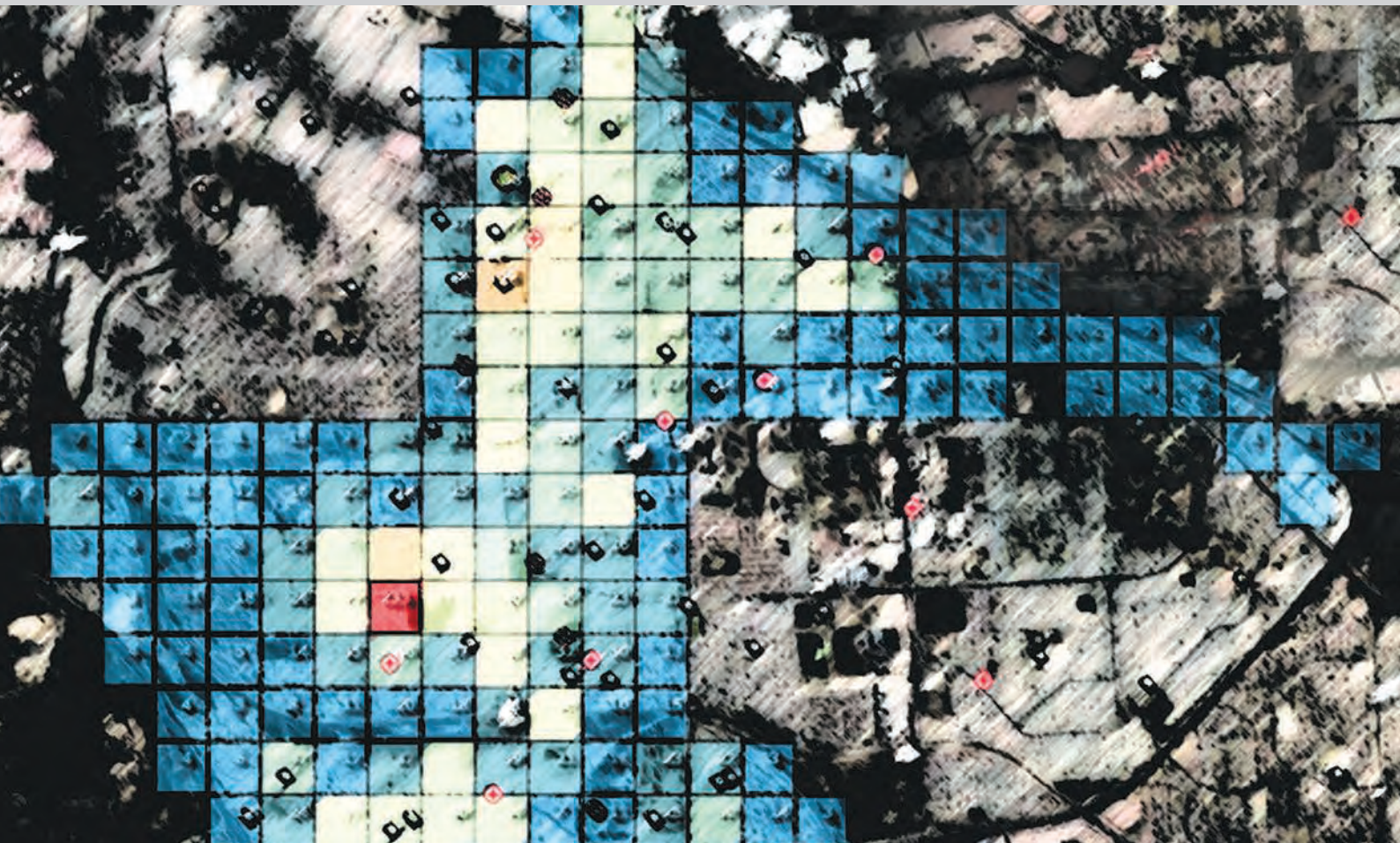


Hotspot policing for murder and robbery

A Cape Town case study

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Accurate, point-level crime analysis and targeted hotspot policing can help reduce murder and robbery in South African cities. Using Durbanville and Nyanga, an analysis of SAPS point-level murder and aggravated robbery data from 2006 to 2018 by place and time reveals crime hotspots and time patterns. The report shows that crime and harm cluster together, and outlines examples of evidence-based police interventions that may have a positive impact in such areas.

Key findings

- ▶ A large portion of murder and aggravated robbery occurs in predictable places and times.
- ▶ Focused policing, guided by accurate crime data, can reduce harm where it is most common.
- ▶ Police may be able to reduce crime by visiting hotspots for just 15 minutes per hour.
- ▶ Police may be able to reduce crime by focusing on problems, people and behaviour in hotspots.
- ▶ Significantly fewer murders and robberies occur in Durbanville (an affluent area) than Nyanga (a poorer area).
- ▶ Murder and aggravated robbery in Durbanville are highly concentrated in two clusters, one in the CBD and near the police station, the other next to the Fisantekraal train station and township.
- ▶ Murders in Durbanville mostly occur on weekend nights. Aggravated robberies occur throughout the day and week.
- ▶ Violent crimes in Nyanga are more numerous and dispersed. Five murder hotspots were detected; four in residential areas and one at the taxi rank. Distinct aggravated robbery hotspots were detected along several roadways.
- ▶ Murders in Nyanga peak between 7 pm on Saturdays and 3 am on Sundays. Aggravated robberies peak at 5–7 am every day of the week, and 7–9 pm over weekends.
- ▶ One murder hotspot of 2 496 m², or equivalent to a circle 56 m in diameter, has seen 71 murders since 2007; the highest concentration in the Nyanga police precinct.

Recommendations

- ▶ Police and their partners must accept that accurate crime data, in terms of precise location, precise time and nature of the event, is critically important and crucial for any effective crime reduction policing intervention. It precludes all findings and further recommendations.
- ▶ Police leaders should promote an organisational culture in which creating and sharing empirical knowledge (evidence-based policing) is encouraged.
- ▶ To the extent that the SAPS's crime data can be accepted as accurate, there are hotspots and peak days and times that careful, evidence-informed policing and violence prevention interventions should be able to disrupt.
- ▶ Police should focus attention and resources where, when and with whom murder and robbery are most predictable.
- ▶ Formulating station-level hotspots for each day of the week and across various times of the day should inform policing operations and impact evaluations in ways that test hypotheses, generate evidence about 'what works' and 'how' it works to tackle specific problems and improve police efficiency and impact.

Introduction

Accurate, detailed information about where and when specific crime types have occurred is crucial if the police are to have any chance at measurably improving public safety. In particular, point-level¹ crime information and analysis can enable targeted hotspot policing that will reduce murder and robbery in South Africa.

This report shows why accurate crime information and analysis must underpin all police resource deployment and operations in South Africa's most violent areas, and why related deployment must be based on interventions that research shows are likely to work.

South Africa records high and increasing rates of murder and aggravated robbery.² Between 2011 and 2019, police-recorded murder increased by 35% to 21 022 in 2018/19, or a rate of 36.4 per 100 000 residents. Similarly, from 2004 to 2019, reported aggravated robbery – robbery with a dangerous weapon or causing serious harm – increased by 39% to 140 032 counts.³

In 2018/19, 57% of reported aggravated robberies occurred in the street, where they are most likely to affect the poor. House robberies accounted for 16% of the category, 14% were business robberies and 12% hijackings. Survey data suggests that street robberies surged in 2018/19, but that 65% of victims did not report the crime to police.⁴

Accurate, point-level crime analysis and targeted hotspot policing can reduce murder and robbery

Reducing murder and robbery should be a priority for South Africa's police and government. In a country where murder is as common as it is, homicide can be thought of as a proxy for broader violence. To bring down murder, police must address the times, places, people and behaviours in which murder-related violence occurs.⁵

Similarly, the threat of aggravated robbery leaves millions of people feeling unsafe in the street, in a car, at work, and at home.⁶ Such fears promote distrust between strangers, suppress economic growth, and generally prevent the kinds of social cohesion required to build prosperous, peaceful communities.⁷

A lot of robbery is carried out by a relatively small number of repeat offenders and organised groups, and follows predictable patterns. This is true of many other types of crime, too.⁸ This means that with adequate information and analysis, the police should be able to prevent and reduce such crimes where they are most common.

In 2018/19, 20% of all reported aggravated robberies in South Africa and 21% of murders occurred in fewer than 3% (n=30) of police precincts. Within these areas, many murders and robberies occur in small geographic areas and at predictable times. Research shows that when police use accurate crime data to target their resources and activities in particular ways, they can effectively reduce crime.⁹

This report illustrates how accurate, point-level crime analysis and targeted hotspot policing can reduce murder and robbery. It begins by introducing evidence-based policing as a concept, and how it can improve police effectiveness. It then presents an analysis of crime in two Cape Town precincts – Durbanville and Nyanga – to illustrate how crime analysis should inform targeted police interventions across South Africa. It ends by highlighting concerns about the way in which some SAPS data is captured.

Evidence-based policing

Policing should be based on the best existing demonstrable knowledge, or evidence, about what works to achieve intended goals. If police want to reduce burglaries in a particular area, then efforts should be based not on common sense but on lessons learned from previous attempts to reduce burglary. The same applies to reducing violence, building trust, or tackling street robbery. This logic underscores evidence-based policing.¹⁰

In evidence-based policing, police do not simply learn from their own experiences – though these are important. Instead, they work with others to understand the outcomes of their work, and feed this knowledge into their training curricula, policies and operations.¹¹

For example, does stop-and-search prevent robbery, build public trust and/or alienate young men? How do we know? To have confidence in the answer, it needs to have been tested, evaluated, documented and shared, preferably in a range of settings and by different groups.

When we have a reliable answer, it can be used to guide policing.

Evidence-based policing is often compared to medicine. Each day, doctors try to solve their patients' health problems. Doctors know that medicine is most effective when based on the latest knowledge about what works to address particular problems. As a result, they constantly research, monitor and learn from how their patients respond to treatments. Doctors do not assume that what they learnt in medical school will forever and always be the best way to do something.

Similarly, our understanding about what works and what does not in policing and crime prevention is developing.¹² When police understand the causes of the problems they face in their work, and when they are familiar with the tools that will most effectively address these, they are more likely to be effective.

There is a strong and growing body of evidence about what works in policing and crime prevention.¹³ While some South African police officers and researchers are aware of it, most are not, and these lessons and practices may not inform daily police work or research in the country. This needs to change, especially when existing evidence suggests that South African police should be able to significantly reduce murder and robbery.¹⁴

Police cannot be everywhere, but they can do what is most likely to work, where it is needed most

Evidence-based policing is not a passing fad. Doctors can be sued or lose their medical licences if they cause patients unnecessary harm, suffering or cost by applying practices or treatments other than those supported by evidence. As police science advances, the same is likely to occur in policing – where individuals, communities and governments will hold police accountable when their activities are not based on good evidence (or evidence-based logic), and end up causing harm.

The South African Police Service (SAPS) already faces hundreds of millions of rands worth of civil claims, an amount that has increased substantially over the past

decade as a result of police officer abuse and negligence.¹⁵ Similarly, it has been argued that criminal courts should expect the same knowledge expertise from police that they expect from other non-police expert witnesses.¹⁶

In other words, it could be said that police have an ethical obligation to use police practices that are most likely to work and least likely to cause harm. This is particularly true in areas with high rates of murder and robbery. Police cannot do everything or be everywhere, but they can do what is mostly likely to work, where it is needed most.¹⁷ They should be supported and held accountable for doing this.

What does the evidence tell us?

Reviews of the most rigorous studies on policing have produced a number of important lessons. Firstly, what is often thought of as the standard model of policing – random patrols, rapid response and mandatory follow-up investigations – does not reduce general crime.¹⁸ Such practices should be avoided.

Proactive and focused policing is much more effective. Here, police focus on the places, people and behaviours most commonly associated with criminality.¹⁹ These can be identified through crime analysis and intelligence.²⁰

Similarly, policing that targets particular crime problems, and that seeks to understand and address their underlying causes, is effective. This is called problem-oriented policing, and is very similar to sector policing in South Africa (though sector policing has never really been implemented effectively).²¹

The approach should be systematic, beginning with analysis, tailoring a response plan, implementing the plan, and monitoring its impact to determine whether it works.²² Problem-oriented policing should be adopted wherever relevant.

The final area in which existing evidence provides clear guidance to the policing of hotspots relates to the way police engage with others. Research shows that when police are fair, consistent and professional in their interactions with victims, suspects and the general public, people are more likely to trust and cooperate with them, and to obey the law in their absence.²³

The above are broad lessons emerging from the existing evidence. Some other strategies have also shown to be

effective, while others have backfired (leading to more crime). One of the most effective and easy to implement is hotspot policing, which will be returned to shortly. In order to implement hotspot policing – or almost any evidence-based intervention, for that matter – accurate crime data is essential.

Importance of crime analysis

It seems common sense that policing, like any problem-solving initiative, be based on careful analysis. For this reason, the SAPS appoints Crime Information Management and Analysis Centre (CIMAC) officials at the station level to help guide a station's work.²⁴ In some precincts, officials will plot daily crime on maps and present it to patrol officers for briefings, along with recommended policing strategies.

Stations are also expected to maintain Crime Intelligence Profiles, which should include precinct hotspots, crime priorities, and date and time analyses of crimes.²⁵ This is a rational and appropriate foundation from which to systematically tackle crime problems.

Police have an obligation to use practices that are most likely to work and least likely to cause harm

The quality of station-level crime data is a critical component in effective policing. It should be integrated into daily operations and monitored, and police activities should be adjusted based on changes in the data. This requires significant investments and dedicated leadership so as to ensure that an organisational culture is established that recognises and champions the use of data in its work.

Unfortunately, research suggests that such a culture is lacking in the SAPS, where officers may not accurately capture data or work in accordance with their crime data.²⁶

Policing has historically celebrated experience and professional knowledge over research, and police organisations can be resistant to change.²⁷ But when police practices are found to be inadequate for improving public safety or potentially harmful to the public, then police have an obligation to change and adapt to new realities.

A 2019 study carried out by the Cambridgeshire Constabulary (UK) illustrates the disjuncture between intuition and research. Using face-to-face surveys, it explored how accurately a small sample of police officers (n=123) could identify the highest crime street locations and offenders in their area, compared with actual records.

It found that officers were 91% inaccurate in naming the most prolific suspected offenders and 95% inaccurate in naming the most harmful suspected offenders. They were 77% incorrect in naming the streets with the highest frequency of crimes, and 74% incorrect in identifying those streets generating the most harm.



EXPERIENCE SHOULD BE
COMPLIMENTED WITH
GOOD DATA

Although the study was small, it suggests that, despite significant experience and professional knowledge, police officers' knowledge of crime trends may not be nearly as accurate as that provided by data stored on well-managed police systems.²⁸

It is important, then, to approach operational planning and problem solving without preconceived ideas or convictions. Instead, information must be gathered and analysed, ideas proposed and questions asked, and the evidence consulted.

The best sources of information that should inform police planning come from community sources, crime intelligence and crime analysis.²⁹ Our focus here is the latter, but in all instances the data produced should be accurate, precise, consistent, complete and reliable.³⁰ It should also be used to guide activities – not simply presented to officers for compliance reasons.

Evidence suggests that the best outcomes occur when police communicate effectively

While the SAPS has put systems in place to apply this type of policing, it is not clear that its data is accurate, precise, consistent, complete or reliable.³¹

In the next section we summarise the evidence in support of hotspot policing.

Policing hotspots

Some of the most effective policing is that which targets people, places and behaviours commonly associated with crime. Associations between crime, place and time can be identified through effective crime analysis and are called 'hotspots'.

There is no set definition of a hotspot, though it usually refers to a small area rather than an entire neighbourhood or precinct.³² Hotspots can be as pointed as a single building (e.g. block of flats) or business (e.g. a bar), or as large as a city block.³³ Hotspot policing involves the targeting of resources and activities in such places.

Exactly what police and their partners do in hotspots can vary depending on the problem being addressed. Strategies may employ crime prevention through active

and passive surveillance, victim awareness initiatives, upgrades to infrastructure, or various types of police-specific focused enforcement activities.

Importantly, evidence suggests that hotspot policing does not displace crime to surrounding areas. Instead, areas around targeted hotspots tend to experience a reduction in crime as well.³⁴

Hotspot policing is more effective in addressing violent crime than property offences. When hotspot policing is combined with problem-oriented policing (i.e. a systematic approach is taken to understanding and tackling problems in the area), it is twice as effective as hotspot policing that merely uses traditional patrol strategies.³⁵

Focusing resources on hotspots also seems like common sense. But South African police commanders may not feel they have the luxury of focused deployment when almost everyone in their precinct feels unsafe and they face internal and external pressure to increase police visibility. Similarly, simply identifying an area as a 'hotspot' does not automatically mean it deserves additional resources. Hotspots should be considered against other hotspots and priorities.

