentencing guidelines, compared to an average of 21 days for those who did not participate in the behavioural change programme. Frequency of arrests was also smaller for the intervention group by 21%. Savings were also made in officer and investigative time of £235k. The results of the analysis suggest the intervention was an effective way to reduce violent recidivism, such that further investment in this intervention may be associated with a discernible fall in reoffending.

The information contained in Box 1 is both important and a faithful account of what went on. But can the salient findings be presented more effectively? In Box 2, we have reworked this material using the BLUF approach. Each sentence uses a fact or judgement about the project using clear, short and to-the-point statements. These points are clearly presented and should be understandable to all readers. The so-called '4-3-3 principle' has also been applied here, which suggests that no sentence should be longer than four lines, no paragraph should be longer than three sentences and no section should have more than three paragraphs. It's not always feasible to strictly adhere to this principle but is nonetheless a useful baseline to work from when writing analytical products for impact.

Box 2: Summary of results analysis using BLUF

Increasing the capacity of the behavioural change programme is likely to produce further **reductions in reoffending and harm.**

Violent offenders who **completed the behaviour change programme** were **27% less likely to be arrested for similar crimes**.

Cost-savings of £235k in officer and investigative time were realised as a result of this project.

Further resources

College of Policing. (2020). **Delivering effective analysis**

Afterword: Tell the world

Herman Goldstein proposed problem-oriented policing as a framework for improving police effectiveness. He believed this could work in two main ways. At the local level, use of a systematic problem solving approach would help the police better understand specific problems, which in turn would help in fashioning more effective responses. At the broader level, Goldstein imagined that the results of local problem solving projects could be collated, shared, and acted on, representing a body of knowledge to inform and improve police policies and practices.

That body of knowledge is now substantial. Forty years on from Goldstein's original formulation of problem-oriented policing, there are now many hundreds of problem solving case studies, reviews and experiments, from both practitioners and academics in different countries and addressing a wide range of crime and community safety issues.

That body of knowledge is growing. It needs to. Crime changes in response to wider societal and technological changes. Offenders adapt. New crime types emerge. New modus operandi develop. There will always be a need for high-quality evidence about what works to reduce specific crime types, how, in what circumstances and at what cost.

You can help meet that need. You can help realise Goldstein's vision. Continuous improvement in policing is contingent on you, as problem solvers, sharing your work and telling others. The reasons for this are self-evident. Others can seek to emulate your achievements if their problem is similar to your own. Likewise, if your response did not deliver the sought-after outcomes, which sometimes happens, then telling others can save them from going down a similar path. Building and acting on a body of knowledge can also help increase efficiencies, such as learning how others have processed certain data or applied a novel analytical technique, and avoiding the wastage associated with repeating interventions that have been shown to be ineffective or even harmful.

There are several ways you can tell others about your problem solving achievements.

- There is the annual UK Tilley Award for excellence in problem solving, and associated national problem solving conference.
- There is the annual International Herman Goldstein Award for excellence in Problem-Oriented Policing, and associated conference.
- There is the **College of Policing practice bank** to showcase promising interventions and to record interventions that had no impact or did not work so that others can learn from your experience.
- There are academic journals that encourage submissions from practitioners such as Crime Science, Policing: a Journal of Policy and Practice and Cambridge Journal of Evidence-Based Policing.

Recommended readings and resources

On problem solving (and serious violence)

Brennan I. (2022). **Homicide: A short problem solving guide for policing**. College of Policing

Clarke RV and Eck J. (2003). **Become a problem-solving crime analyst: In 55 small steps**. Jill Dando Institute of Crime Science. London: University College London

Cordner GW. (2020). **Evidence-based policing in 45 small bytes**. US Department of Justice, Office of Justice Programs, National Institute of Justice

Sidebottom A and others. (2020a). **Implementing and sustaining problem-oriented policing: A guide**. Jill Dando Institute of Security and Crime Science. London: University College London

Sidebottom A and others. (2020b). **Problem-oriented policing in England and Wales 2019**. College of Policing, NPCC and South Yorkshire Police

Sidebottom A and others. (2020c). **Successful police problem-solving: A practice guide**. Jill Dando Institute of Security and Crime Science. London: University College London

Sidebottom A and others. (2021). **Knife crime: A problem solving guide**. College of Policing

On evidence-based policing

Ratcliffe JH. (2018). ‘Reducing Crime: A Companion for Police Leaders’. New York, NY: Routledge

Ratcliffe JH. (2022). ‘Evidence-Based Policing: The Basics’. New York, NY: Routledge

On crime analysis

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Chainey SP. (2021). ‘Understanding Crime: Analyzing the Geography of Crime’. Redlands, CA: ESRI Press

Groff ER and Haberman CP. (2023). ‘Understanding Crime and Place: A Methods Handbook’. Philadelphia, PA: Temple University Press

On effective writing and presentation

Eck JE. (2022). ‘Writing with Sweet Clarity’. Routledge: New York, NY

Web resources

Center for Problem-Oriented Policing – An extensive library of problem guides, tools and resources relating to problem-oriented policing.

Crime reduction toolkit – Hosted by the College of Policing, this toolkit rates and summarises evidence relating to a wide range of crime prevention interventions.

Policing evaluation toolkit – Hosted by the College of Policing, this toolkit provides advice on how to effectively evaluate the impact of policing and crime prevention interventions.

Reducing Crime podcast – A podcast featuring interviews between Jerry Ratcliffe and influential thinkers in policing and crime prevention.

Youth Endowment Fund toolkit – An overview and assessment of research on approaches to prevent serious youth violence.

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How to cite this guide

Sidebottom A, Agar I, Brennan I and Chainey S. (2024). ‘Problem solving serious violence: A guide for analysts’. College of Policing

Acknowledgements

Thank you to those who took part in our analyst focus groups and who contributed material that features in this guide. We also thank those who commented on some or all of the units in this guide: Gavin Bardsley, Rob Braddock, Davnet Cassidy, Toby Davies, John Eck, Stuart Kirby, Nick Tilley and Julia Wire.

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