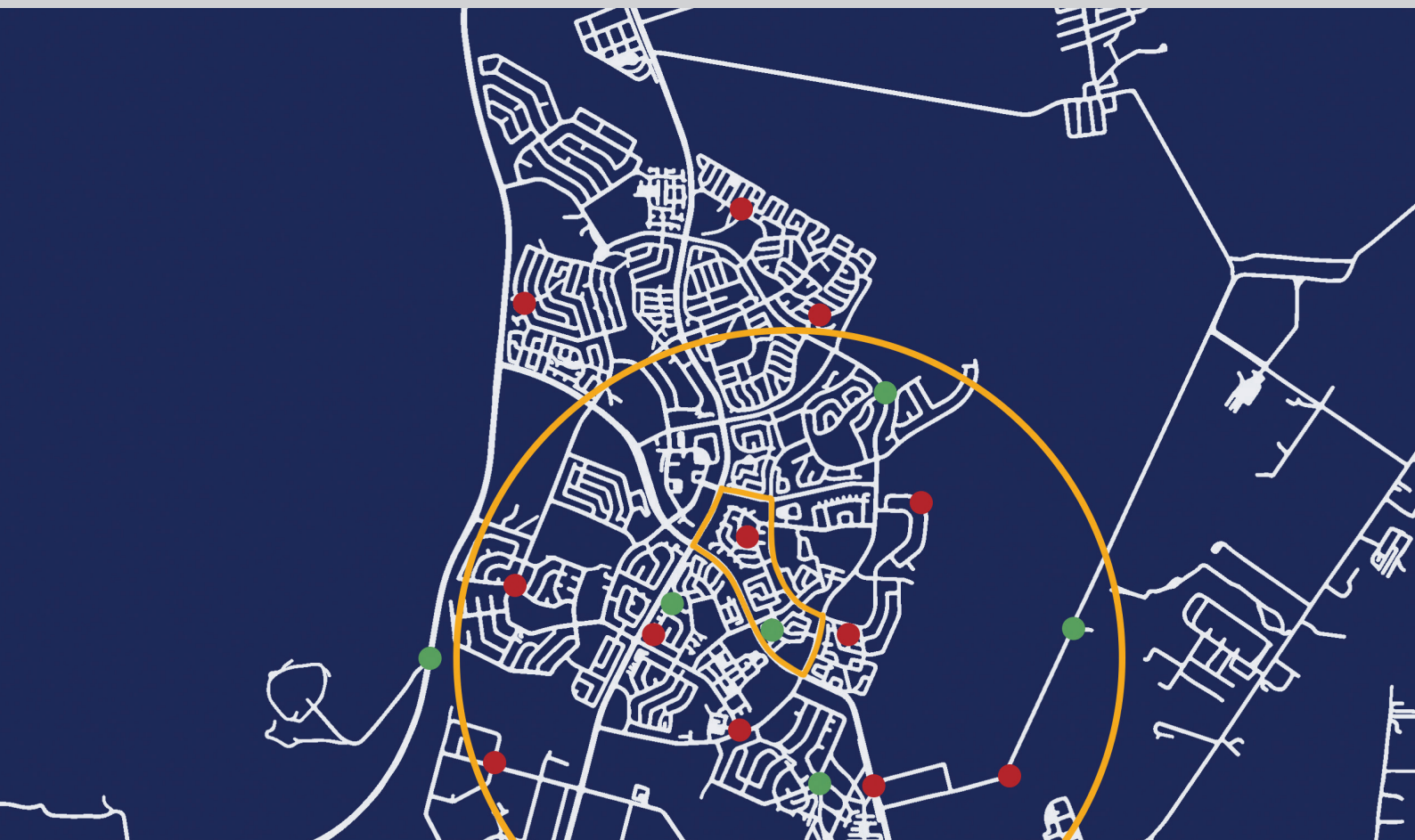# How to map violence without police data

Andrew Faull

Reducing violence requires knowing how it occurs and tailoring responses accordingly. Understanding where, when and how murder takes place also provides insights into other violent crime trends. This can be achieved by plotting murder on maps, but the South African Police Service does not regularly make such data available. In the absence of police data, how can murder trends be charted to guide violence prevention and policing interventions?

Key findings

▶ Violence is not evenly spread across South Africa but is rather clustered in particular areas.

▶ Policing and other interventions that tackle violence must be based on reliable data and informed by good evidence.

▶ Quality, timely information is central to joint problem identification and problem solving when it comes to crime and violence.

▶ The South African Police Service (SAPS) is the custodian of reported crime data, but this is not regularly shared with the public, which can inhibit evidence-based policing and violence prevention.

▶ The White Paper on Policing states that communities are entitled to the release of comprehensive and timely information by local police.

▶ The White Paper on Safety and Security calls for the continuous monitoring and evaluation of violence prevention interventions based on the collection and analysis of data.

▶ Where communities and the private sector can easily access crime and violence data, they will be more empowered to secure their own safety, partner with the police to improve safety, and hold police and government accountable for safety-related interventions.

▶ Murder (and so violence) can be mapped in the absence of police data through Community Police Forums, public health facilities, ambulance and mortuary van trackers, emergency call data, and smartphone applications managed by communities in high-violence areas.

Recommendations

▶ Regular crime information should be made available to all.

▶ The SAPS should publish select monthly (provisional) crime data for all high-murder police stations.

▶ Wherever possible, victim surveys and docket analysis should be carried out in areas with high murder rates, and the data used to guide policing and violence prevention interventions.

▶ Wherever possible, local and provincial governments should collaborate with others to map violence and make related data available to all. In the absence of regular police data, such maps should guide community safety and safety governance interventions.

▶ Civil society should continue to advocate for regular public access to crime data.

▶ Evidence-based policing and violence prevention should be supported and championed.

Introduction

To reduce violence one must understand the conditions under which it occurs and tailor interventions to address them. But violence, like other crime, can be hard to measure. This is because most violence is not reported to police. Nearly all murders, however, result in a police record. Where murder is common, other forms of violence will be common too. As such, understanding where, when and how murders occur provides important insight into where, when and how other forms of violence might occur. This can be achieved by plotting murder on maps.

Most murders occur in particular places, during regular periods, and under specific circumstances. In 2017/18, 30 of the South African Police Service's (SAPS) 1 146 stations recorded 20% (4 124) of all murders. In 2016/17, 13% (148) of stations recorded 50% of all murders. Between 2016/17 and 2017/18, murder increased by 1 320 incidents, 42% of which were recorded at just 30 police stations.

> The more we know about when, where and how murder occurs, the more we will understand violence

The SAPS is the custodian of software systems which keep real-time, geo-located records of crimes reported to police. When properly used, this information informs daily police activities. However, police alone cannot address the drivers of violence. As such, at least some of this information should be made public so that others can partner with police to promote safety.

Many SAPS stations regularly share crime data with members of their Community Policing Forums (CPFs). However, far more could be done with this data if it were shared more systematically and widely. For instance, provincial and municipal governments could use such data to guide their work and improve safety. When provincial and local government authorities and civic groups understand exactly when and where murder occurs, they can drive holistic interventions and provide oversight of police where most needed. This information, however, is not easily accessible.

This report explores alternative methods through which government authorities can map murder and violence in the absence of SAPS data. It uses the Western Cape province as a case study. Although it focuses on a single province, its recommendations are relevant throughout South Africa, particularly to provincial and municipal governments, and in major metropolitan areas.

It begins by outlining why mapping murder is important and what is known about murder in the Western Cape. It then summarises the evidence regarding what works to reduce violence and links this to crime mapping, before exploring a number of data sources and mapping methodologies that can be used to track murder and violence.[1] It concludes by suggesting that the most feasible methods for mapping murder and violence in the absence of police data are:

- Weekly/monthly communication with community structures in high-murder precincts that already have regular access to SAPS murder data. Interested parties could source and map this relatively easily.

- Partnering with provincial health and forensic pathology services to: a) collect select data on injuries from patients presenting at health facilities; b) collect tracker and call-out data for ambulance services; and c) collect tracker and call-out data for mortuary vans.

- Partnering with neighbourhood watch groups and facilitating the rollout of crime-mapping smartphone applications so that communities can record and map incidents, even if they are not reported to police.

- Partnering with the City of Cape Town (or other large metros) to access the range of data on crime, violence and disorder that they collect and collate from various sources.

While these are the most feasible strategies, a number of additional methods are also discussed.

Why map murder?

Policing and violence prevention interventions should be based on the best available evidence of what works to produce the outcomes we seek.[2] This requires the regular collection of data to guide and evaluate activities.

Ideally, government agencies, police and communities should have access to data and maps that provide a range of useful information helping them understand and

respond to risk. It would be particularly helpful to know exactly when and where various categories of crime occur. However, in the absence of this, mapping murder alone can generate significant returns. Why?

Murder is the most reliable category of crime and the best proxy for general violence. Most murders are reported to police or detected by pathology services, but many other violent crimes are not. Figure 1 shows that victims of crime are increasingly choosing not to report crime to police. In 2017, just 29% of robberies were reported to police.[3] Research shows that in the Western Cape, victims living in some of the province's most violent police precincts are the least likely to report crime to police.[4]

Because of this under-reporting, mapping murder is important. For every person murdered, it can be assumed that numerous others fall victim to less lethal forms of violence such as attempted murder, assault and sexual assault. Understanding the dynamics of murder can also provide insight into the degree to which violence is coupled with property crime, such as street and house robbery.

This is best achieved through victim surveys and docket analysis in violence hotspots, but small area surveys are seldom conducted. In their absence, we must assume that where there is murder, there is likely to be other violence, and the more we know about when, where and how murder occurs, the more we can understand violence in the absence of other data. Murder can therefore serve as a guide to action.

Murder in the Western Cape

Murder in the Western Cape and Cape Town has steadily increased over the past decade.