Assigning officers to too many hotspots can undermine effectiveness, spreading resources too thinly or demotivating officers through the monotony of a task. This can be addressed with careful leadership, hotspot-related training, and systems that hold officers accountable for their assignments (e.g. reviewing a patrol car's automatic vehicle location [AVL] data).

For example, officers can be encouraged to engage in regular, purposeful conversations in hotspots, consult with people at risk of offending, or engage in respectful stop-and-search routines, depending on appropriateness. Activities pursued in hotspots should vary depending on the category of crime or disorder being addressed.

It is also important to consider how hotspot policing activities may be perceived by the public. Some communities or individuals may perceive a focus on their area as a sign that the state mistrusts them, while others may welcome it. Either way, the evidence suggests that the best outcomes occur when police communicate effectively and treat all people fairly.³⁶

While addressing the causes of crime or harm in hotspots can involve a range of stakeholders, there are

at least three evidence-informed strategies where police should take the lead in implementation.

Strategy 1: General hotspot policing³⁷

Providing a police presence in crime hotspots, and pursuing related activities, is central to basic hotspot policing. However, where resources are scant, evidence suggests that such policing need not detract from other responsibilities.

- Police stations should use crime analysis to identify two to five problem areas or hotspots in their area.
- During each shift, when not responding to calls for service or attending to other tasks, officers should be present in the pre-selected areas for 10–15 minutes at a time.
- Depending on the type of crime in the area, they should spend this time on foot patrol, speaking with the public, questioning suspicious people, or searching suspicious vehicles, among other strategies. They should always engage with the public respectfully and fairly, and respond clearly and politely to questions about what they are doing.
- Police should randomly repeat this process throughout their shifts, whenever time allows. In this way, hotspots can be policed without negatively impacting general police services.

Evidence suggests that hotspot policing doesn't displace crime but instead helps reduce it in areas around targeted hotspots

Strategy 2: Problem-oriented policing in hotspots³⁸

Problem-orientated policing (POP) in hotspots involves trying to identify, understand and address a specific problem in a hotspot. Responses are tailored to each situation and are monitored to determine whether they are effective or not. They can involve activities and interventions that are not police-intensive, such as changes to the physical environment, but can still be initiated or supported by police. POP generally includes the following steps:

- Identify and prioritise crime and disorder problems in their area (or in specific hotspots)
- Analyse problems to try to understand their underlying causes
- Develop a response that will address the underlying causes of the identified problem – this may require working with various partners, including the municipality, schools and community groups
- Monitor the implementation of the response to assess whether it is having the desired effect – if it is not, revise the plan and keep monitoring



PROBLEM-SOLVING IN
HOTSPOTS CAN BE
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Strategy 3: Focused deterrence in hotspots³⁹

Most violence is committed by a small percentage of people. In some instances, offenders reside or offend in a relatively small geographic area. This is often true for most types of robbery and gang-related violence. Identifying, targeting and supporting such offenders can reduce incidents of related crime and harm.

- Use crime analysis and intelligence to identify high-risk offenders operating in local hotspots
- Partner with other government stakeholders (teachers, prosecutors, social workers, etc.) and community members to address the problem
- Create a crime intervention plan: assign roles to various members of the team, and make sure everyone agrees on the goal, and their task in reaching it
- Contact identified individuals to tell them about the team's work in the area, and to let them know that violence will not be tolerated
- Offer them social and economic support where possible – complementing the threat of arrest with positive opportunities to change
- Respond swiftly when targeted individuals offend but also follow through on offers of support to those willing to accept it

These three strategies are not the only ways to address crime in hotspots. However, they are supported by good evidence and so should be among the first considered by police, as they are likely to work. Of course, there is overlap between them, and they can be combined and adapted as needed.

Problem solving in hotspots may require changes to the environment (e.g. introducing street lighting) or public awareness campaigns (e.g. when street robbery is common near a taxi rank), for example.⁴⁰ The key message, however, is that policing that is focused, guided by and evaluated through data, is likely to be more effective than policing that is not. This logic is supported by a growing evidence base.

Considering the concentrated nature of murder and robbery in South Africa, police should be able to reduce it where it is most common.

Mapping crime for evidence-based policing

In the remainder of this report we present an analysis of 12 years of murder and robbery data for two areas in Cape Town. Our aim is to demonstrate how such techniques can reveal crime hotspots, which in turn can be used to guide and assess interventions, such as those outlined above.

Study sites

The Cape Town metropole is among the most violent in the world. In 2017/18 its murder rate was 69 per 100 000 residents, compared to a South African average of 36⁴¹ and a global average of 6.⁴² Although crime and violence are pervasive in the city, a disproportionate number of incidents and harm occur in just a few locations.

This study compares a high-incident, high-harm police precinct (Nyanga) with a relatively low-incident, low-harm precinct (Durbanville) to illustrate the clustering and predictability of crime in hotspots.

A disproportionate number of incidents and harm occur in just a few locations

Durbanville is an affluent, spacious suburb in Cape Town's northern suburbs. According to the last national census, in 2011 the Durbanville main place (the census equivalent of a suburb) covered 21.78 km² with a population of 40 944 people and 15 258 households.⁴³

The population was 81% white, 96% of 15–64-year-old residents were employed, 14% of households had a monthly income of R3 200 or less, and 99% of households lived in formal dwellings. The effective population densities were 1 880 people per km² and 700.6 households per km².

In contrast, Nyanga is one of Cape Town's oldest townships, originally established to house migrant workers. The Nyanga main place covers 3.09 km² and in 2011 had a population of 57 996 people and 15 993 households.⁴⁴

The population was 99% black, 55% of 15–64-year-olds were employed, 74% of households had a monthly income of R3 200 or less, and 67% of households lived

in formal dwellings. The effective population densities for Nyanga were 18 775 people per km² and 5 177 households per km², making it one of the most densely populated main places in the country.⁴⁵

In both Durbanville and Nyanga the police station boundaries do not correspond with the census main place boundaries. For example, the Nyanga precinct covers roughly 14 km² with an estimated population of over 200 000 residents.⁴⁶ This means that some crimes within these communities are recorded at other police stations and vice versa.

Durbanville and Nyanga are approximately 20 km apart. Although at extremes, they represent the contrast between a low population-density, affluent suburb and a disadvantaged, high population-density township with a mix of formal and informal areas.

Data

Geo-coded, point-level crime data for the Durbanville and Nyanga police stations was obtained through a public information request to the SAPS. The datasets list all reported contact crimes by police precinct, crime category, date and time, and geolocation from 1 April 2006 to 31 March 2018, a 12-year period. No further metadata or information has been provided by the SAPS on the datasets.

The analyses focus on murders and aggravated robberies (robberies with a weapon: either a firearm or an instrument other than a firearm).

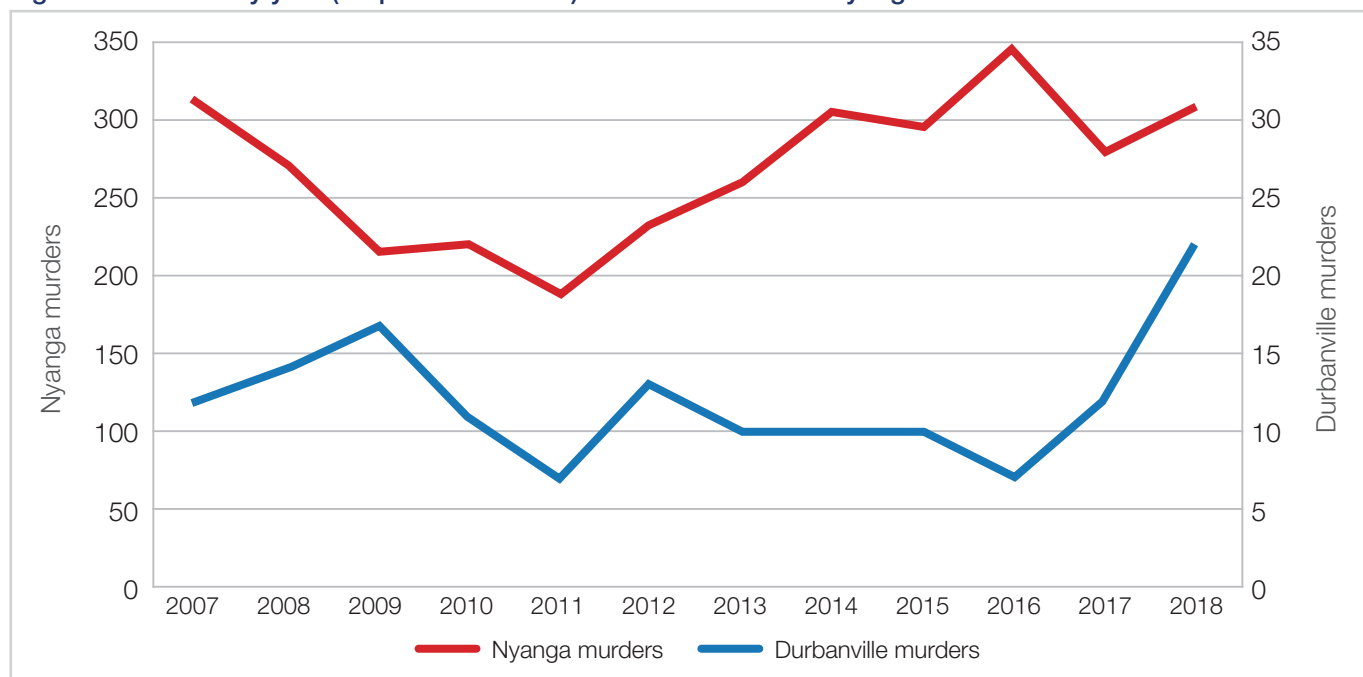
In total, over the 12-year period 3 236 murders were recorded in Nyanga, 145 murders in Durbanville, 6 136 aggravated robberies in Nyanga and 689 aggravated robberies in Durbanville.

Over 12 years, 3 236 murders were recorded in the Nyanga precinct

Murder trends by year (Figure 1) show increases in both communities from 2011, reaching a peak in Nyanga in 2015–2016 (345 murders), and in Durbanville in 2017–2018 (22 murders). Aggravated robberies (Figure 2) increased significantly in both communities from 2011, reaching peaks in 2017–2018 (985 in Nyanga and 100 in Durbanville).

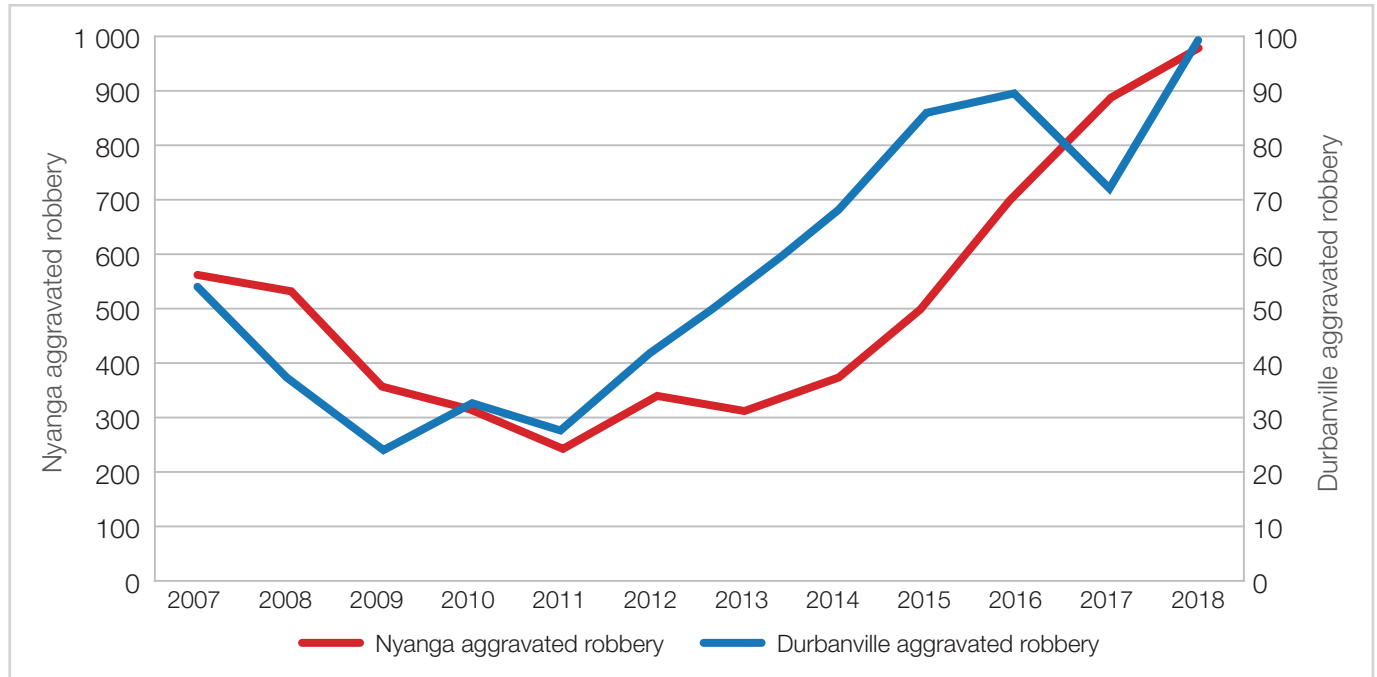
These totals represent threefold or greater increases in both communities since 2011. Notably, there is a ratio of 4.75:1 aggravated robberies to murders in Durbanville, compared to 1.90:1 in Nyanga. This highlights the extremely violent nature of crime in the Nyanga police precinct.

Figure 1: Murders by year (1 April to 31 March) for Durbanville and Nyanga



Note: Different scales are used for Nyanga (left axis) and Durbanville (right axis).

Figure 2: Aggravated robberies by year for Durbanville and Nyanga



Note: Different scales are used for Nyanga (left axis) and Durbanville (right axis).

Analysis methods

We built on the methodology for spatial (space) data presentation, visualisation and analysis developed and used in Edelstein and Arnott’s 2019 examination of point-level crime data in Khayelitsha, Cape Town.⁴⁷ This includes the binning (combining) of murder and aggravated robbery data into 267 m by 267 m square grids to plot the general location of crime concentrations.

Empirical hotspot identification is then separately conducted using the fuzzy mode analysis method (F-mode),⁴⁸ which involves totalling the number of incidents (murders or robberies) over the 12-year period within 50 m, 100 m, and 200 m radii of a central point.

The data highlights the extremely violent nature of crime in the Nyanga precinct

Initially, a limit of five incidents is chosen, and all points with fewer than this number of incidents (within the chosen radius) are removed, revealing areas with higher crime densities. The limits are then increased incrementally, revealing the most prominent hotspots.

The final threshold levels for hotspot identification are set to 20, 30 and 80 murder incidents, respectively, in Nyanga, and two murders within 50 m radii of a central point in Durbanville. Murder concentrations are given priority in initial hotspot identification. Additional aggravated robbery hotspots are manually identified along several street corridors in Nyanga.

Detailed space and time analysis of the hotspots follows.⁴⁹ The space and time (time of day and day of week) concentrations are depicted in a standardised visual format. Ratcliffe refers to the spatial aspects of crime hotspots as dispersed, clustered or hot point, and to the time aspects as diffused, focused or acute.⁵⁰ We use this terminology, where appropriate, to describe the space-time profiles for each identified hotspot.

Hotspots for Durbanville and Nyanga, respectively, are presented showing their location in the police precinct and crime distribution with small graphs showing time of day and day of week trends for visual comparison. Detailed hotspot visualisations and graphs of murders and aggravated robberies by time of day, day of the week, are also presented.

Evidence of unnatural, gridded data, lying along an evenly spaced geo-coordinate grid, was discovered in

previous analyses of Khayelitsha crime data.⁵¹ It must be assumed that such data is at least partially inaccurate, as it is impossible for dozens of crime incidents to occur at exactly the same distance from one another along a perfectly spaced geometric grid.

In the Nyanga and Durbanville data, evidence of gridded data is again found. Such errors make space analysis, hotspot identification and police planning difficult. If a police service or local authority does not have accurate

data about when and where crime occurs, it will be unable to address it effectively.

Analysis and visualisations

Time analyses: murder

Figure 3 shows that, over the 12-year period, murders most often occur between 6 pm and 6 am in both Durbanville and Nyanga. Fewest murders occur in the late morning to early afternoon, with increases from 4–7 pm

Figure 3: Murder by hour of the day, Durbanville and Nyanga, 2006–2018

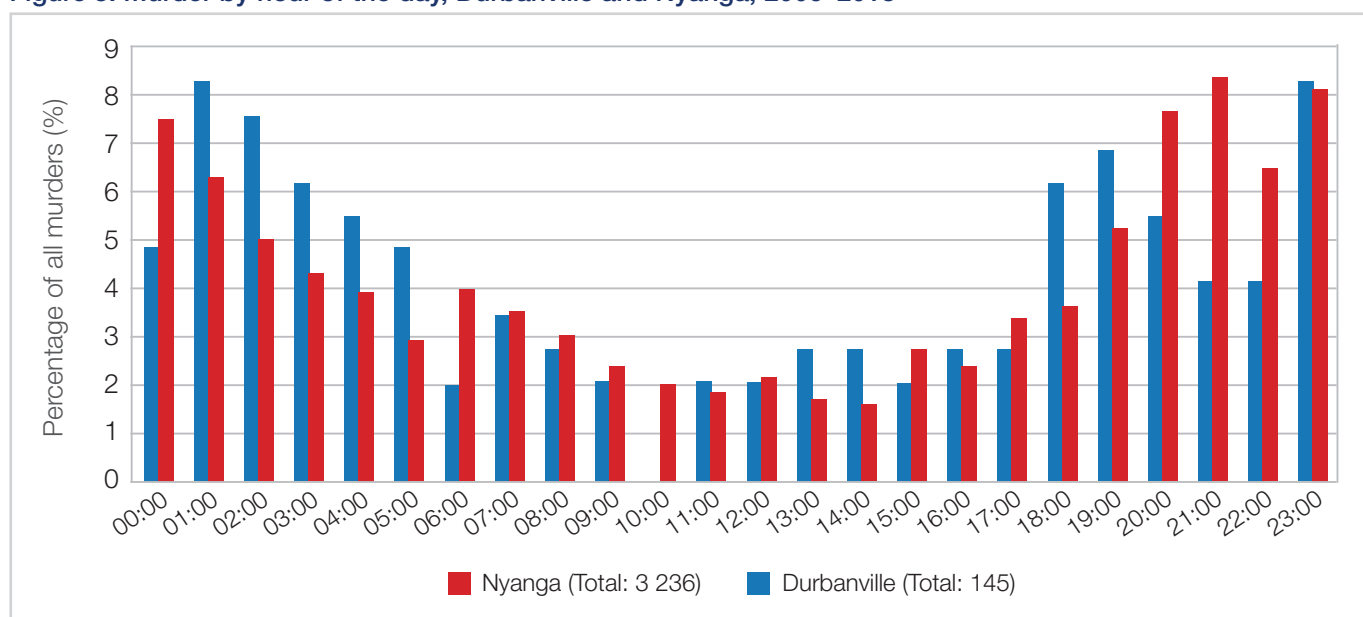
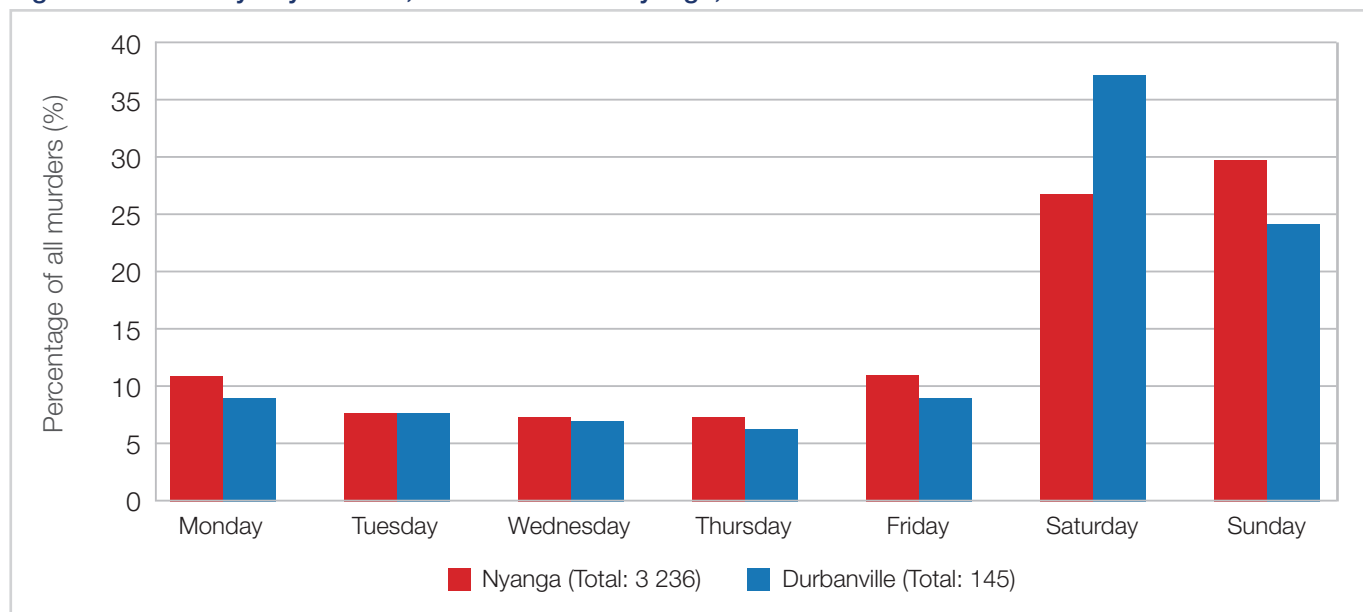


Figure 4: Murder by day of week, Durbanville and Nyanga, 2006–2018



in Durbanville and 9 pm in Nyanga, followed by several hours of decline (three hours in Durbanville; one hour in Nyanga), with additional peaks between 11 pm and 1 am and declines thereafter.⁵²

The early evening spikes from 6–7 pm in Durbanville and 8–9 pm in Nyanga are notable and could inform problem-oriented responses.

In both areas, murder is least common from Tuesday to Thursday, with increases on Fridays. Incidents roughly triple on Saturday and Sunday, tapering into early Monday mornings. Murders occurring around or after midnight may lead to some day-of-the-week coding inconsistencies (e.g. late Saturday night crimes listed as Sunday morning). Either way, the data clearly suggests that most murder occurs on Saturdays and Sundays, and mostly at night, as depicted in figures 5 and 6.

In Durbanville (Figure 5), murder peaks between 5 pm and 11 pm on Saturdays and Sundays, and midnight and 5 am. While the numbers are relatively low, the clustering of murder on weekend evenings and night-times/early mornings is clear.

In Nyanga, where there were far more incidents, murder increases gradually from 7 pm on Fridays to 1 am on Saturdays, and again from 5 pm on Saturdays until 2 am on Sundays (Figure 6). Incidents increase again on Sundays from 5 pm, peaking around 8 pm and declining gradually into Monday morning. Like Durbanville, most murders occur on weekends and at night.

Time analyses: aggravated robbery

Aggravated robberies are relatively dispersed by time of day in Durbanville with two relative peaks seen around commuting hours, 5–8 in the mornings and 7–9 in the evenings. Aggravated robberies in Nyanga see a spike during morning commuting hours, i.e. 5–7 am, and a second, more gradual peak during evening commuting hours, from 6–9 pm. It is least common from 11 pm to 3 am.

Aggravated robbery peaks on Fridays and Saturdays in both communities, and is relatively consistent on other days (Figure 8). Notably, robberies taper off on Sundays (even lower than Mondays) compared to murders, which remain high on both Saturdays and Sundays in both communities (Figure 4).

Figure 5: Murder totals by hour of the day and day of the week, Durbanville, 2006–2018

Day	Hour of the day																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Monday	0	1	1	1	2	0	0	0	1	0	0	0	0	2	1	1	0	0	1	0	0	2	0	0
Tuesday	0	1	0	0	0	1	0	1	1	0	0	2	0	1	1	0	0	0	1	0	0	0	0	2
Wednesday	0	1	2	0	2	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	0	0	1	
Thursday	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2	0	2	1	0	0	2	
Friday	0	0	0	0	2	0	1	2	0	1	0	1	0	0	0	1	0	0	1	0	0	2	1	1
Saturday	2	6	4	5	2	3	0	2	2	1	0	0	1	0	1	1	1	0	3	5	5	1	5	4
Sunday	5	3	4	3	0	2	2	0	0	1	0	0	2	1	1	0	0	2	2	2	2	1	0	2

Note: Higher values are shaded in orange and red, lower values in yellow and blue.

Figure 6: Murder totals by hour of the day and day of the week for Nyanga, 2006–2018

Day	Hour of the day																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Monday	36	27	17	20	17	7	9	17	13	14	6	7	7	5	5	10	8	17	11	15	20	22	20	19
Tuesday	9	11	8	5	2	7	14	13	3	5	4	8	10	9	2	13	10	8	8	15	22	28	13	17
Wednesday	5	5	10	6	13	5	13	4	3	4	7	11	10	1	9	11	6	7	13	20	23	20	17	7
Thursday	8	5	7	8	6	4	6	11	10	5	6	4	8	12	3	6	10	8	10	12	27	27	13	21
Friday	17	8	16	9	8	6	10	8	9	6	9	2	7	7	6	7	13	10	13	21	33	36	36	57
Saturday	60	51	33	29	36	32	36	25	25	13	20	12	11	7	10	22	16	31	30	46	62	85	65	102
Sunday	108	97	70	62	44	33	40	36	36	30	12	16	16	14	16	20	14	28	32	40	61	52	45	41

Note: Higher values are shaded in orange and red, lower values in yellow, grey and blue.

Figure 7: Aggravated robbery by hour of the day, Durbanville and Nyanga, 2006–2018

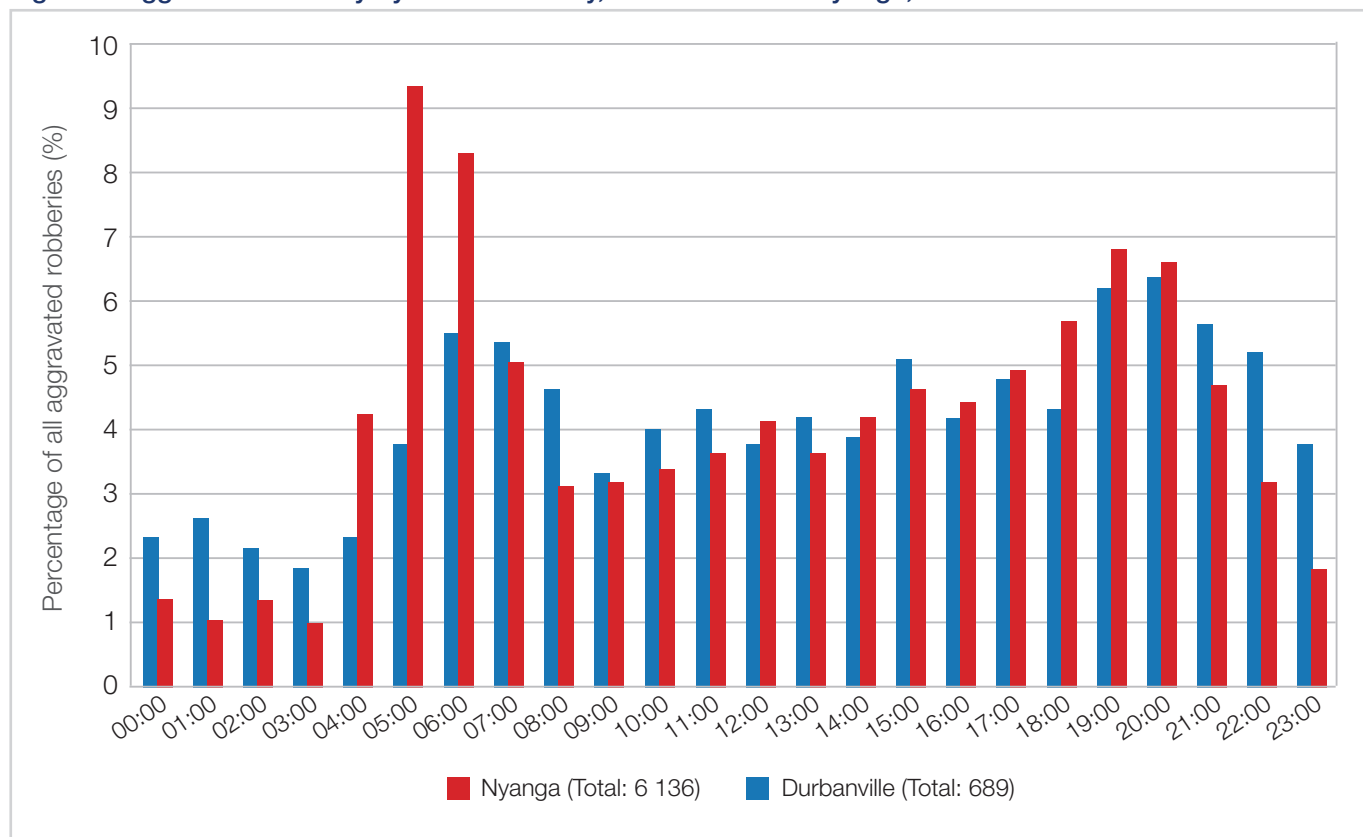


Figure 8: Aggravated robbery by day of week, Durbanville and Nyanga, 2006–2018

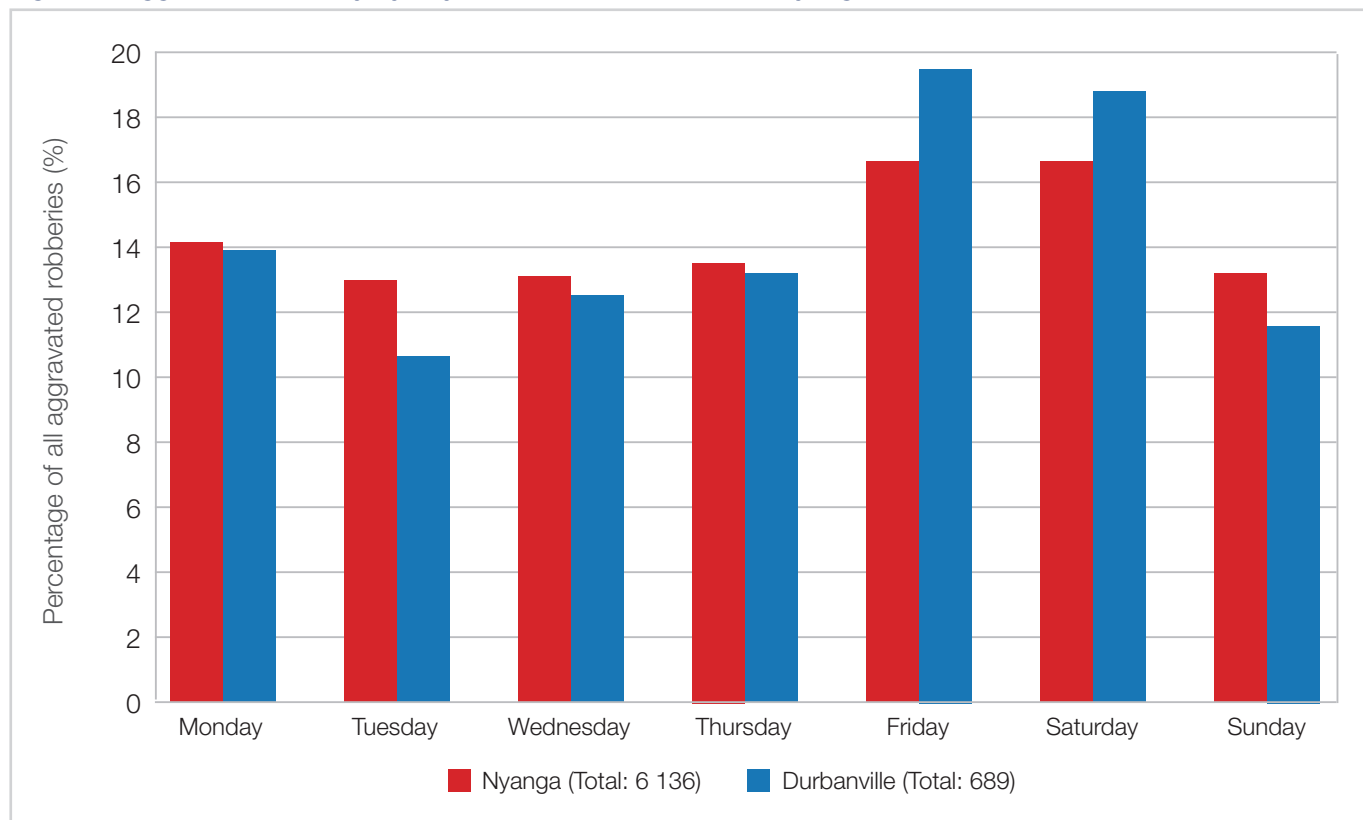


Figure 9: Aggravated robbery totals by hour of day and day of week for Durbanville, 2006–2018

Day	Hour of the day																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Monday	2	3	4	0	0	3	11	5	2	1	7	6	2	6	3	7	3	6	4	7	6	4	2	2
Tuesday	3	1	1	1	1	1	3	4	4	3	4	5	4	6	2	4	1	2	6	6	1	1	6	3
Wednesday	1	1	1	2	1	1	4	3	4	7	7	7	3	6	1	3	2	3	8	2	4	4	4	
Thursday	1	1	1	1	2	3	5	7	6	2	5	5	2	6	3	5	7	3	5	3	4	7	5	2
Friday	1	2	2	4	1	8	3	7	6	5	1	1	7	7	5	12	8	8	5	9	14	7	7	4
Saturday	5	5	5	5	4	8	7	7	6	3	2	5	2	1	5	4	2	10	3	7	11	10	5	7
Sunday	3	5	1	0	7	2	5	4	4	2	2	1	2	0	3	2	5	2	4	3	6	6	7	4

Note: Higher values are shaded in orange and red, lower values in yellow, grey and blue.