While the SAPS does not publish geo- or time-coded murder data – the kind required to accurately map crime – it has in recent years begun publishing helpful details on murder (and other crime) trends based on analysis of dockets. For the Western Cape, the SAPS revealed that in 2017/18, 65% of murders took place from Friday to Monday and 54% took place between 6pm and 1am.
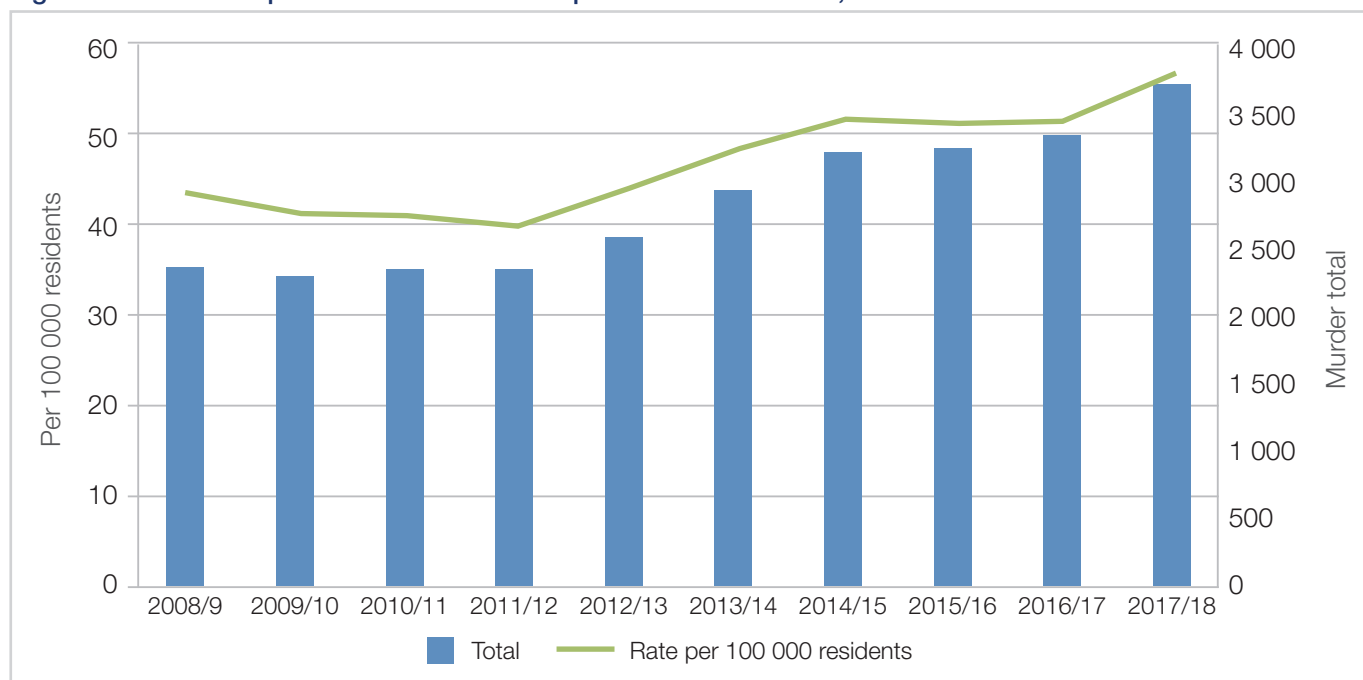
While the SAPS identified gang activity as the most common cause of murder (22%) in the province

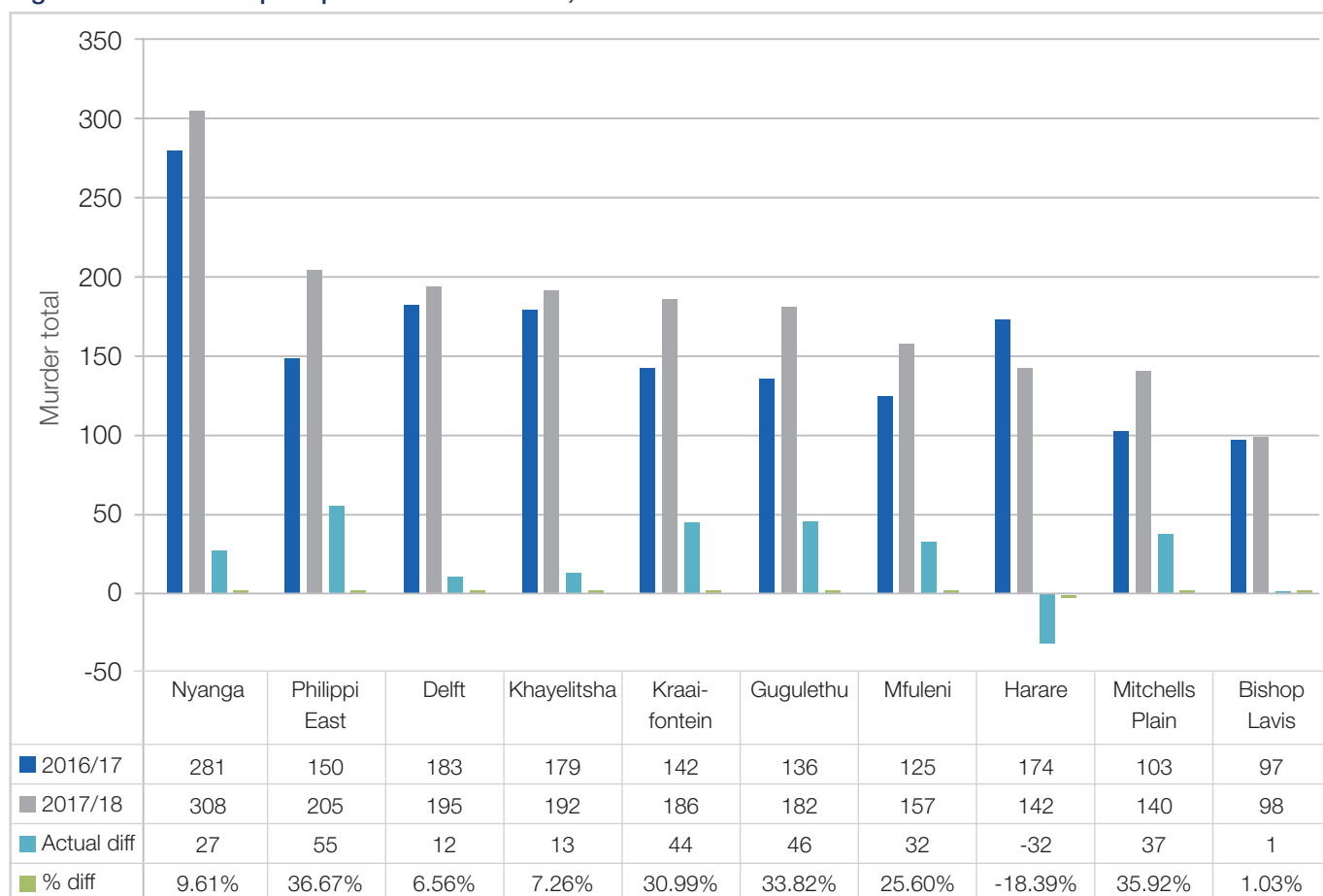**Figure 1: Percentage of victims who reported crime to police by category, 2016 and 2018[5]**
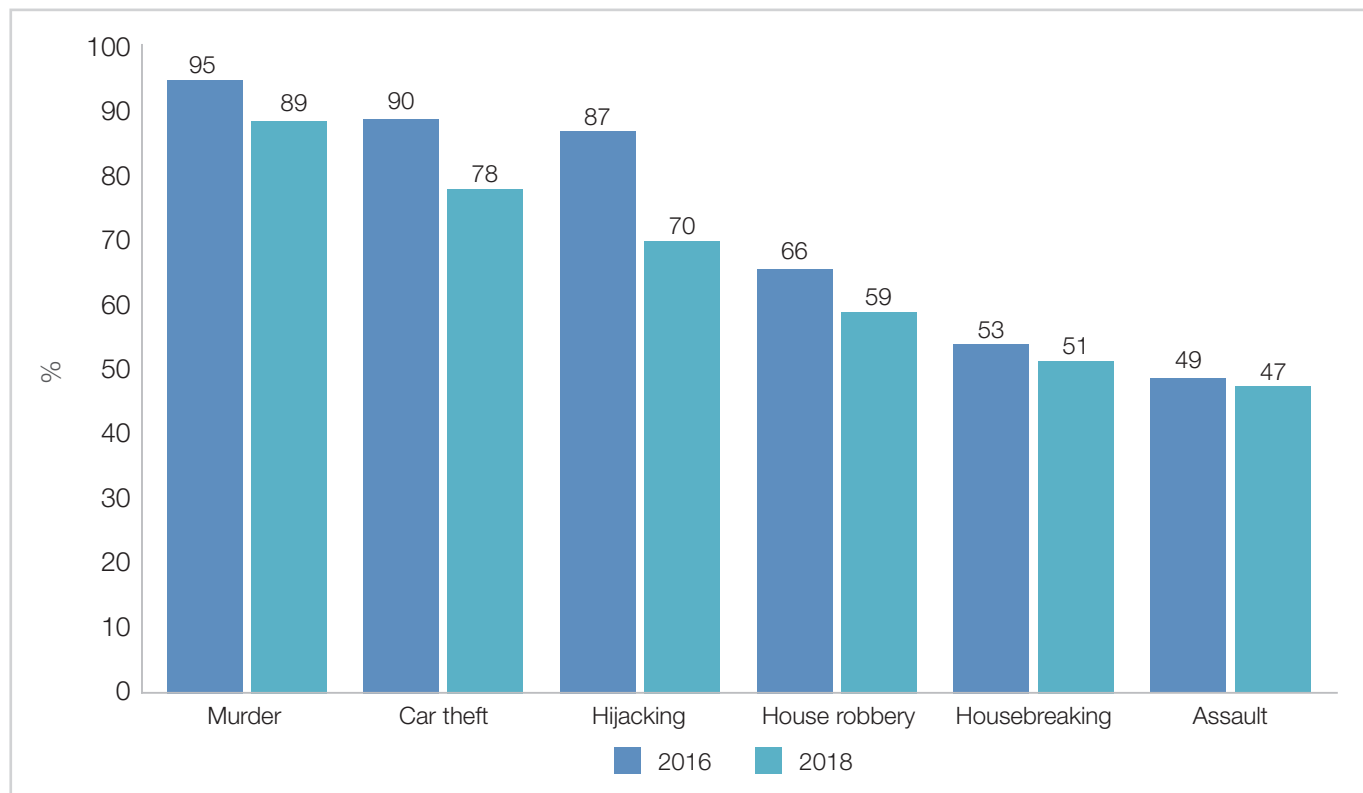
Source: Statistics South Africa, 2017 and 2018

Figure 2: Western Cape murder total and rate per 100 000 residents, 2008–2018[6]

Source: ISS Crime Hub

Figure 3: Western Cape top 10 murder stations, total murders 2016/17 and 2017/18[7]

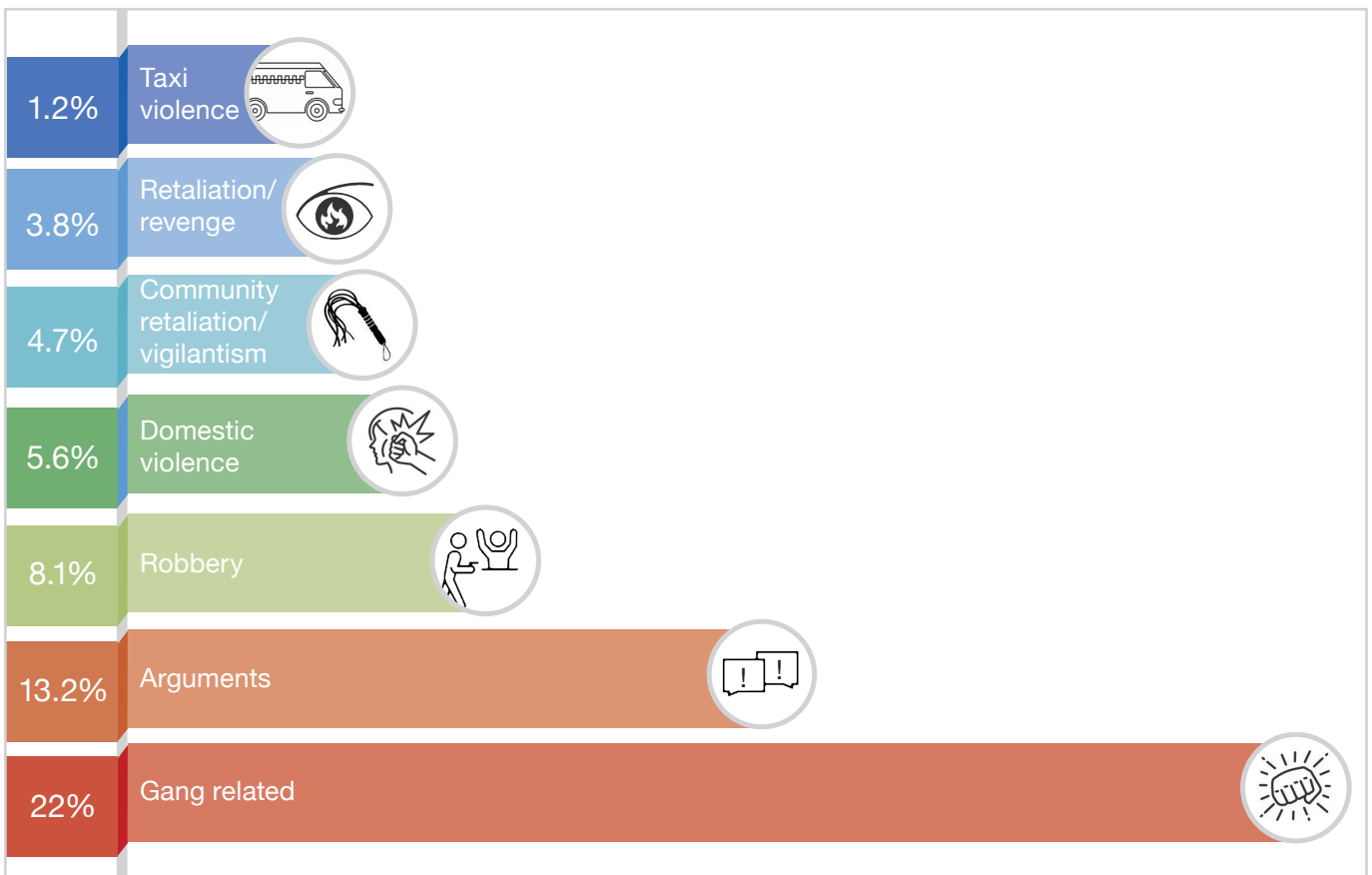|	Nyanga	Philippi East	Delft	Khayelitsha	Kraai-fontein	Gugulethu	Mfuleni	Harare	Mitchells Plain	Bishop Lavis
■ 2016/17	281	150	183	179	142	136	125	174	103	97
■ 2017/18	308	205	195	192	186	182	157	142	140	98
■ Actual diff	27	55	12	13	44	46	32	-32	37	1
■ % diff	9.61%	36.67%	6.56%	7.26%	30.99%	33.82%	25.60%	-18.39%	35.92%	1.03%

Source: SAPS, 2018

in 2017/18, 23% of murders were the result of arguments, domestic violence and retaliation/revenge. In other words, interpersonal conflict, often between people who know one another, is likely the most common cause of murder in the province, and in the country as a whole.[8] For 38% of murders the SAPS could not determine a motive or circumstance.
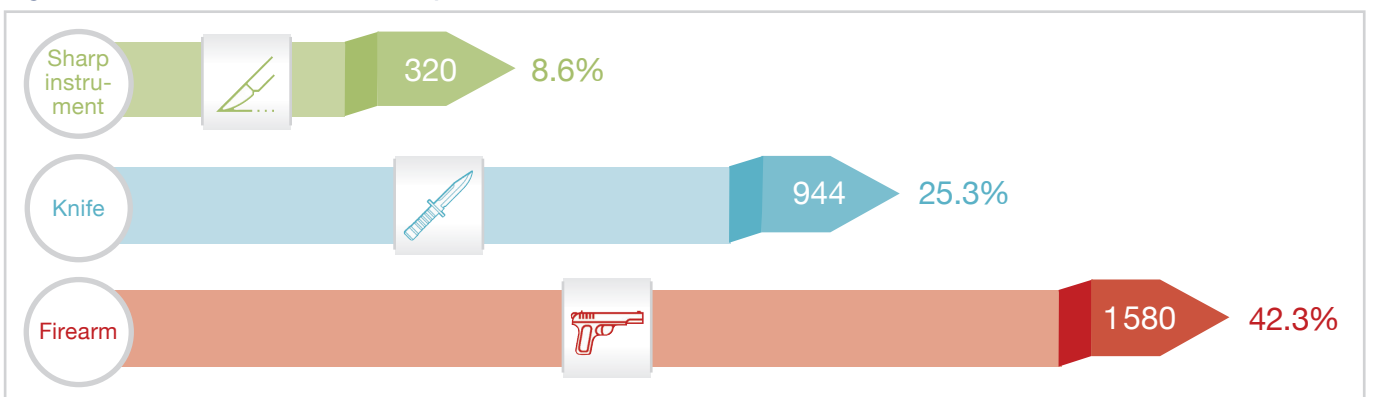
The SAPS also provides a helpful assessment of the most common instruments used to commit murder in the province. According to its analysis, the most common are firearms (42%) followed by knives (25%). A total of 77% (n=2 851) of attempted murders in 2017/18 involved firearms.

Figure 4: Murder in the Western Cape, motives/circumstances 2017/18[9]

1.2%	Taxi violence
3.8%	Retaliation/revenge
4.7%	Community retaliation/vigilantism
5.6%	Domestic violence
8.1%	Robbery
13.2%	Arguments
22%	Gang related

Source: SAPS, 2018

Figure 5: Murder in the Western Cape, instruments used 2017/18[10]

Sharp instrument	320	8.6%
Knife	944	25.3%
Firearm	1580	42.3%

Source: SAPS, 2018

Mortuary data can also provide valuable insight into the nature of violence. Based on a morbidity study, the Western Cape Department of Health found that sharp instruments accounted for most murders in 2016.[11] It also found a 100% increase in year-on-year firearm-related murders. This increase may be what is reflected in the SAPS 2017/18 analysis.

Because firearms feature so prominently in murder, removing illegal firearms and ensuring better regulation of legal firearms should significantly reduce murder. This has been empirically shown in Cape Town. In the months following firearm-focused cordon and search operations in high-violence neighbourhoods, murder declines for several months. It is believed that murder increases again only once illegal firearms filter back into these communities.[12]

Where does the SAPS get its data?

Much of the above data is drawn from murder dockets. The SAPS also conducts its analysis using data drawn from a number of other systems. Each station has a Crime Information Management and Analysis Centre (CIMAC) manager, who daily pulls and analyses data based on the following:[13]

- Crime Administration System (CAS)/ Investigation Case Docket Management System (ICDMS)
- Crime Management Information System (CMIS) – SAP 6
- Criminal Record Information Management (CRIM) System
- Global Access Control System
  - Management Information System (BI [Business Intelligence] – operational analysis)
  - Geographical Information System (GIS – crime mapping)
  - Profiling

It also sources information through:
- Crime scenes
- Field visits
- Environmental assessments
- Docket analysis
- Suspects
- Witnesses

Table 1: SAPS Station Intelligence Profile[14]

Identification of hotspots
Identification of priority crimes
Date and time analysis
General geographic information
Parolees (convicted of serious priority crimes)
Most wanted suspects (top 10)

Source: SAPS, 2018

This is relayed to the Intelligence Analysis Centre (IAC) at each cluster, which in turn analyses it and relays it to the Provincial Operational Coordination Centre (POCC), provincial IAC, and crime registrar.

Each SAPS station is required to establish and maintain a Station Intelligence Profile containing the information in Table 1.