Figure 10: Aggravated robbery totals by hour of day and day of the week for Nyanga, 2006–2018

Day	Hour of the day																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Monday	14	12	12	10	46	93	114	62	30	27	32	28	33	27	29	37	37	32	37	55	46	21	22	11
Tuesday	8	6	7	6	33	84	73	51	22	27	31	29	34	30	44	36	35	45	51	43	39	31	16	15
Wednesday	11	7	7	9	31	64	63	37	32	33	34	34	33	41	35	47	28	41	53	47	41	37	19	19
Thursday	11	8	14	9	36	79	73	35	24	25	44	34	40	38	42	46	38	40	46	44	38	32	20	12
Friday	9	10	6	6	28	92	78	48	25	34	28	46	37	40	48	54	60	52	64	94	66	42	38	14
Saturday	18	9	16	10	37	78	58	44	35	24	24	32	48	25	38	49	44	55	48	72	100	80	48	26
Sunday	12	12	23	11	51	84	49	35	25	25	14	19	30	22	23	16	30	37	53	64	76	46	33	15

Note: Higher values are shaded in orange and red, lower values in yellow, grey and blue.

In Durbanville, aggravated robbery increases sharply between 6 am and 8 am every day, particularly on Mondays. It is elevated and consistent from Monday to Thursday, 10 am to 3 pm, and almost every day from 6–9pm. Robberies peak at 3 pm and 8 pm on Fridays, and 5 pm and 8–9 pm on Saturdays.

Again, because there were relatively few robbery incidents across the 12-year period in Durbanville, identifying peak days and hours was potentially problematic. This was not the case in Nyanga (Figure 10).

Murders roughly triple on Saturday and Sunday, tapering into early Monday mornings

There were significantly more aggravated robberies in Nyanga (Figure 10) than Durbanville. As a result, more consistent trends and peaks are evident. Incidents are most common between 5 am and 6 am every day, with peaks on Mondays and Fridays. In the evenings, incidents peak between 6 pm and 8 pm on Fridays,

7 pm and 9 pm on Saturdays, and 7 pm and 8 pm on Sundays.

A total of 17.6% (1 082 events) of all aggravated robberies in Nyanga occur between 5 am and 6 am, with another 13.5% (825 events) between 7 pm and 8 pm.

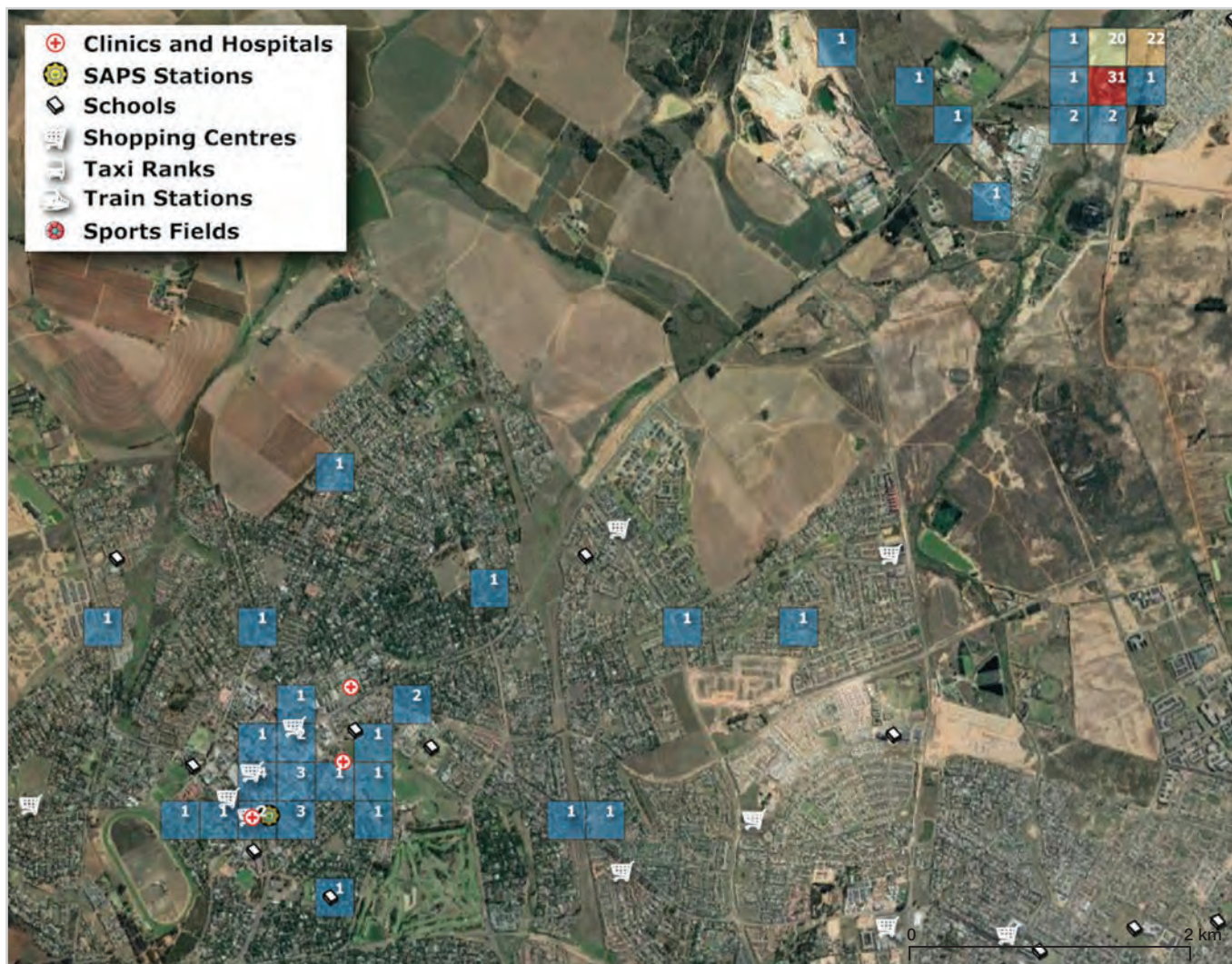
This analysis demonstrates how murder and robbery patterns can be identified relatively simply, particularly in precincts such as Nyanga where the number of incidents is high. Interventions should target the periods and spaces in which offences are most common.

Spatial (space) visualisations

Figure 11 shows two concentrations of murder in Durbanville over the 12-year period. One general, though geographically dispersed, concentration is in the Durbanville CBD, near the police station. This area has a concentration of restaurants, bars, shopping centres, medical centres and other businesses. These may generate environments and targets, such as till points and intoxicated pedestrians, that are susceptible to victimisation.

A second, much higher concentration is seen in the north-east of the precinct, immediately adjacent to

Figure 11: Enlarged view: Durbanville murder incidents binned into 267 m by 267 m block grids, 2006–2018



Note: The number of incidents appears in each cell. Higher value cells are shaded in yellow, orange and red, lower values in blue.

the Fisantekraal township, train station and informal settlement. Notably, Fisantekraal township itself lies within the adjacent Kraaifontein police precinct – a relatively high-crime precinct that recorded 1 547 murders from 2006–2018.⁵³ The Fisantekraal sub-place also belongs to the Kraaifontein census main place, not Durbanville.

17.6% of all aggravated robberies in Nyanga occur between 5 am and 6 am

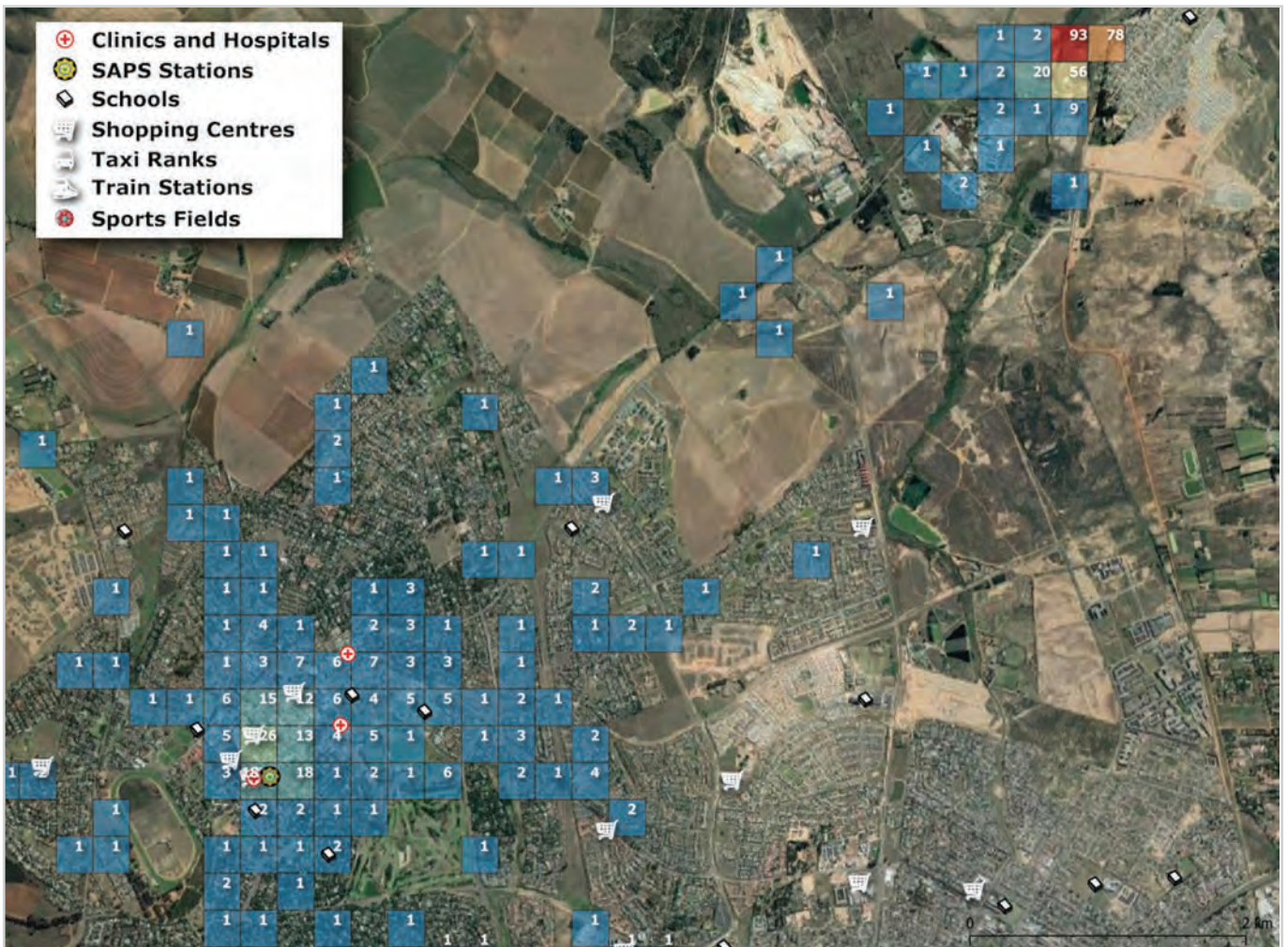
Thus, the location of this concentration suggests that a portion of Fisantekraal’s crime is recorded by, or spills over to, the SAPS Durbanville police. This highlights the complexity of policing a small, relatively poor and

high-crime ‘border community’ in an otherwise affluent precinct, as well as interpreting community-level crime statistics without space data.

In the aggravated robbery grid for Durbanville (Figure 12), the same two concentrations appear: in the Durbanville CBD and next to Fisantekraal township in the upper right portion of the map. Levels are much higher and more concentrated near Fisantekraal. Shopping centres in the Durbanville CBD may account for the robbery concentration, while the Fisantekraal train station and the township itself appear to be high-crime areas. Other than these two areas, incidents are very low, especially when compared to Nyanga.

The Nyanga murder grid (Figure 13) reveals that although murder has occurred in almost every part

Figure 12: Enlarged view: Durbanville 12-year aggravated robbery incidents binned into 267 m by 267 m block grids, 2006–2018



Note: Higher value cells are shaded in yellow, orange and red, lower values in blue.

of the precinct, it is most concentrated in five areas. Some of these are in individual blocks just 267 m in length, and others in groups of three to six blocks approximately 1 km in length. It is possible that concentrations along roads, railways or paths may not emerge clearly in this visualisation.

The two highest concentrations (91 and 131 murders) are found in the Brown's Farm section, adjacent to an undeveloped green space to the east, bordered by Sheffield Road to the north and Msingizane Street to the south. The area is predominantly residential and includes an informal settlement to the west. Most formal dwellings have multiple backyard shacks, so that the area is densely populated.

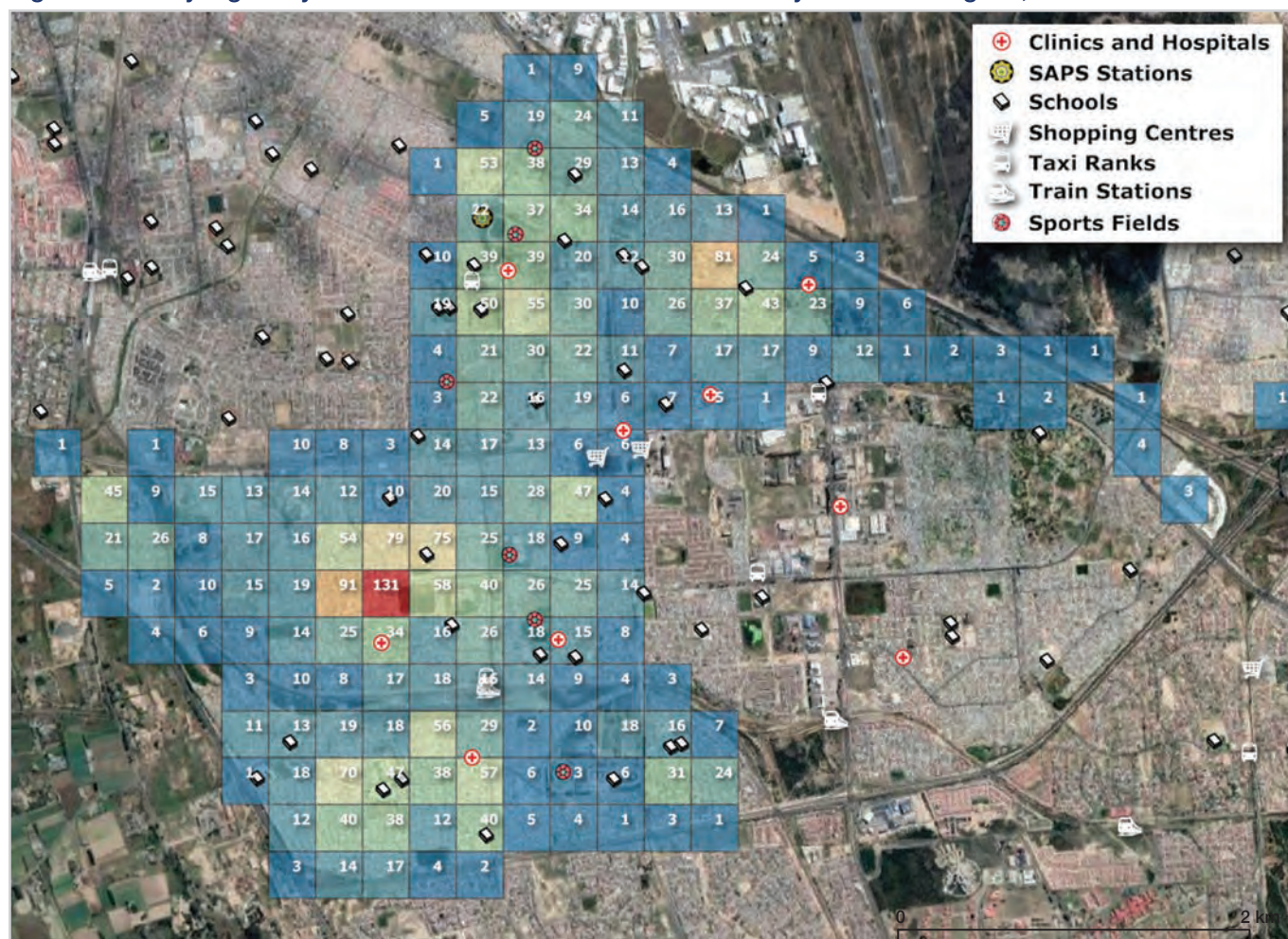
The third-highest murder concentration (81 murders) is in a formal residential section of Crossroads, east

of Nyanga main place, near Sigcawu Primary School on Klipfontein Road. Apart from the primary school (of which there are many in the precinct) there are again few indicators from the built environment that may explain elevated murder levels in just 267 m by 267 m square.

While many murders occur across the Nyanga police precinct, two aspects become apparent at this level of analysis: higher murder concentrations appear outside of the Nyanga main place boundaries (leading to popular confusion about the supposed 'murder capital of South Africa' and the potential for misplaced interventions and resources), and violent crime hotspots (if correctly geolocated) are not easily explained by the built environment.

A more detailed space and time analysis is required to better understand where and when violent crime peaks in

Figure 13: All Nyanga 12-year murder incidents binned into 267 m by 267 m block grids, 2006–2018



Note: Higher value cells are shaded in yellow, orange and red, lower values in green and blue.

Nyanga. Nevertheless, when murder is this concentrated in space, police and other government officials should be able to reduce it.

Like murder, aggravated robbery occurs throughout the Nyanga precinct (Figure 14) but is most concentrated in particular areas, including the five where murder is most common. The 267-m block with the most robberies (233 robberies with five adjacent high-level blocks) is the same high-murder block in Brown’s Farm seen in Figure 5. This suggests extremely high levels of concentrated violence.

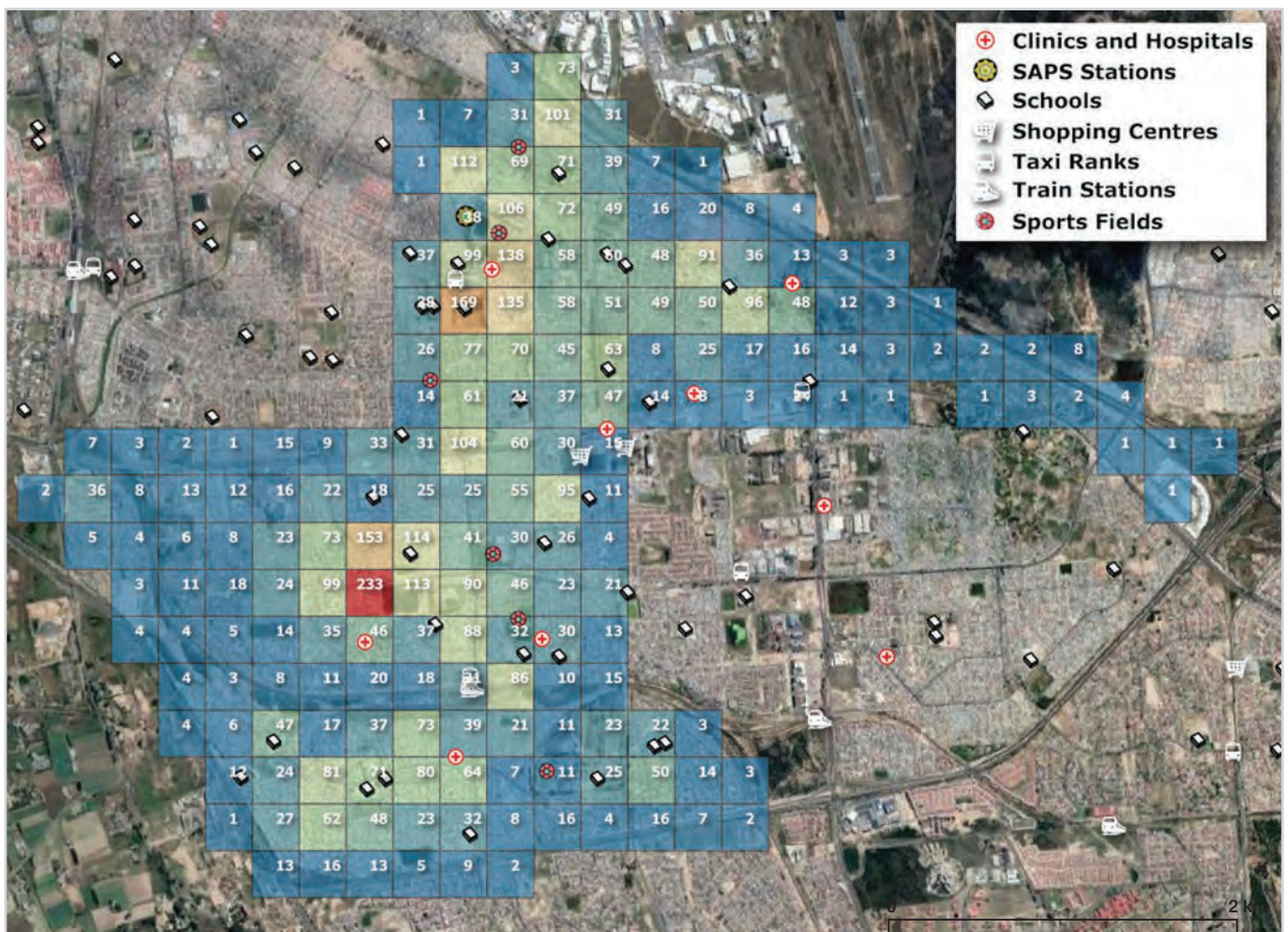
Another area of concentrated robberies is next to the Nyanga police station and taxi rank. There is some indication that adjacent high-robbery blocks may follow main roads, such as Emms Drive (heading south from the police station and taxi rank) and Sithandatu Avenue (heading east from the taxi rank).

Identification and analysis of hotspots

The figures discussed thus far hint at a number of hotspots in need of more detailed analysis. In Durbanville there are two clear hotspots – in the CBD and adjacent to Fisantekraal township (Figure 11). Due to the much greater levels and dispersion of crime in Nyanga, we used a method known as f-mode analyses to identify hotspots, with a focus on murders in that precinct.⁵⁴ With this method, the number of murders within a particular radius is added up. Any analysis points with fewer than a select number of murders are removed, revealing only those areas with very high concentrations.

In our analysis, we used radii of 50, 100 and 200 m around each analysis point. The minimum number of murders was incrementally increased, with the most meaningful visualisations found at thresholds of 20, 30 and 80 incidents, respectively.

Figure 14: All Nyanga 12-year aggravated robbery incidents binned into 267 m by 267 m block grids, 2006–2018



Note: Higher value cells are shaded in yellow, orange and red, lower values in green and blue.

Figure 15 shows all murder crime points in Nyanga that have 80 or more murder incidents occurring within a 200 m radius of those points. Five concentrations are apparent.

From these hotspot concentrations, outline shapes were manually drawn to include all points with a frequency of 80 or more incidents that were close enough together to be grouped as a single hotspot. We also identified three street corridors with high crime concentrations, although these oblong shapes are not as easily identified through hotspot analyses based upon centre points. The street hotspots were drawn by manually identifying and enclosing incidents that were not separated from the road by a barrier such as a fence or wall.

With hotspots identified in both Durbanville and Nyanga, we combined place, day and time data to better

understand crime patterns in each space. Figure 16 shows the location of the two Durbanville hotspots.

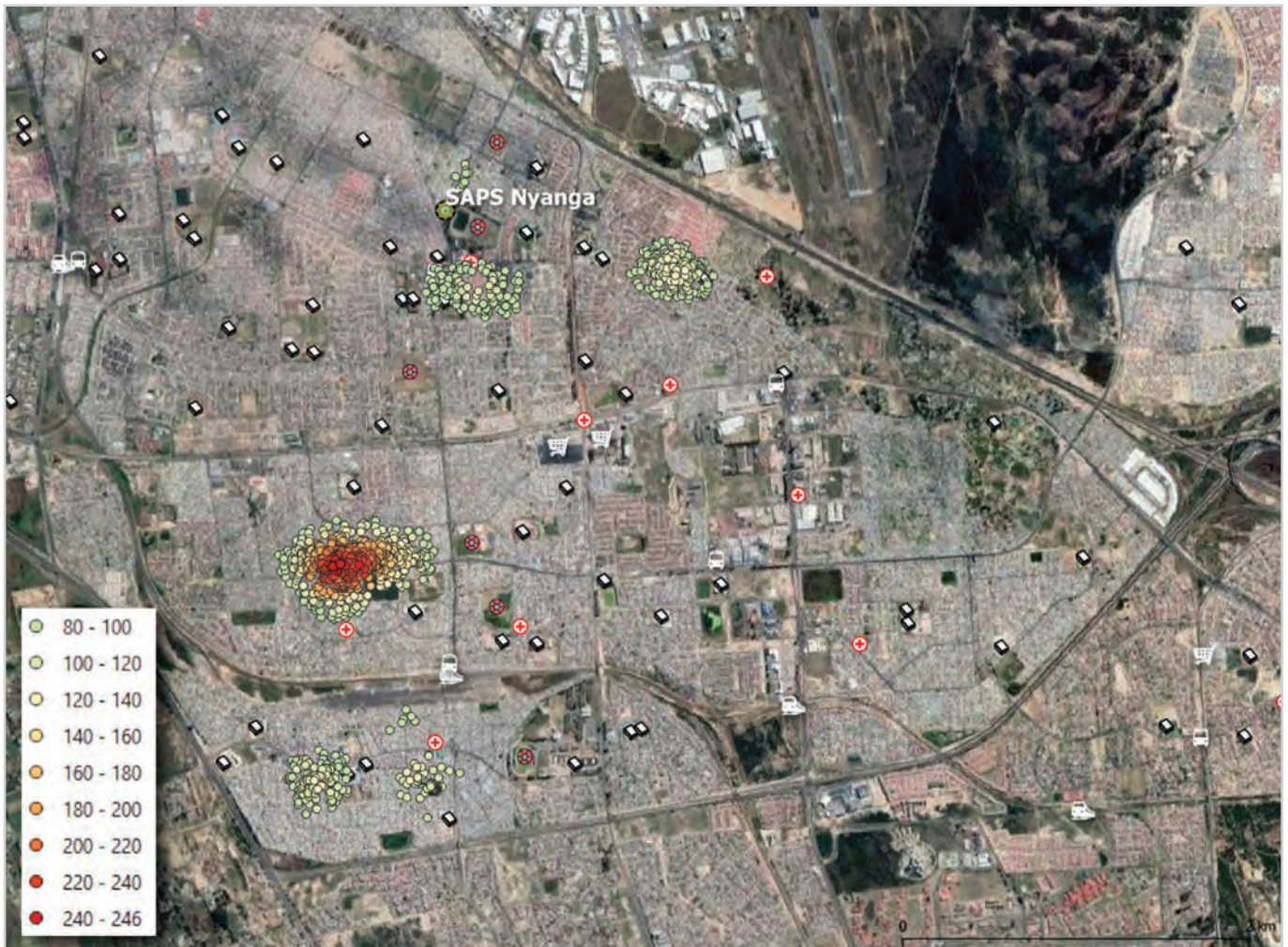
Durbanville hotspot #2

Figure 16 is a detailed examination of the two Durbanville hotspots. The CBD hotspot (#2, Figure 18) is quite large – 0.61 km² – and accounts for 11% of all murders in the precinct over the 12-year period and 19% of all aggravated robberies.

Spatially, murders are dispersed throughout the hotspot. Aggravated robberies are relatively dispersed but cluster near shopping centres and commercial buildings. Notably, Vrede Street/R302 to the east of the shopping centres accounts for much of the crime in the hotspot.

Murders in the area occur throughout the day and are most common on Saturdays, followed by Fridays.

Figure 15: F-mode hotspot identification for murders in Nyanga, set at 80 incidents within 200 m radii, 2006–2018



Aggravated robberies reveal no time-of-day or day-of-the-week trends, meaning there are no clear peaks to target.

The hotspot experienced steep increases in robberies and murders from 2012 to 2018, suggesting a growing crime problem in the hotspot. In such instances, a more general crime awareness and prevention programme may help to improve vigilance and harden targets.

Durbanville hotspot #1

The second Durbanville hotspot (#1 in Figure 16, Figure 17), next to the Fisantekraal train station and township, accounts for 52% of all murders and 30% of all aggravated robberies in the precinct. At 0.087km², it is only 14% the size of the first hotspot. This suggests targeted intervention should work in the area.

Examining the hotspot reveals an acute crime point at the very top, on the main roadway (R312) near the railway overpass. With no immediately apparent features to explain this, it is possible that the location is used by police as a reference point for crimes happening along a broader stretch of roadway and/or near the train station, train tracks, or pedestrian paths over or under the road.

A second concentration is seen near the R312 off-ramp to an agri-processing facility (the large buildings in the lower half of the hotspot). While it is possible that this business is a crime generator, it seems unlikely to produce high-value goods, store large amounts of cash, or have a flow of ‘easy-target’ customers. Thus, it is likely that police use the business as the general reference point for crimes in the greater area.

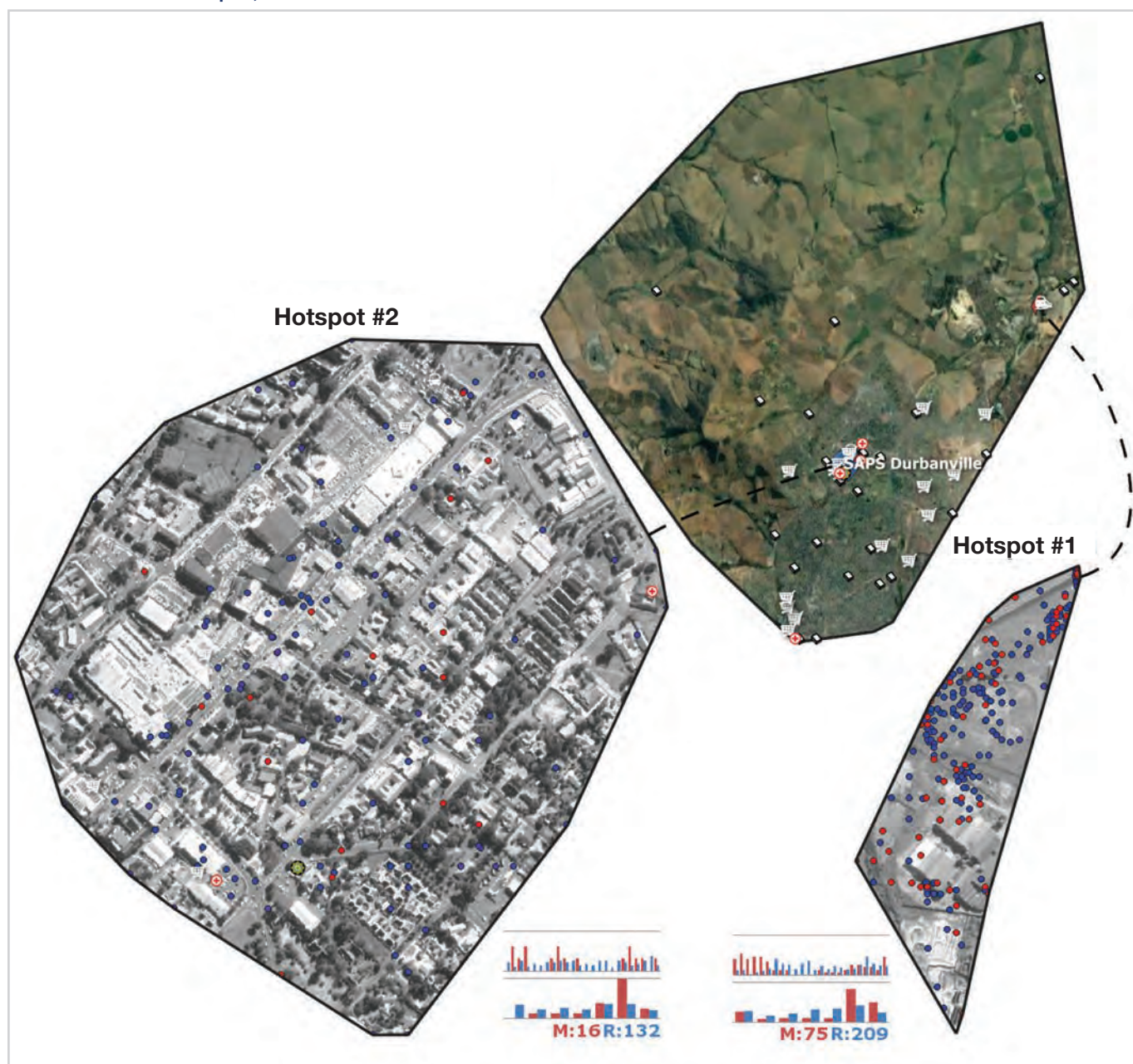
If this is the case, it renders the data less useful than it should be to police and government authorities. Notably, no crimes are recorded along the train tracks or at the train station, though these would seem more likely crime generators.