It does this in part by collating and plotting reported crime on a 24-hour basis with a focus on shifts in crime numbers, location and crime patterns (what, where, when, how). In busy, urban stations, operational officers and their managers can generate crime reports and crime intelligence officers can assess crime trends at any time, but most commonly do so to brief officials booking on duty. Analysis is bolstered through various qualitative investigation and research activities, including linkage analysis, docket analysis, fieldwork and profiling to identify repeat offenders and groups.

> Removing illegal firearms and ensuring better regulation of legal firearms should significantly reduce murder
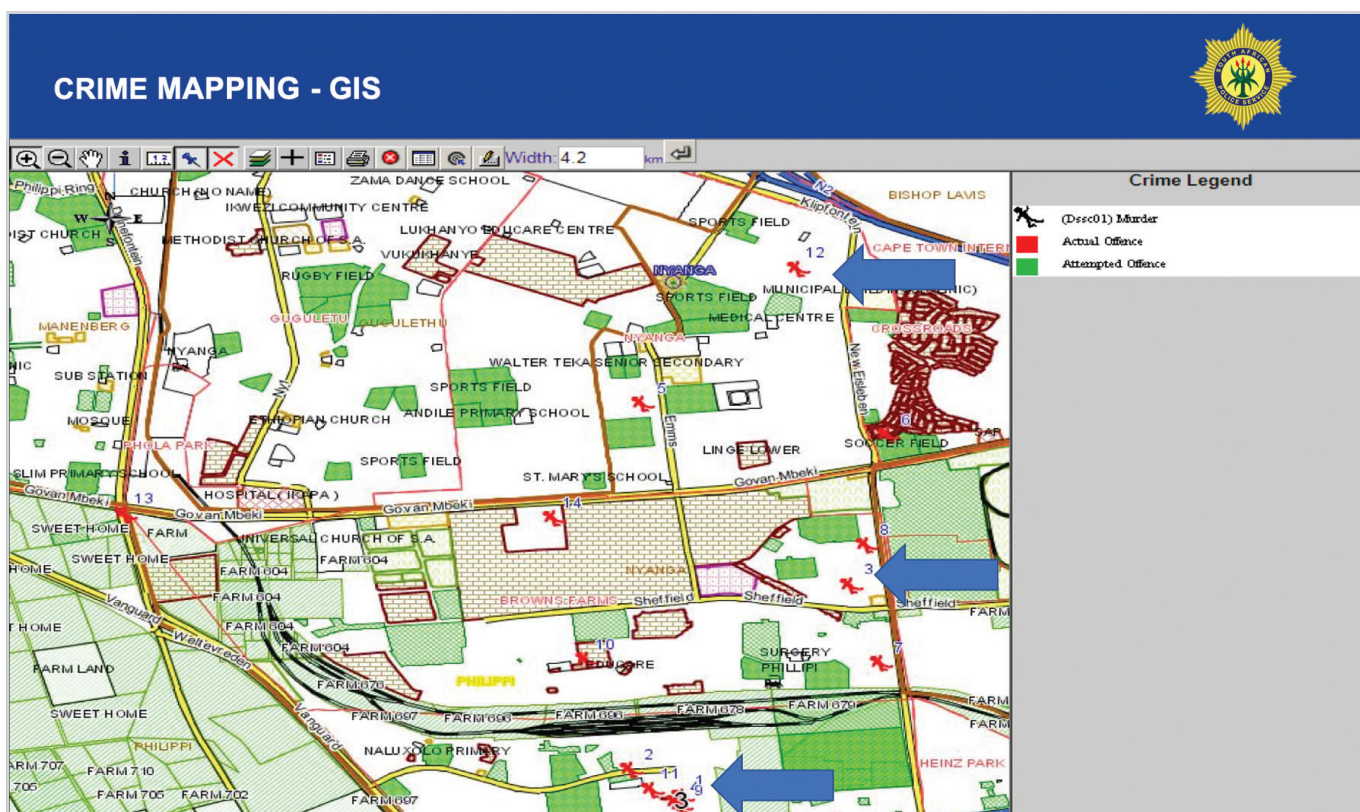
Figures 6 and 7 show examples of SAPS hotspot and GIS analysis. However, it is unclear whether this level of analysis is conducted at most stations, and whether point-level (GIS) data is consistently accurate or not.[15]

Figure 6: Example of SAPS hotspot analysis[16]
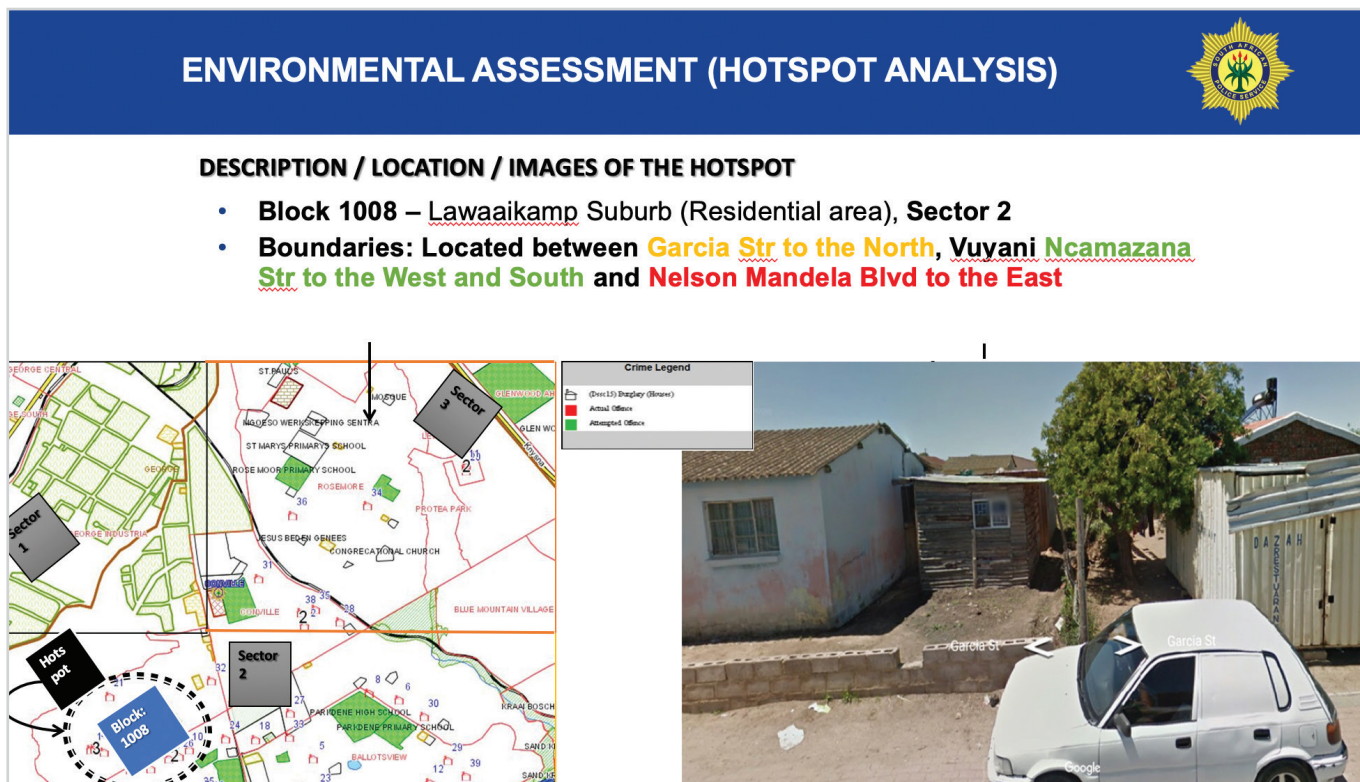
Source: SAPS, 2018

Figure 7: Example of SAPS GIS analysis[17]

Source: SAPS, 2018

The importance of data for effective violence prevention

It is increasingly accepted that policing and violence prevention initiatives should be informed by the best available evidence of what works to produce the intended outcomes.

The White Paper on Policing (2016) and the White Paper on Safety and Security (2016) outline the importance of crime-related information, as well as communities' right to it. Noting that effective policing requires partnerships with local communities, the White Paper on Policing states that:

> An exchange of quality and timely information is at the core of joint problem identification and problem solving, and collective planning for sustainable safety delivery. Communities are entitled to the release of comprehensive and timely information by local police station management. Access to such information serves to reassure and allay community fears and concerns, and allows communities to play a more active role in helping to resolve local policing challenges, and to work jointly at developing strategies aimed at creating safe and secure communities.[18]

Similarly, the White Paper on Safety and Security notes that:

> [I]nterventions must be informed by needs analyses, audits of service delivery, and be subject to ongoing monitoring and evaluation to determine effectiveness and impact.

> The availability of data is critical for planning and evaluating, strategies and interventions … Reliable and up-to-date data must be collected across the range of departments and sectors to … identify and define the incidence and prevalence of crime and violence reported and unreported.[19]

Despite this official recognition and policy, information is not always easy to come by. At one point, a cabinet decision may have been made to undermine the policy.[20] As such, it is worth recapping why such data sharing is vital to effective violence prevention.

In 2016 the United States Agency for International Development (USAID) published a meta-review of what works in preventing community violence, including murder.[21] It was intended to guide spending on violence prevention interventions in some of the world's most violent countries: El Salvador, Honduras and Guatemala.

It found that for most interventions there is weak evidence of effect, or evidence that interventions make things worse.[22] The two most effective interventions identified were focused deterrence and cognitive behaviour therapy, both of which are supported by strong evidence. In terms of this report's emphasis on crime mapping, focused deterrence is most important.

Since institutions responding to violence cannot be everywhere, but can be where it matters most, focused deterrence suggests that to achieve significant reductions in violence, resources should be concentrated in areas where violence is greatest.

Although focused hotspot policing can effectively address certain crimes, the meta-review's recommendation does not refer to policing alone.[23] Rather, like the White Paper on Safety and Security, it emphasises that violence prevention strategies must involve a range of stakeholders working together. In the most effective interventions that it identified, it found six common characteristics, all of which require the sharing of data.[24]

> Focused deterrence reduces violence by concentrating resources in areas where the problem is greatest

First, interventions should target areas, people and behaviours that are most commonly associated with violence. In targeted areas and with targeted groups they should focus on specific problems and behaviour, such as murder or gun violence, rather than attempting to reduce all crime equally.

Second, interventions should as much as possible be proactive, preventing violence before it occurs. Once target areas have been identified, authorities must find and reach out to high-risk individuals – those most likely to use violence (e.g. gang members, young men with histories of violence) – to offer them non-judgemental,

compassionate support and opportunities, while making it clear that violence will not be tolerated.

Communication of these messages must be clear and recurrent and offers of support must be credible and backed by action (e.g. school-completion support, skills training, internship opportunities). Similarly, sanction of violations must be consistent, rapid and fair. Interventions that create a positive loop between formal and informal social controls (e.g. police and community structures) are more likely to be perceived as legitimate and therefore to be sustained.

Third, interventions must be well resourced, well coordinated (between, for example, schools, social workers, prosecutors, business partners and police), flexible and responsive. They should, as much as possible, be free of the red tape that often slows action dependent on government decision-making so that the various stakeholders can adapt the intervention strategy as and when they need to.

> For communities to most effectively help police prevent crime, they need access to regular, reliable data

Fourth, the work of the various role players must be planned and guided by a theory of change that is understood by all involved. A theory of change is a clear story that links what is being done to the expected result. It has to be logical, feasible and acceptable to those involved. Police officials, social workers, teachers and other stakeholders operating in the intervention area should understand what they are working towards and how their individual roles inform the broader strategy and goal.

Fifth, effective interventions require involving the right people and successfully partnering with others. Sixth, interventions must be based on a range of data that helps analyse the problem, identify targets, guide interventions, drive implementation and evaluate effectiveness.

While it is possible, based on the murder data and other crime statistics published once a year by the SAPS, to gauge the police precincts in which violence is most common, this information is too general and, by the

time it is made public, too dated to guide the kinds of interventions found to be effective by the USAID and other evidence reviews.[25]

For communities, the private sector and other government departments to best support the SAPS in its crime prevention mandate – and for evidence-based interventions to be effectively integrated into shared visions and theories of change – all parties need access to regular, reliable data; even if only for specific crimes in specific areas, and even if only provisionally (the SAPS or Statistics South Africa could review and revise data later where necessary). For this reason, it is important, at the very least, to map murder.

Mapping murder and violence without SAPS data

Though not ideal, there are various ways in which murder and violence can be mapped in the absence of police data. This section reviews the most effective alternatives to guide the formulation of substitute methodologies for mapping murder. It covers the following approaches:

1. Casualty/trauma and EMS data

2. CPF/Neighbourhood Watch mapping

3. Partnership mapping with cell phones

4. Forensic pathology services

5. Programme EPIC and ShotSpotter (municipal data mapping)

6. Participatory community mapping

Method 1: Casualty/trauma and EMS data

The greatest benefit of mapping murder is that it serves as a proxy for violence. Most violence does not result in murder, nor is most violence reported to police. As such, understanding murder helps explain violence more broadly.

That said, there is an excellent alternative to mapping violence without murder data. The method can reveal violence hotspots that even police are not aware of. Most commonly known as the Cardiff Model, it is based on collecting anonymised data sourced from health facilities – usually trauma departments – and ideally combining it with police data. It was introduced on

the understanding that in developed countries police become aware of only a third of the violent incidents that result in hospital treatment.

In South Africa, where rates of reporting to police are almost certainly lower than in most developed states, police are likely unaware of an even greater proportion of violence. While victims may seek medical assistance after an assault, far fewer will report it to police (e.g. Figure 1). This can be addressed by recording violence-related injury data at health facilities.

By collecting violence data at clinics and hospitals, police and other government stakeholders are far better equipped to understand where, when and how violence occurs, and so to prevent it from occurring, than if they rely on police data alone. Evaluations of this model suggest it reveals hidden violence hotspots.[26] Tackling violence in these areas can prevent harm and result in large healthcare savings.[27]

In the example in Figure 8 from Tower Hamlets in London, the left image shows the violence hotspots identified using health data, using yellow and red colouring. Where violence is most pronounced, hotspots are enclosed with a red square.

The right image uses red and yellow stains to show the violence hotspots identified using police data. It also includes the red squares which represent the hotspots identified in the left image, using health data. In the right

(police data) image the red squares are largely unstained by red or yellow colouring, revealing that police data did not reflect most violence for which people sought medical assistance.

Elements of the Cardiff model have been tested in South Africa.[28] With the right financial and political support it would be relatively simple to implement in the Western Cape and other provinces, first at health facilities servicing the most violent areas, but eventually at all major emergency departments and clinics. With such a system in place, the SAPS, provincial and municipal governments, and communities would significantly improve their understanding of patterns of violence.

> Once released, SAPS data is too outdated to guide the kinds of interventions that are effective

It should be noted that related work has been carried out at various health facilities servicing Nyanga and Khayelitsha in the Western Cape in five waves of Injury Morbidity Surveillance studies, as well as in province-wide analysis of all cases admitted to forensic pathology services over a six-year period.[29] These studies saw all injury data collected from trauma patients over five one-week periods.[30]

Figure 8: Violence hotspots identified by health facilities (left) and police (right), London[31]

Source: Shepherd et al. (2016)

While these studies provide helpful information on violent incidents, including relationship with perpetrator, implement used, time, demographics and type of location (see Box 1), they do not record the actual site of violence (or do not publish this), and so do not aid in its mapping. Nevertheless, this type of data collection is invaluable. If provincial governments could collect just a fraction of this for each person presenting in an emergency department with a violence-related injury, it would be immensely helpful in planning and rolling out violence prevention interventions, as well as guiding traditional law enforcement activities.

Method 2: CPF/neighbourhood watch mapping

Another of the more promising methods of mapping murder (and other crime) is for a coordinating organ like a provincial government to consult community structures, particularly CPFs in high-murder precincts.

Although the SAPS does not regularly publish crime statistics, many station managers share crime data with community partners on a weekly or monthly basis, most commonly with CPFs but also with neighbourhood watches and other groups. Although this data is not generally shared using maps, the locations of murders are usually shared. CPFs also learn about the location of murders through other community networks.

Unfortunately, because this information is seldom shared widely or formally, it is difficult to use it to inform the kinds of interventions described earlier, involving a multitude of stakeholders united by a theory of change. It is also unlikely to draw the attention of potentially powerful partners, such as provincial government or large corporations, that may otherwise have their interest piqued by the data.

> ## Victims may seek medical assistance after an assault, but fewer will report it to police

A relatively simple way to map murder in the country's most violent precincts would be to consult with community structures such as CPFs, once a week or once a month, and to note the location of murders reported. Even more efficient would be a self-reporting system that allows CPFs to report the location of murders via phone, email or text message (more on this under 'Community self-reporting' below). This information could be plotted by and for provincial or municipal government purposes, but could also be published online and made accessible to all.

Such a system would not be flawless, particularly because many murders likely occur in informal

Box 1: Example of violence data from an Injury Morbidity Surveillance study[32]

Of the 550 injury cases assessed in the 2015 component of the Injury Morbidity Surveillance study in Nyanga and Khayelitsha, 65.3% were due to violence. Most victims were male (70.7%) and sought treatment on a Saturday (25.6%) and Sunday (25.1%). Harm inflicted with sharp objects accounted for 56.4% of cases overall, 61.3% among males and 44.8% among females. Other common methods involved blunt objects (15.0%) and pushing/kicking/punching (9.9%). For females it was pushing/kicking/punching (27.6%) followed by blunt objects (22.9%).

Most violence against males was crime-related (32.3%) and interpersonal (31.9%), followed by gang-related (18.5%). Among females it was interpersonal (45.7%), crime-related (16.2%) and sexual (15.2%). Eighty per cent of perpetrators were male and 28.4% were community members. Spouses and partners were the most common perpetrators of violence against females (24.8%). Both females (75.2%) and males (32.7%) were usually injured by a single person, but 23.6% of males were assaulted by four or more people.

Violence was most common in the home (31.2% overall and 57.1% for females), at shebeens, bars or nightclubs (27.6%), and on the street (26.2%). Alcohol was suspected to be involved in 58.5% of violent injuries, and drug use in 14.2% of cases.

Source: Mureithi et al., 2016

Figure 9: Observatory neighbourhood watch-generated crime map
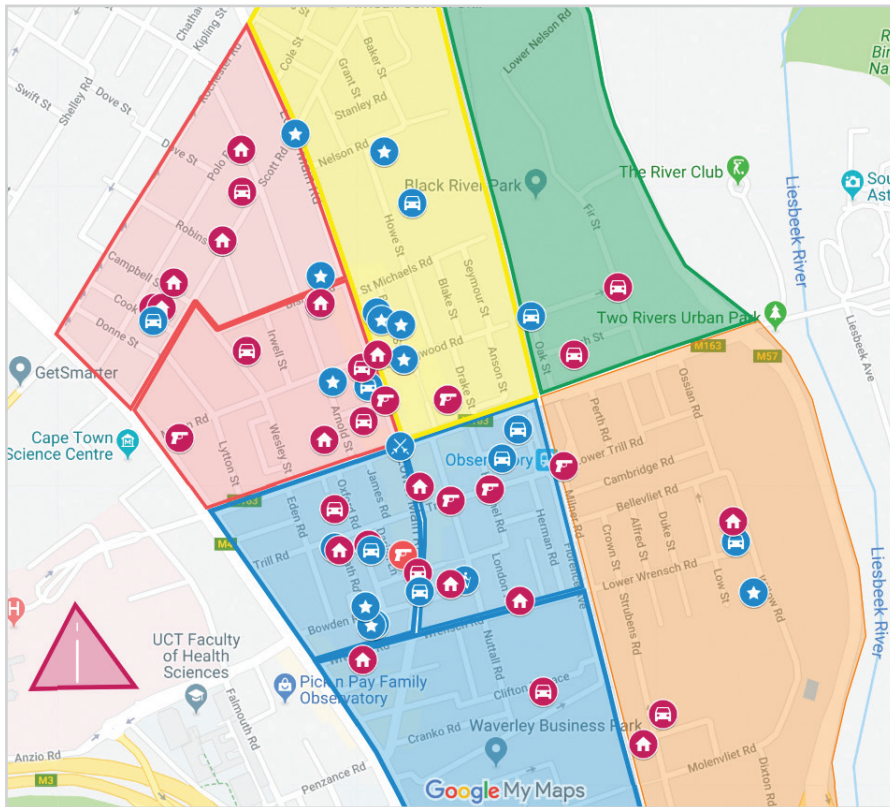
settlements that lack street names or numbers, but it would still be possible, in many instances, to identify the location of bodies within a few hundred meters. Another weakness would be the potential duplication of reports, or the reporting of murder when death was accidental or natural. However, these potential errors would be much less significant than the potential value that the data could generate.