While the Fisantekraal train station and township fall under the Kraaifontein police jurisdiction, crime occurring along the tracks and attacks on victims using the paths across the tracks may fall into a jurisdictional ‘no-man’s land’,

with crimes not accurately recorded in space. This could hamper police intervention in the area.

Murders in this hotspot are moderately focused by time of day, with peaks between 11 pm and 4 am, and without any murders recorded between 9 am and 11 am throughout the period. Murder is most common on Saturdays and Sundays, followed by Mondays, suggesting a weekend, night-time phenomenon, potentially related to alcohol and open spaces with poor surveillance.

Figure 16: Composite hotspot visualisation for Durbanville with time of day/day of week crime signatures for each hotspot, 2006–2018



Note: Blue dots and graphs denote aggravated robberies (R). Red dots and graphs denote murders (M).

Figure 17: Durbanville-Fisantekraal hotspot #1

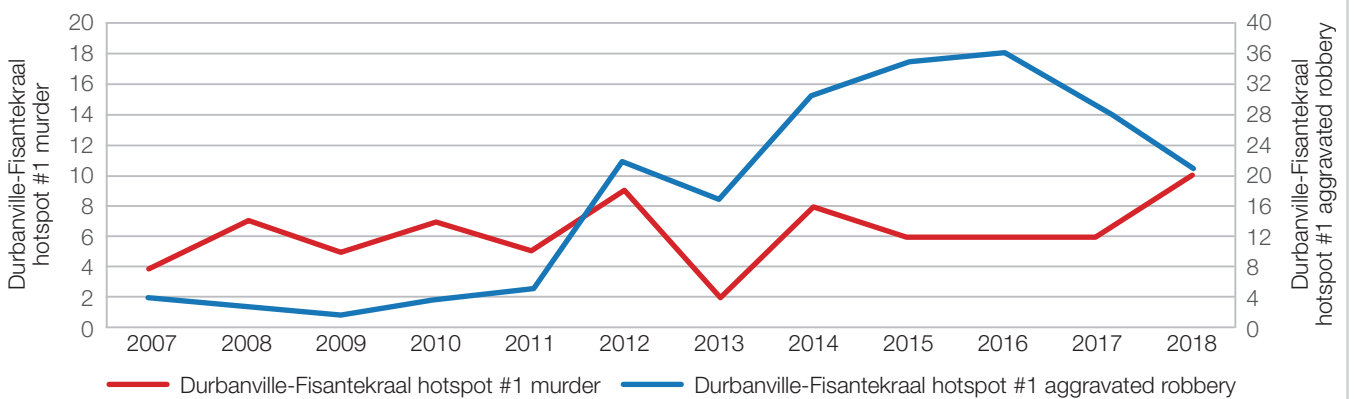
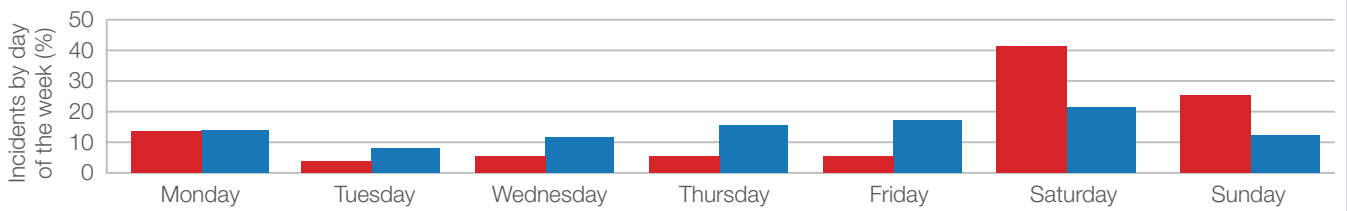
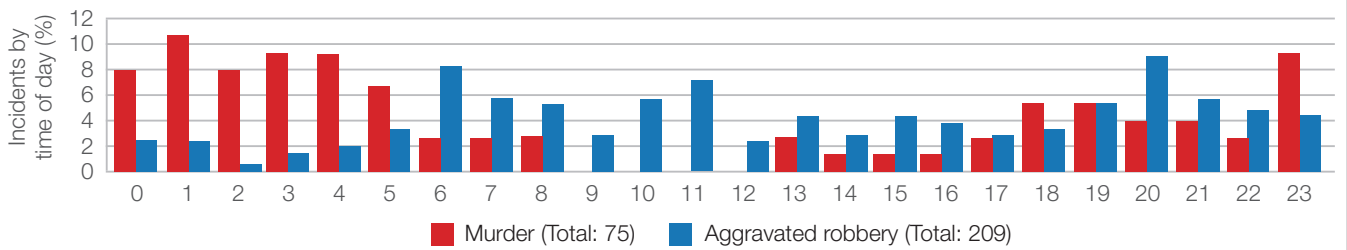
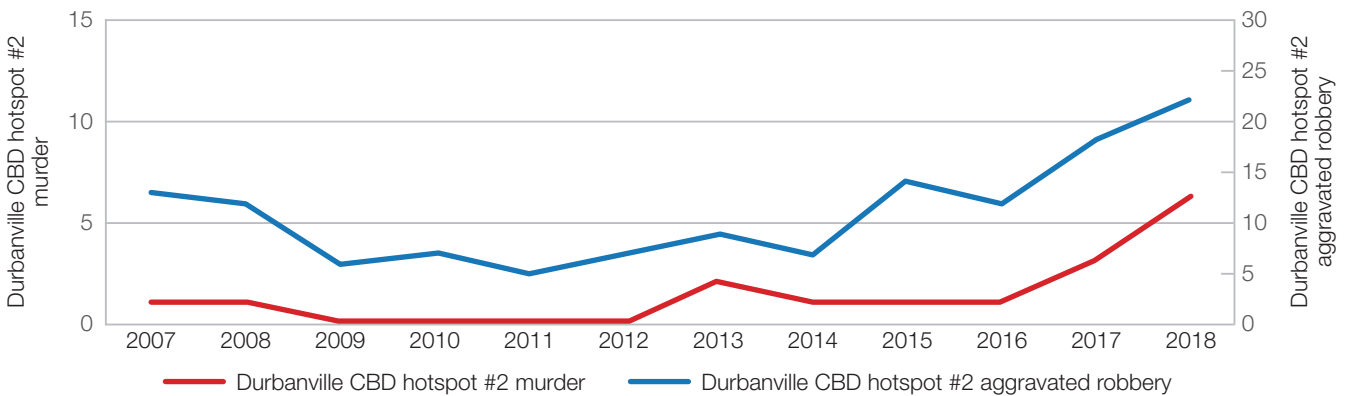
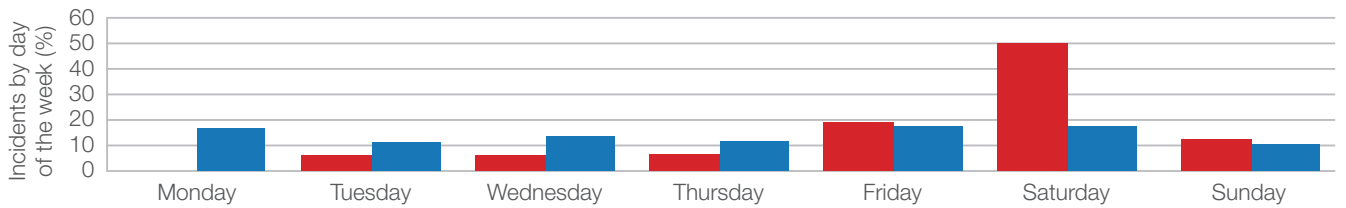
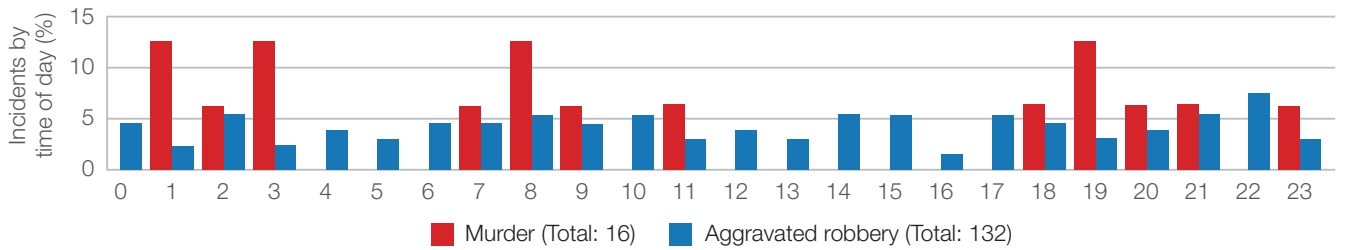
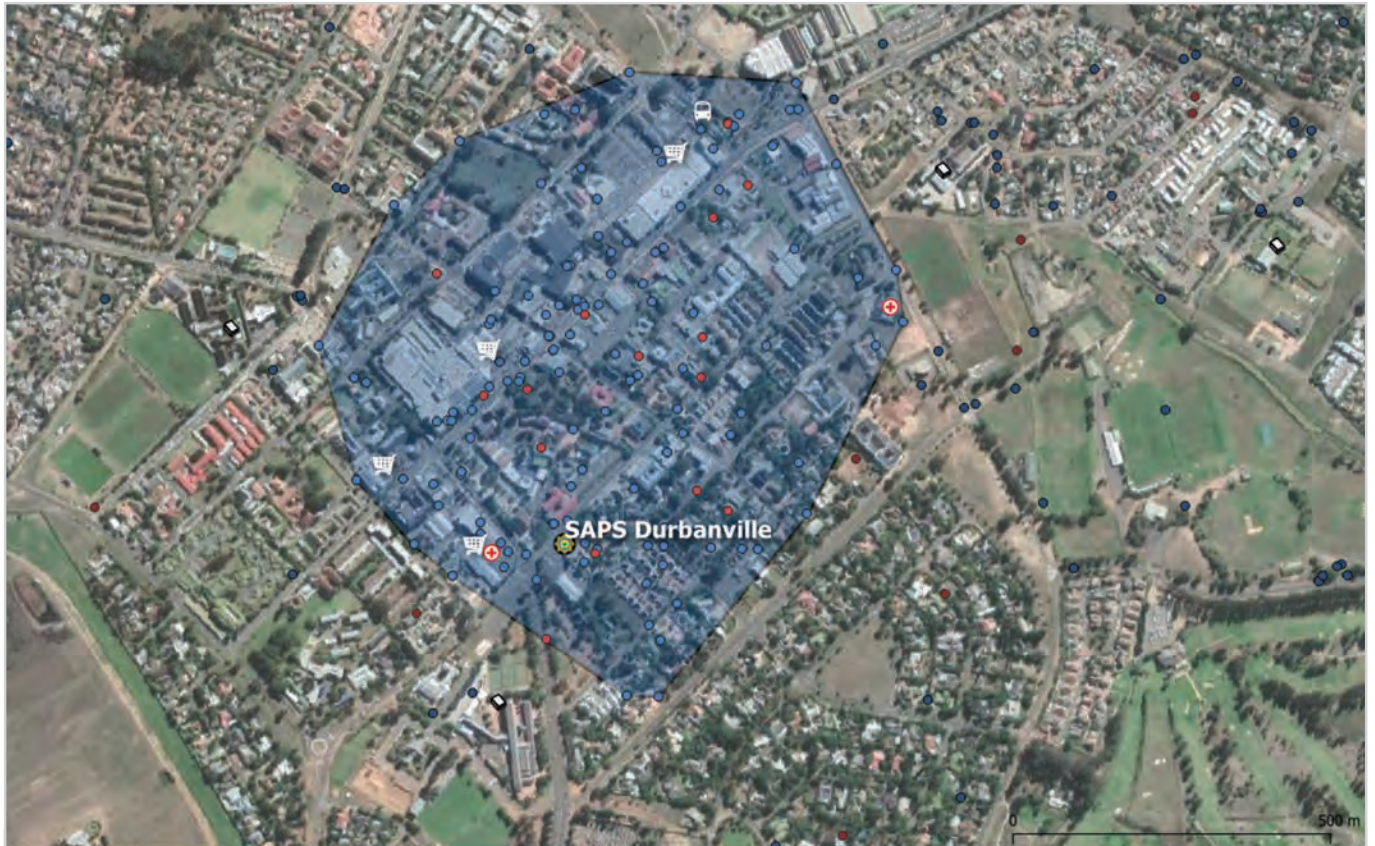


Figure 18: Durbanville CBD hotspot #2



Aggravated robberies are less predictable, with peaks from 6–8 am (potential commuting hours), 10–11 am and 7–9 pm. Robberies peak slightly on Saturdays.

This hotspot recorded relatively few crimes in 2007 but subsequently saw increases in both murders (peaking in 2016) and robberies (peaking in 2018). This suggests an increasing crime problem in need of police intervention.

Overall, this small area accounts for nearly half of all violent crime in the Durbanville precinct. Although lack of predictability can hamper police intervention, the fact that violence appears so localised means police and other authorities should be able to stem it in the area.

We identified eight hotspots in Nyanga (Figure 19), five of which were prominent in F-mode analysis (#1 to #5). Hotspots #6 to #8 are street corridors identified through visual inspection. The eight hotspots account for 20% (n=638) of Nyanga’s murders and 19% (n=1 134) of aggravated robberies. Considered in relation to their geographic size, these figures are staggering. Each hotspot is described in detail below.

Nyanga hotspot #1

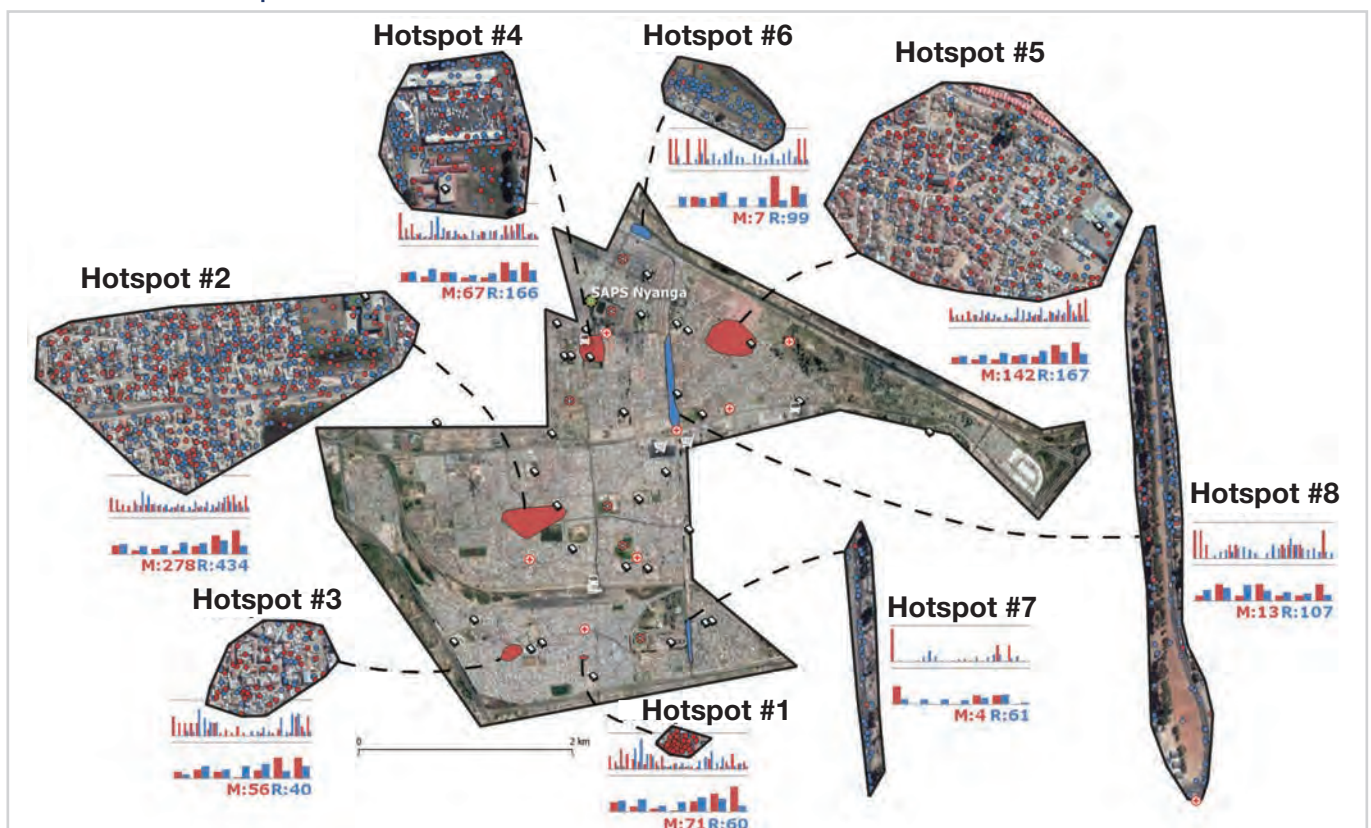
Nyanga’s hotspot #1 (Figure 20) covers just 0.0025km² but accounts for 71 murders (2.2% of all murders) and 60 aggravated robberies (1% of the total). The hotspot is a dense residential area in Samora Machel, north of Samora Machel Primary School and encompassing a cul-de-sac off Jameson Mngomezulu Street.