> One way to map murder in the country's most violent precincts is to regularly consult community structures such as CPFs

Figure 9 shows a community-generated crime map from Observatory in Cape Town. The map is created monthly by the Observatory Neighbourhood Watch (ObsWatch) using information reported by community members (not SAPS data). It is publicly accessible and online.[33] By clicking on a crime-incident icon on the map, viewers can access the date and time of the incident, as well as a few words about what occurred.

Provincial and city governments could set up their own versions of such maps, or could provide guidance and resources to communities so that they could do it themselves. This data could be harvested by government, police and others to inform interventions.

CPFS HEAR WHERE MURDERS HAPPEN FROM COMMUNITY NETWORKS

Method 3: Partnership mapping with smartphones and tablets

For the purposes of mapping murder, Method 2 may be the simplest. In that approach, consulting key informants, such as CPF chairs, may be most efficient. However, there are more complex, more interesting, and ultimately more useful ways to map crime, aided by the spread of ever cheaper and smarter technologies.

An example of such a technology is provided by the company Suritec Geospatial (Pty) Ltd in Cape Town, through their product Locstat. Although Suritec Geospatial is a private company, it has offered its technology and services to communities free-of-charge.[34] A small number of community structures like neighbourhood watches, use the system but this type of capability is new and requires the right strategy to realise its benefit. With support, for example from government, the system could be put to good use, for the benefit of all.

Locstat focuses on the collection of information from the community using computers, smart-phones, smart sensors (e.g. CCTV/LPR cameras) and vehicles (e.g. armed response or neighbourhood watch patrols). Information is used to generate situational awareness through the use of real-time tracking, geospatial analysis i.e. heat-maps and analysis of crime incidents, identifying risk and informing prevention interventions.

It is in collecting the data that Locstat aspires to bring about a data-driven, situationally-aware approach to community safety and security. The aim is to change the paradigm from the current reactive model to a data-driven, pro-active model in South Africa. Here is an example of how it can work:

1. A community adopts the approach. As many people as possible use the web-reporter and mobile app. It is used to report crime and suspicious activity, and to monitor community patrol groups and sensors set up by the community (e.g. CCTV and LPR cameras).

2. Other security stakeholders working in the area adopt the system, e.g. armed response companies, neighbourhood watch groups, city improvement district patrollers. They can input and access crime data, coordinate with others in real time, generate reports, track one another's location, and more.

3. The SAPS and Metro Police buy into the system and can either input unclassified data into the live system for public consumption or draw on community-reported data to supplement its own reported crime statistics. It can also coordinate with community and private security patrol groups using real-time tracking.

Figure 10: Examples of heat maps, spreadsheets, graphs, reports and other Locstat capabilities[35]
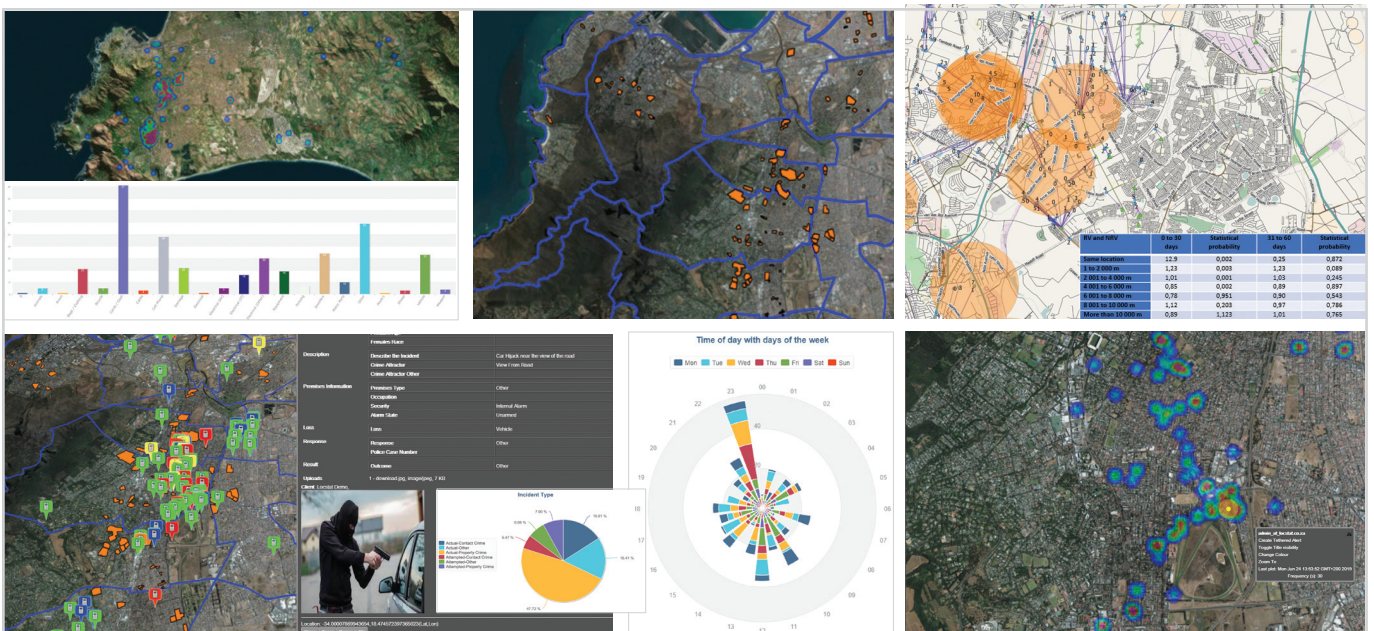
Source: Suritec Geospatial (Pty) Ltd, 2018

While Locstat-like systems have huge potential, they also have limitations. The first is getting broad enough community buy-in to make the data useful. The second is having motivated community members with access to smartphones capable of running the application. Yet both challenges can be partially overcome using existing community structures. For example, high-murder precincts are often poor and densely populated. However, provincial or municipal governments could provide affordable smartphones to key community leaders and encourage community members to report crime to them.

> Ever cheaper and smarter technologies allow more complex, more interesting and more useful ways to map crime

Such an app could also be used to generate a parallel set of crime data reported to police. This could be achieved by stationing someone at SAPS stations in high-violence precincts and having them input basic crime data into the app based on brief interactions with victims reporting crime at the station, or by accessing anonymised 'first information of crime' data from SAPS dockets.

Such systems are not perfect, but they have great potential if given the right combination of resources, leadership and motivation.

Method 4: Forensic pathology services

Pathology services are excellently placed to provide useful data on the proportion of unnatural deaths that result from violence, as well as the types of violence that lead to murder.[36] Provincial government bodies such as the Western Cape Forensic Pathology Service (FPS) can also gather demographic and location of death data related to bodies collected by mortuary vans.

In the Western Cape, FPS vans carry location trackers that transmit and record their whereabouts. Even without additional data from the FPS, information sourced from these trackers could be used to trace where vans stop when called to collect bodies from murder scenes, and therefore approximately where bodies are found. This can in turn be mapped.

The Western Cape FPS generates daily morbidity reports but does not share these publicly. This data is validated each month. In that province, the FPS is open to sharing its data in a controlled manner, to inform violence prevention.[37] Ideally it would map murder itself, but in the Western Cape it does not have the resources to do so. With additional support, or in other provinces, this may be possible. Such maps and data, if released regularly, could significantly contribute to understanding where, when and how murders occur.

PATHOLOGY SERVICES PROVIDE USEFUL DATA ON VIOLENT DEATHS

Method 5: Programme EPIC and ShotSpotter

Since the bulk of the Western Cape's murder occurs in Cape Town, reducing murder and related violence in that city would help reduce murder in the province as a whole. The same applies to other major metropolitan areas in South Africa.

Although not specifically intended to map murder, two useful sources for understanding violence (among other needs) within the City of Cape Town are its Programme EPIC (EPIC) and its acoustic gunshot location technology, ShotSpotter. EPIC is an integrated common operating platform for police and emergency services working

for the City. All emergency personnel and vehicles are tracked on maps in real time, while staff can log and relay live information and other incidents using smart devices (see Figure 11).
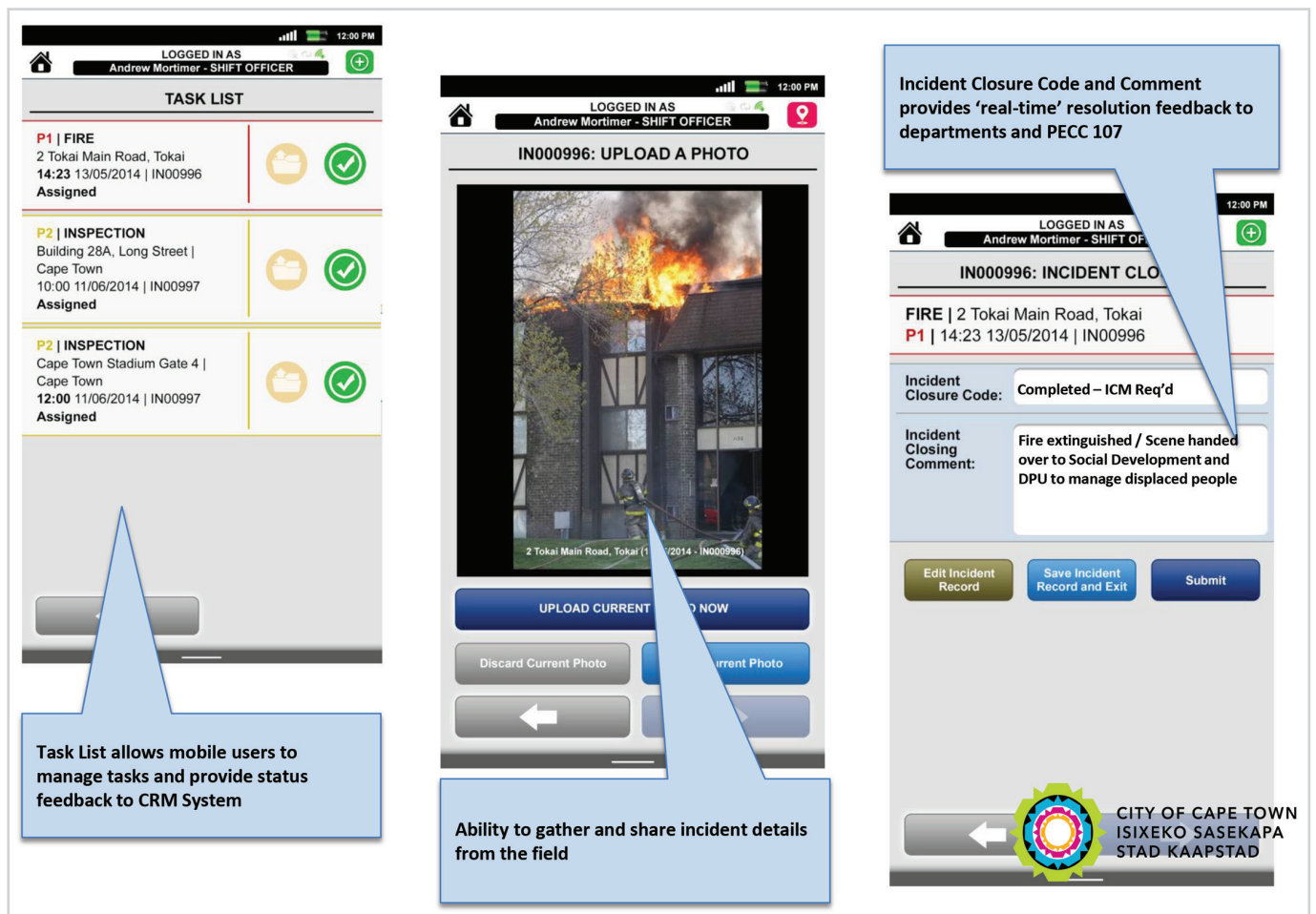
Importantly, a range of valuable data is collected and synthesised by EPIC, providing a holistic picture of calls for service, degrees of disorder, violence and crime across the city. The City is open to sharing this data with partners and is thus likely to share it with the Western Cape Government (WCG) if requested.[38] In that most murder and violence in the province occur in Cape Town, this could be useful. The data is listed in Table 2.

Table 2: Other data collected by the City of Cape Town[39]

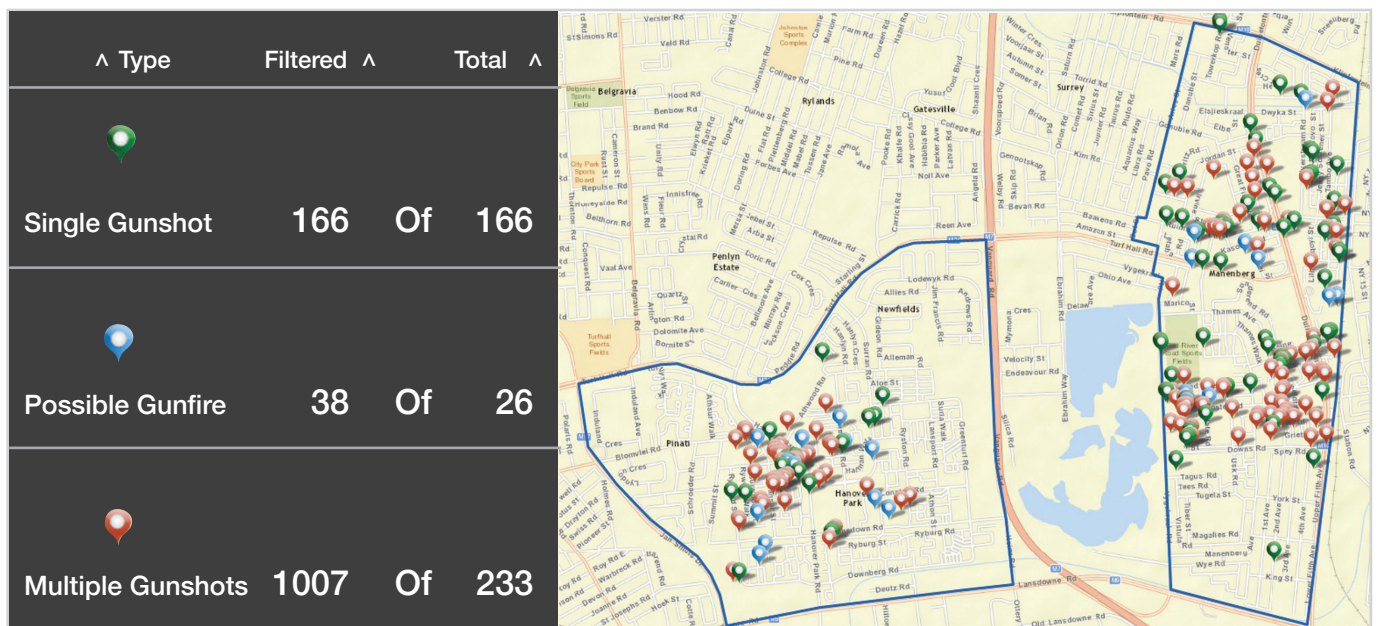| Type of data	Use/value
Calls to 107, the City's emergency hotline	Most calls for police service do not result in the formal recording of a crime. By monitoring the location of and reasons for calls to metro police and law enforcement (as well as fire and ambulance services), the City can better map disorderly, risky and violent activities taking place and better understand demand on services across the city. Table 4 provides a breakdown of calls responded to at a single SAPS station over a one-month period. While the City's data would be richer and more diverse, it is clear from the SAPS data that most calls would not have resulted in a formal complaint.
Ambulance dispatch data	The City examines 90 000 ambulance calls a month with a focus on anything linked to drugs, gunshots, assault and domestic violence. For the City, this data is more helpful than SAPS data, for the same reason that the Cardiff Model is so successful – most violence is not reported to police.
C3 data	This is the City's online service request portal. Residents can alert the City to concerns ranging from noise and unruly behaviour to traffic offences, problem buildings, leaking pipes and uncollected refuse. While not strictly crime- and violence-related, there is often a link between violence and anti-social behaviour, and physical disorder. It is therefore useful to map related calls for service.
CCTV observations	The City has the largest CCTV footprint in Africa. Notable observations are fed into EPIC.
SAPS meetings	City officials attend CPF meetings and try to record details of crime patterns in order to feed them into EPIC.
ShotSpotter	ShotSpotter is an American product that the City has implemented in Manenberg and Hanover Park. Acoustic sensors detect and pinpoint the location of gunshots when fired. This information is immediately sent to the City's operation centre from where feeds from CCTV cameras covering the area can be examined and law enforcement personnel can be dispatched. ShotSpotter generates detailed analysis regarding the type of gunshots fired, the location thereof, time of day, and more. Like EMS and emergency department data, this is helpful for plotting potentially lethal violence that would not show up in police crime records.

Source: Cape Town Metro Police Department, 2018

Figure 11: 'Mobile Field Enablement' – example of EPIC's smartphone application[40]

Task List allows mobile users to manage tasks and provide status feedback to CRM System

Ability to gather and share incident details from the field

Incident Closure Code and Comment provides 'real-time' resolution feedback to departments and PECC 107

Source: City of Cape Town, 2016

Figure 12: A screenshot from the ShotSpotter operating system[41]

^ Type	Filtered ^		Total ^
Single Gunshot	166	Of	166
Possible Gunfire	38	Of	26
Multiple Gunshots	1007	Of	233

Source: City of Cape Town, 2018

Table 3: Number of complaints attended, Cape Town Central SAPS, June 2011[42]

Reason for call	Calls
Burglar alarm	265
Fighting	202
Car accident – serious injuries	132
Car accident – damage to vehicle	127
Rebellious person	123
Assault	75
Assault GBH	68
House breaking in progress	64
Emergency alarm/panic button	61
Theft in progress	34
Fire in progress	28
Malicious damage to property	26
Theft out of motor vehicle in progress	15
Driving under influence of alcohol	14
Murder in progress	13
Robbery in progress	10
Theft of vehicle in progress	8
Robbery from person in progress	7
Arson	7
Suicide in progress	6
Shooting incident in progress	5
Child abuse in progress	5
House robbery in progress	5
Armed robbery in progress	4
Car accident – fatal	3
Business robbery in progress	3
Gang fighting	2
TOTAL	1 312

Source: SAPS, 2012

Method 6: Participatory community mapping

Although perhaps least helpful for the purpose of mapping murder in relative real time, some mention should be made of what is known as participatory community mapping.[43] This approach has been used by the WCG in the past[44] and the Department of Community Safety in 2018 conducted a number of such workshops in Atlantis, Phillippi East and Stellenbosch.

Participatory mapping involves facilitated consultations/focus groups with communities during which they describe the physical spaces in which they live, aided by maps, and update them with regard to perceptions and experiences of risk and crime in different areas. Participants discuss what kinds of crimes are most common, where and when, and how they occur.

They talk about the aspects of physical space and community dynamics that make some spaces unsafe, the structures to which they report crime and concerns, what they have heard about, witnessed or experienced, and how crime affects life in the area.

> Ambulance data on gunshots and assaults can shed more light on violence than police data

It gives communities a voice and helps them understand the patterned and localised nature of crime in their area, but also offers an opportunity to identify hotspots or spaces of disorder that impact communities but are unknown to authorities. Depending on who runs the workshop, it can provide an important opportunity for connection and communication between communities and the state/police.