Incidents appear concentrated on just five or six dwellings on the corner of the cul-de-sac, suggesting a highly improbable hot point of murders and aggravated robberies.

With no obvious crime generators or attractors (unless there are illegal alcohol outlets in one or more of the dwellings), it is again unclear why so many violent crimes are geo-referenced to this precise location. The data is either incorrectly recorded or police have failed to address very localised and obvious generators of lethal violence not visible through our analysis.

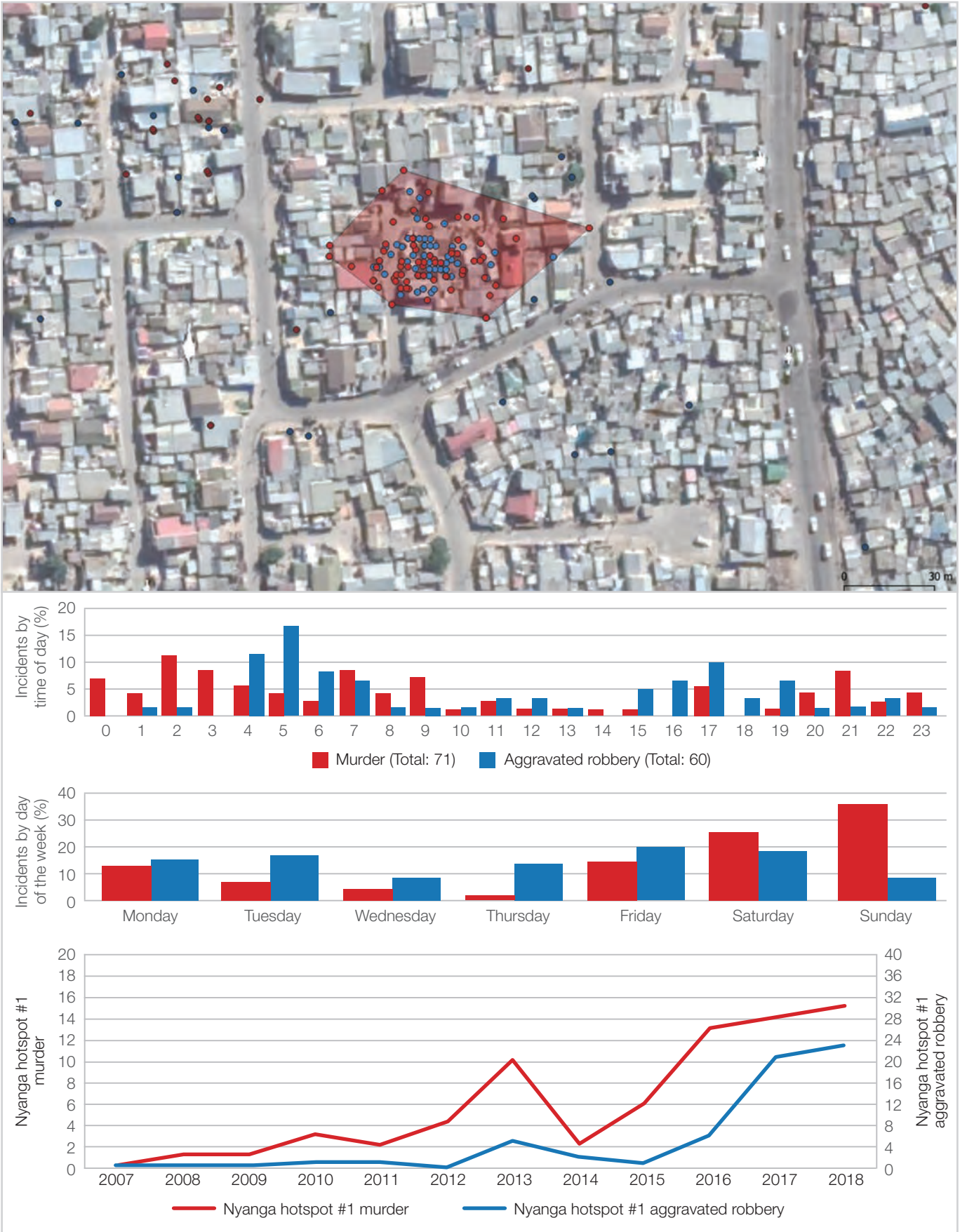
Analysed by time, murders in the hotspot are generally dispersed with peaks at 2–3 am, 7–9 am and 8–9 pm.

Figure 19: Composite hotspot visualisation for Nyanga with time of day/day of week crime signatures for each hotspot



Note: Blue dots and graphs denote aggravated robberies (R). Red dots and graphs denote murders (M), 2006–2018.

Figure 20: Nyanga murder/robbery hotspot #1



They are most common on Sundays, followed by Saturdays, Fridays and Mondays. Aggravated robberies in the area are most common from 4–6 am and 3–5 pm.

This hotspot recorded relatively few murders and robberies until 2010 and 2013 respectively. Both crimes surged again from 2015, forming an acute hotspot. Again, if this crime data is correct, police should be able to address the violence relatively simply.

Nyanga hotspot #2

Nyanga hotspot #2 (Figure 21) is one of the largest, covering 0.12km². It accounts for 8.6% (n=278) of all murders and 7.1% (n=434) of aggravated robberies. It is residential, situated around the intersection of Sheffield Drive and Link Road in Brown's Farm. It includes Intsebensiswano High School to the east. Although the school may generate some crime, one would expect more incidents around the school than within its grounds, where activities are more regulated.

Although some crimes are recorded in the street, most cover the entire hotspot. The area has a mixture of formal houses, including what appear to be detached hostel units, and backyard shacks. There are informal areas to the east and north-east of the hotspot, and a large informal area to the west – all of which appear to have much higher housing densities but far fewer crimes. This suggests that police may use the school and/or the Link Road/Sheffield Drive intersection as the reference point for crimes occurring in the general vicinity, significantly reducing the value of the data.

Both murders and aggravated robberies in the hotspot are relatively dispersed in time. Murders peak from 8 pm to 1 am, especially on Sundays and Saturdays. Aggravated robberies occur throughout the week and day but peak on Saturdays and from 5–6 am and at 7 pm.

Murder and robbery peaked in the hotspot in 2008, followed by intermittent declines and increases. Data for 2015–2017 suggests it is increasing again.

If data for this hotspot is accurate, police and city officials should be able to do something about it. This could be achieved through the policing strategies outlined earlier, as well as through active and passive surveillance, street lighting and school security. However, the accuracy of

the space data would need to be confirmed, alongside an exploration of why adjacent informal areas appear to record relatively little crime.

Nyanga hotspot #3

Hotspot #3 (Figure 22) covers just 0.02km² and accounts for 1.7% (n=56) of murders and 0.7% (n=40) of aggravated robberies. It is situated in Samora Machel, just west of Weltevreden Valley Primary School and south-west of Zisukhanyo Secondary School. Its northern edge borders Oliver Tambo Drive.

Both murders and aggravated robberies are relatively dispersed, with some concentrations along Oliver Tambo Drive and the intersection of Moses Mabida Crescent and Michael Mapongwana to the south.

If this data is correct, police should be able to address extreme flashpoints

Like hotspot #2, the area is primarily residential with a combination of formal units and backyard shacks. The north-eastern point of the hotspot is a traffic circle at the intersection of Oliver Tambo Drive and Robert Sobukwe. This suggests another possible landmark to which police geo-reference surrounding crime.

Both school grounds, although beyond the hotspot boundary, show murders and aggravated robberies at school buildings and sports fields. It is possible that the schools generate some crime, but one would have expected that this could be stemmed – especially with more than 10 murders.

Given that the two schools are the most prominent features in the built environment, further investigation of the nature of the crimes, victims and perpetrators (problem-oriented policing) could provide the missing information necessary to address the problem.

Murders in the hotspot occur throughout the day, with peaks at 9 pm, between 11 pm and 1 am, and on Saturdays and Sundays. Aggravated robberies are more focused in time with peaks from 4–7 am, at 6 pm, and from 8–9 pm. They occur throughout the week but peak on Fridays, Sundays and Thursdays.

Figure 21: Nyanga murder/robbery hotspot #2

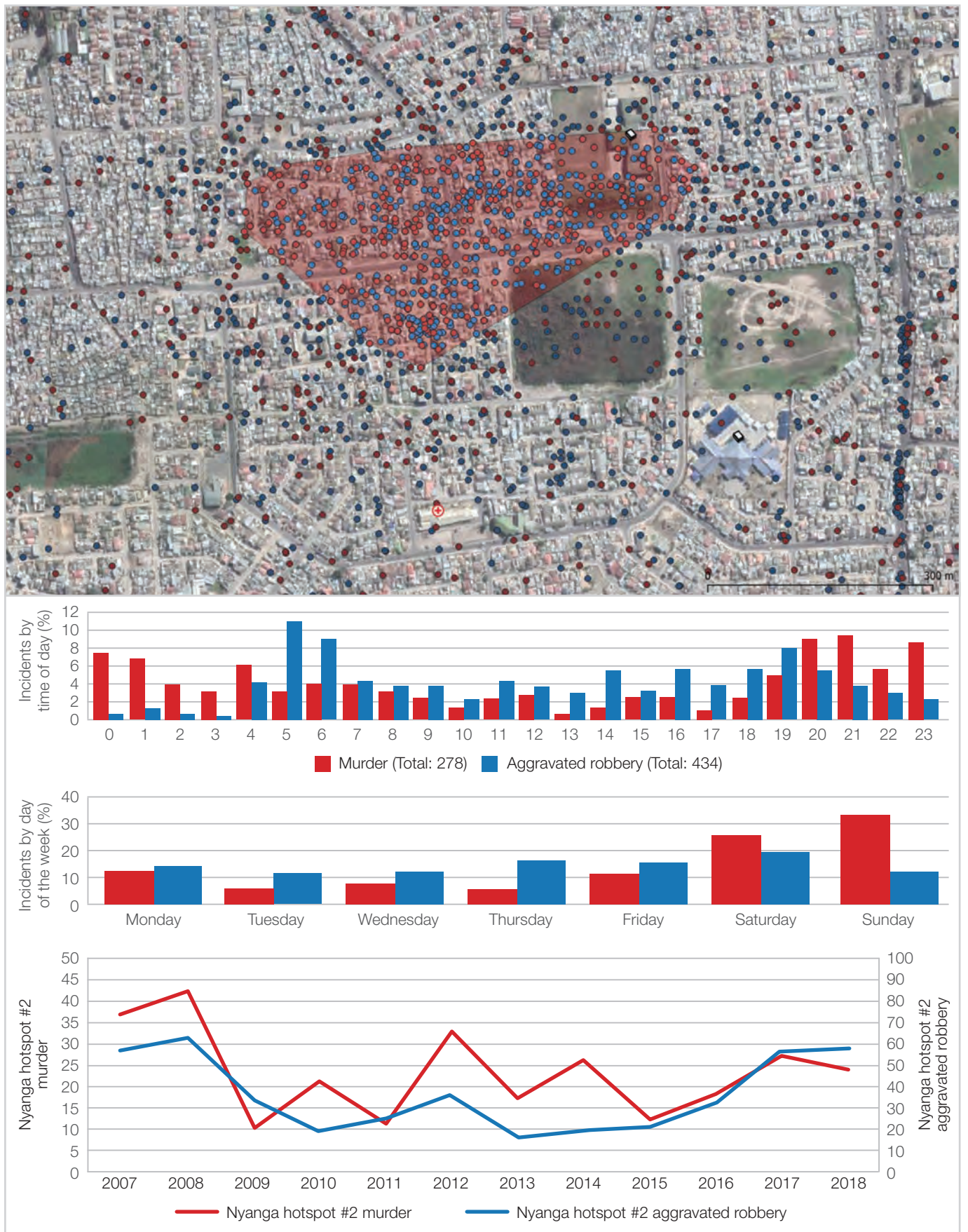
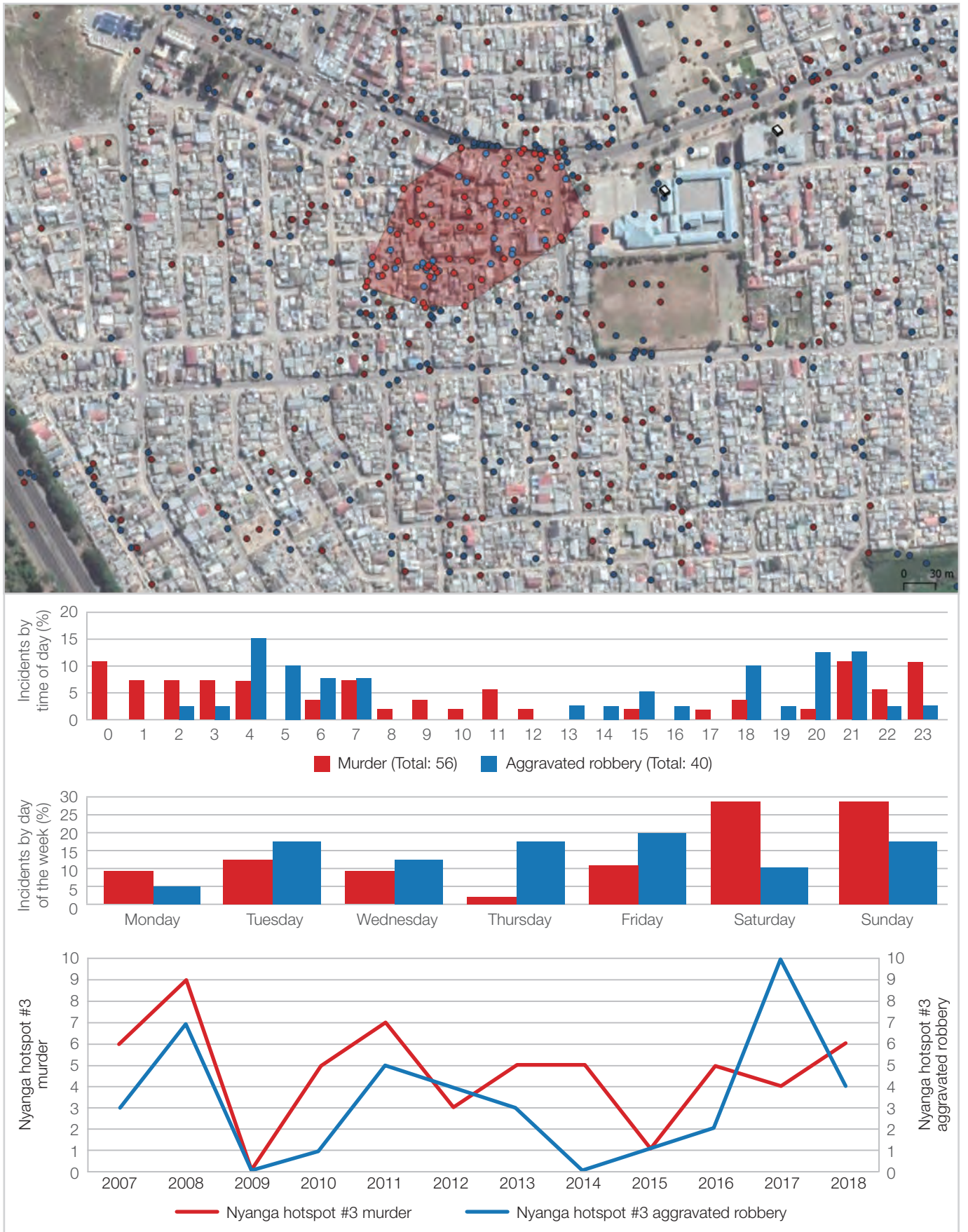


Figure 22: Nyanga murder/robbery hotspot #3



Hotspot #3 saw murder and robbery peaks in 2008, followed by intermittent declines and increases. Robbery peaked in 2017 and murder increased in 2015 and 2017. This suggests a hotspot that cooled off – perhaps due to police intervention – and became hot again.

Aside from confirming the accuracy of the data (in this case, there are no apparent adjacent informal settlements), activity along the main roads and the school–community interface could be points for police intervention.