Additional methods, sources and potential partners

In addition to the methods and stakeholders outlined above, various other groups and companies map crime and order-related variables. Such stakeholders should be kept in mind as possible partners and sources of valuable data. Examples include Violence Prevention through Urban Upgrading (VPUU), which has used various methods to map alcohol outlets in Khayelitsha, as well as all taps and toilets.

Figure 13: Example of community-generated crime hotspot map, Atlantis 2018[45]
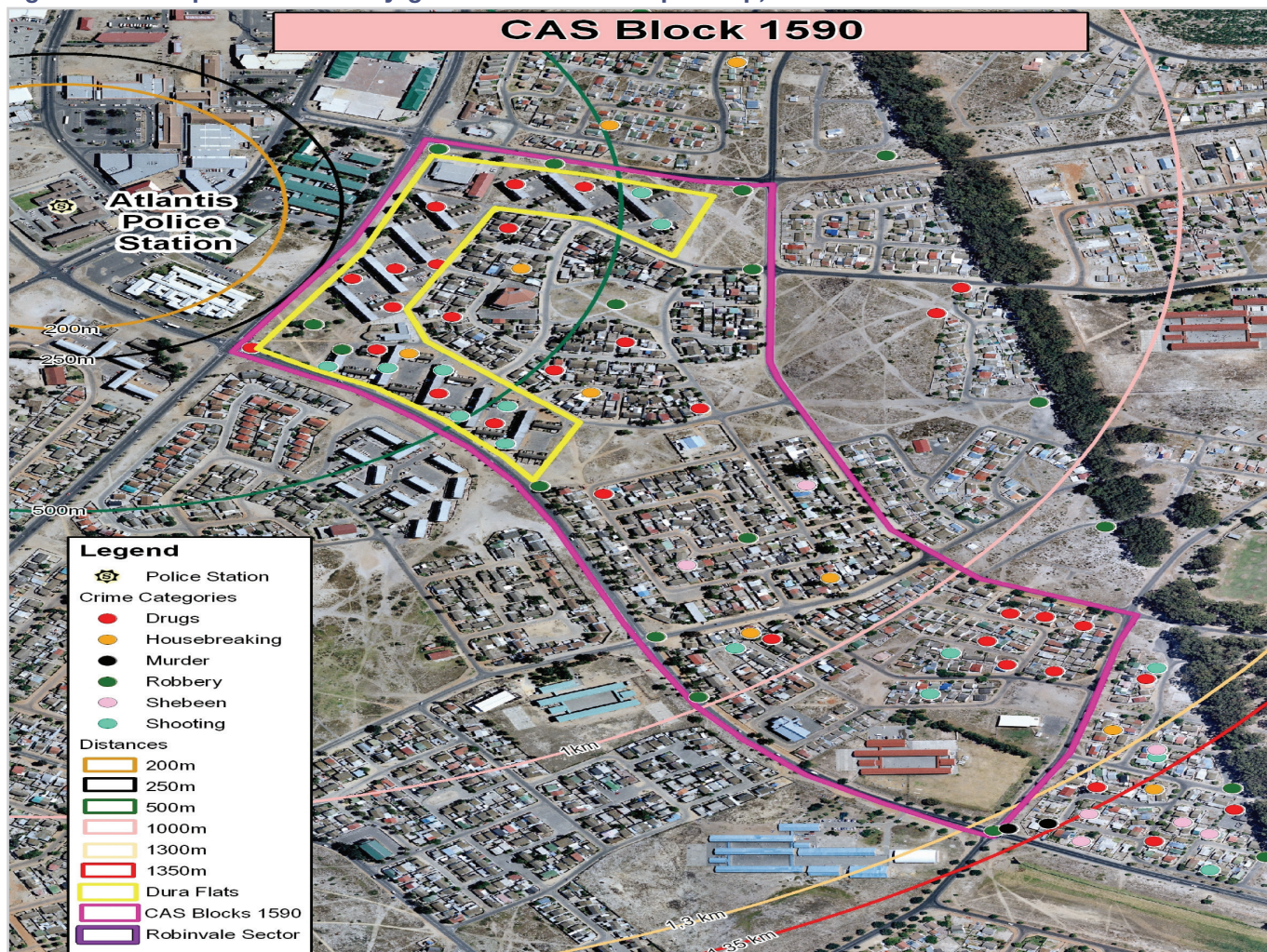
Source: Western Cape Department of Community Safety, 2018

It has managed to source relatively accurate murder data from the local SAPS stations and to overlay this with its other geo-spatial information to generate valuable analysis. However, this has been based on relationships with local police. A more efficient system would see police data readily available to such organisations countrywide, allowing for ease of partnership formation.

Another example is a company called Namola, which produces an emergency assistance app. The app is free to download and use. Through it, users can request emergency assistance and Namola will call them to talk through their needs while liaising with police and other emergency services. The app sends location data to the Namola call centre, allowing it to generate a database of caller demographics, location, emergency type, and more.

Which methodology is best for a provincial or municipal government?

While all of the methodologies discussed are helpful, some are far more so than others. Ideally, a provincial or local government would have access to regular geo-coded data from the SAPS, identifying what crime is happening where and when. If this were not possible for all crime, then murder data would be an excellent proxy for understanding violence in space and time.

The white papers on policing and safety and security make provision for the SAPS to share such data with communities. Local and provincial governments represent communities and could therefore argue that they require access to this data and that policy requires that the SAPS share it. In the absence of this data, four primary options exist for local and provincial governments:

Option one

The simplest way to map murder where it matters, in the absence of SAPS data, is likely through CPFs or related community structures in high-murder stations. This could be achieved relatively simply and cheaply. Local or provincial governments could reach out to select CPFs with access to this data and negotiate sharing of data as regularly as possible (probably once a week or month). The information could be communicated over the phone or via email to a designated official, who could input it into a database and map. The information would not always be accurate, but it would likely be good enough for the purposes of improved safety governance.

> With a few strategic partnerships and a small investment of resources, a large portion of murder can be mapped

Authorities could also establish relationships with community groups that already map crime, such as the Mitchells Plain CPF and ObsWatch in Cape Town. This data could be collated and applied to a single map.

Option two

Murder data is valuable because it tells us about violence more generally. If local and provincial authorities can access data on violence without murder data, the latter becomes less necessary. There are various valuable ways in which authorities could access such data without SAPS buy-in, primarily through partnerships with health facilities.

In the spirit of the Cardiff Model and Injury Morbidity Surveillance methods, authorities could begin collecting select data from injured people presenting at health facilities. This would provide unprecedented insight into the types of violence occurring, where they occur, when, and between whom.

Relatedly, ambulance and mortuary van tracker and call-out data could offer easily accessible (after initial negotiation) data indicating the proximate areas in which violence and murder occur.

Option three

Linked to option one, local and provincial authorities could work with neighbourhood watch groups or other community structures in high-murder precincts, and equip them with mapping technology of the Locstat sort. With it, communities could map both murder and (at least some) other categories of crime. This information could be used by the community, the municipal or provincial authorities, and potentially any other partners, including the SAPS.

Authorities could also station someone at police community service centres where data could be inputted into a Locstat-like app from people waiting to be served or exiting the station. While this would be efficient it would not pick up crime not reported to police.

SAPS SYSTEMS CAN CAPTURE GIS/POINT DATA ON CRIME

Option four

Although rates of violence are higher in some rural areas than they are in urban areas, more violence and murder occur in urban centres. Cape Town is the Western Cape (and the country's) most violent city. If murder and violence were reduced there, it would slash murder across the province. The City of Cape Town's EPIC system collects a range of extremely helpful information on crime, violence and disorder in the city. The City seems willing to share this with partners, and so would likely do so were it approached. Other major metros may collect comparable data which could be used to map violence.

Conclusion

South Africa is a violent country and the Western Cape is a violent province, but violence is not evenly spread. Most violence occurs at particular places and times, is perpetrated by a small number of repeat offenders, and is associated with particular behaviours. By identifying the places, people and behaviours that are most commonly associated with violence, the government, business and communities can partner to disrupt and prevent it.

> To prevent violence, we need to know the places, people and behaviours associated with it

Evidence suggests that the most effective interventions are those that are focused on particular spaces, problems, behaviour and people; guided by a theory of change; adaptable; and informed and evaluated using data. For the purpose of this report, the last aspect is key. For local and provincial governments to tackle violence they (and their partners) need at the very least to know where violence occurs, and ideally when, how, and between whom it occurs.

The SAPS has impressive, sophisticated systems of data collection and analysis, and each station is required to establish a station intelligence profile, which includes hotspot and crime pattern analysis. While SAPS systems allow for the capturing of GIS/point data relating to reported crime, it is not clear that this is accurate.

The white papers on police and safety and security both require that/provide for the SAPS to regularly share crime data with communities and partners. While this does not occur at a national, provincial or cluster level, it does seem to happen at the station level, including in many high-murder precincts. Authorities could feasibly plot a significant proportion of murders in a city or province by liaising with structures that have access to such data, such as CPFs and neighbourhood watch groups.

CPFs, neighbourhood watch groups and communities in general could be encouraged to adopt Locstat-type systems to map crime without reporting it to police. Since Locstat is available free of charge to communities, this may be relatively simple with government support. Alternately, authorities could set up a simple version of the software and distribute and manage it themselves.

Other excellent sources of information on the nature and location of violence in the province can be found in emergency/trauma departments at health facilities and tracker and related data from ambulance and mortuary van call-outs. The City of Cape Town's Programme Epic generates a wealth of data on violence and disorder, including from ambulance call-outs, emergency call requests, ShotSpotter gunshot identification and more, which should inform violence prevention.

With a few strategic partnerships and a small investment of resources, provincial governments and authorities in large metropolitan areas should be able to map a significant portion of murder (and other violence). This will empower them and their communities to more effectively reduce the problem.

Notes

1 Methodological note: This brief is based on a range of documents, events and consultations. These include meetings with the senior management of forensic and pathology services in the Western Cape; the Cape Town Metropolitan Police Service; telephonic conversations with leaders of CPFs in high-murder precincts; presentations and discussions emanating from three seminars held as part of this project; and a literature review.

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