Nyanga hotspot #4

This hotspot (Figure 23) covers 0.05km² and accounts for 2.1% (n=67) of all murders and 2.7% (n=166) of aggravated robberies. It is situated in the centre of the Nyanga main place and encompasses the main Nyanga taxi rank along Terminus Road/Sithandatu Avenue between Emms Drive and Sithandatu Street.

The hotspot includes the taxi rank, adjacent hawker stalls and small businesses and Oscar Mpetha High School to the south. There are three other schools in the immediate vicinity, as well as a medical clinic (the Nyanga Community Health Centre). The Nyanga police station is situated approximately 200 m to the north.

Murders and aggravated robberies are dispersed across the hotspot (and into the surrounding areas), with concentrations along the roads and storefronts. There is a robbery concentration in the western portion of the hotspot near the T-junction of Emms Drive and the southern border of the taxi rank. The dispersion in space suggests the crime-generating effects of a busy transportation hub with surrounding commercial activity, despite the nearby police station.

Murders peak between midnight and 2 am and again from 6–8 pm, and on Saturdays and Sundays. Given the hotspot's location in central Nyanga, there are likely nearby drinking establishments that attract weekend activity (and crime). While the taxi rank itself may be largely inactive in the late night/very early morning hours, the area may still attract criminal elements.

Aggravated robberies occur throughout the day and week, but peak from 5–6 in the mornings (likely commuting hours) and around 7–8 pm, and on Tuesdays, Saturdays and Sundays. This hotspot saw murders and

robberies peak in 2015, followed by a decline. However, robberies increased threefold from 2012, peaking in 2018, suggesting a diverging trend: an increasing robbery hotspot and a cooling murder hotspot.

Overall, this hotspot seems clearly linked with the built environment and the movement of people and commerce. Policing during commuting times and hourly, random visits by police, as well as passive surveillance (e.g. CCTV cameras) and adequate street lighting could help to deter some criminal activities. The fact that this hotspot lies just 200 m from the police station suggests that only highly targeted policing is likely to deter offenders.

Nyanga hotspot #5

Hotspot #5 (Figure 24) is 0.12 km² and accounts for 4.4% (n=142 murders) of murders and 2.7% (n=167) of aggravated robberies in Nyanga. It is situated in Crossroads, is bordered by Klipfontein Road to the north and sits about 300 m south of the N2 and the Cape Town Airport industrial area. The hotspot includes Sigcawu Primary School to the west. Aside from the school, the area is comprised of small formal houses with backyard shacks.

The fact that this hotspot is 200 m from the police station suggests that only targeted policing will deter offenders

Both murders and aggravated robberies are highly dispersed, with few crimes on the school grounds. No roads or intersections attract high crime, other than a small cluster in the western central region at the intersection of Joyce Ndisana and Hani streets. It is notable that these two streets are prominently curved in what appears to be a carefully developed area incorporating streets and housing.

Murders in the hotspot are highly focused between 8 pm and midnight, surging on Saturdays and Sundays. This suggests the possibility of night-time, high-risk activities in the vicinity. Aggravated robberies occur throughout the day, peaking from 11 am to 1 pm and at 8 pm. Fridays, Saturdays and Sundays produce more robberies but robbery is common throughout the week. The

Figure 23: Nyanga murder/robbery hotspot #4

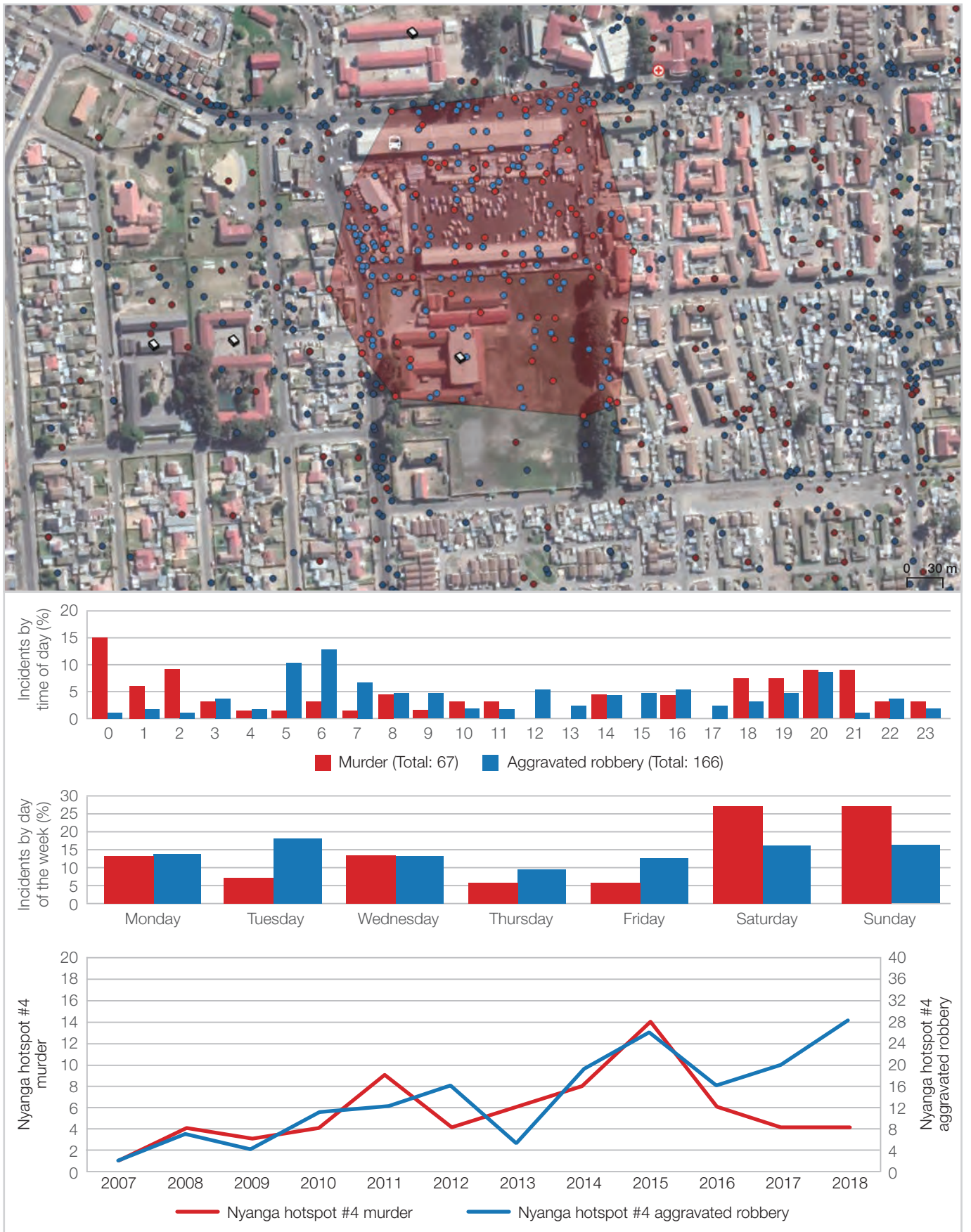
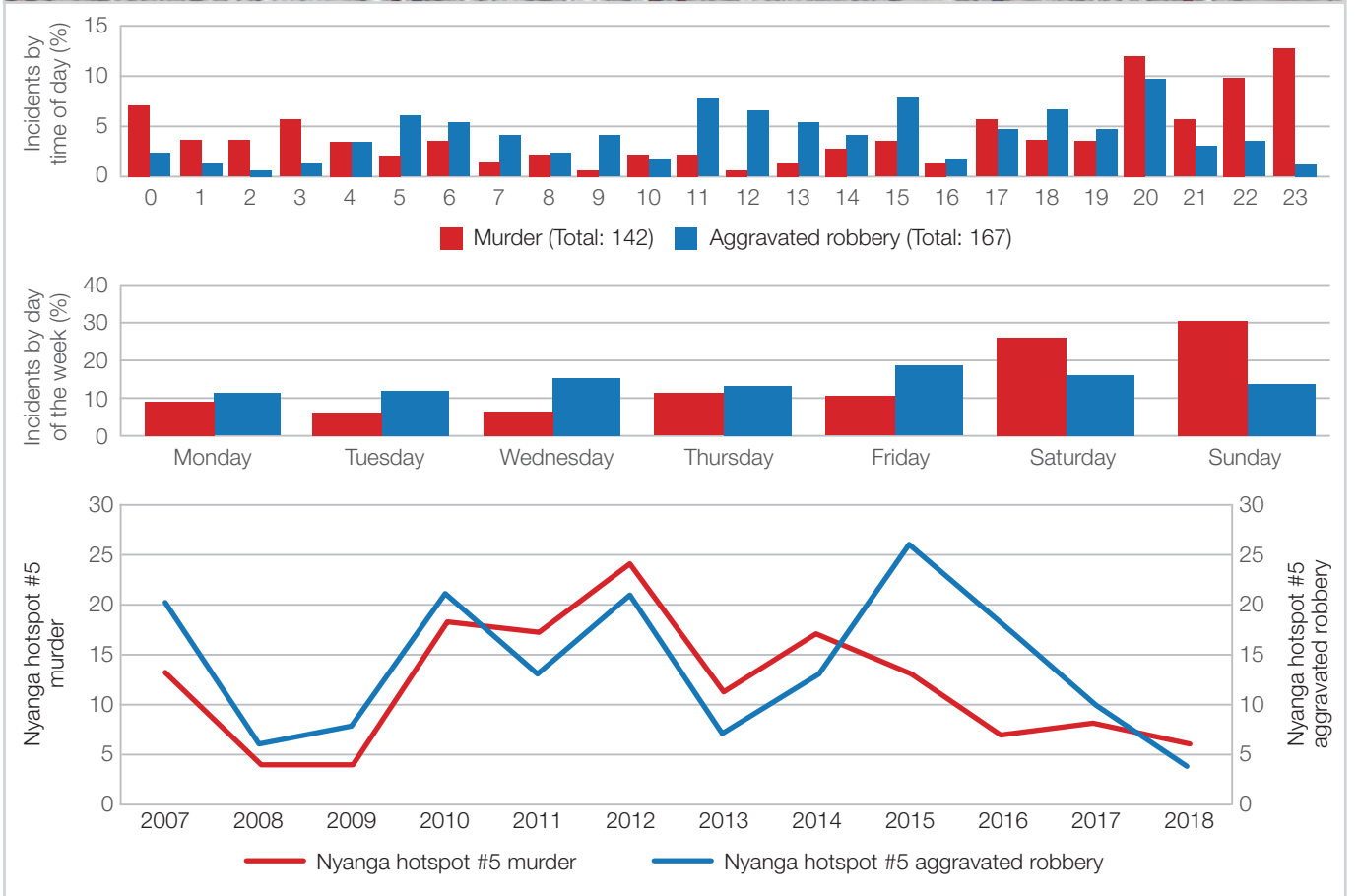
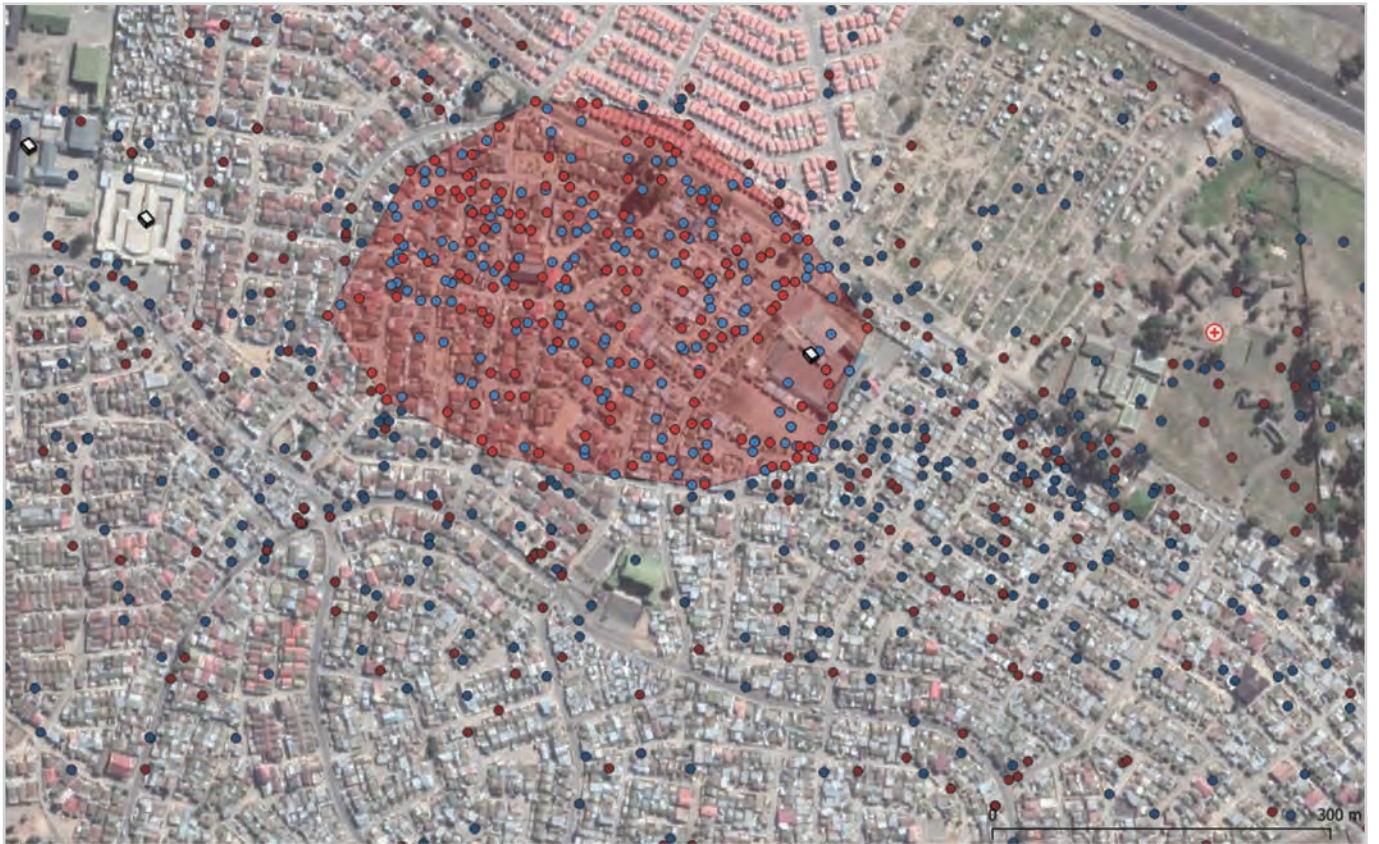


Figure 24: Nyanga murder/robbery hotspot #5



area experienced a murder peak in 2012 and a robbery peak in 2015, followed by declines through 2018, suggesting that the hotspot may be 'cooling off'.

Overall, this area appears, on the surface, to be a 'well-designed' residential community with relatively little informality or over-crowding. This makes its high crime incidence befuddling. A more localised, problem-oriented study would be required to ascertain the nature of violent crime, victims and perpetrators in the area to find appropriate interventions.

Measures that could improve community surveillance (block watches, community policing forums, etc.) might be appropriate, if not already in place.⁵⁵

Nyanga hotspot #6

Nyanga hotspot #6 (Figure 25) is an aggravated robbery hotspot that we identified manually. It is 0.02km² and accounts for just 0.2% (n=7) of all murders, but 1.6% (n=99) of aggravated robberies. It follows the N2 westbound off-ramp to the M22/Ntlangano Crescent, which marks the busiest road entrance to Nyanga. It is bordered on the north by the N2 and on the south by a long informal settlement stretch between the N2 and Klipfontein Road/M18.

Increased active and passive surveillance could help deter robberies, and a change in road design so drivers needn't stop may also help

The hotspot includes the highway off-ramp and bordering areas, green space between the N2 and the off-ramp, and the very dense informal settlement. Crime incidents increase approaching the intersection, probably as vehicles slow down and stop. There is less clustering at the intersection itself and no incidents on the other side of the intersection, at the highway on-ramp. This suggests a specific crime pattern along a vehicular crime hotspot.

Due to the low number of murders in the hotspot (n=7), time analysis is mute, though there is a trend towards weekend nights and early mornings. Aggravated robberies occur throughout the day and week, with intermittent spikes. Robberies in the hotspot increased from 2015, especially in 2016 and 2017. In sum, this appears to be a very clearly defined aggravated robbery hot point.

Increased active and passive surveillance could help to deter robberies and/or aid investigations, while a change in road design so that drivers need not stop may largely neutralise the problem. It is possible that a small number of offenders target robberies in this hotspot, in which case a focused-deterrence intervention could be effective.



NYANGA'S HIGHWAY
OFF-RAMP IS A
ROBBERY HOTSPOT

Figure 25: Nyanga robbery hotspot #6

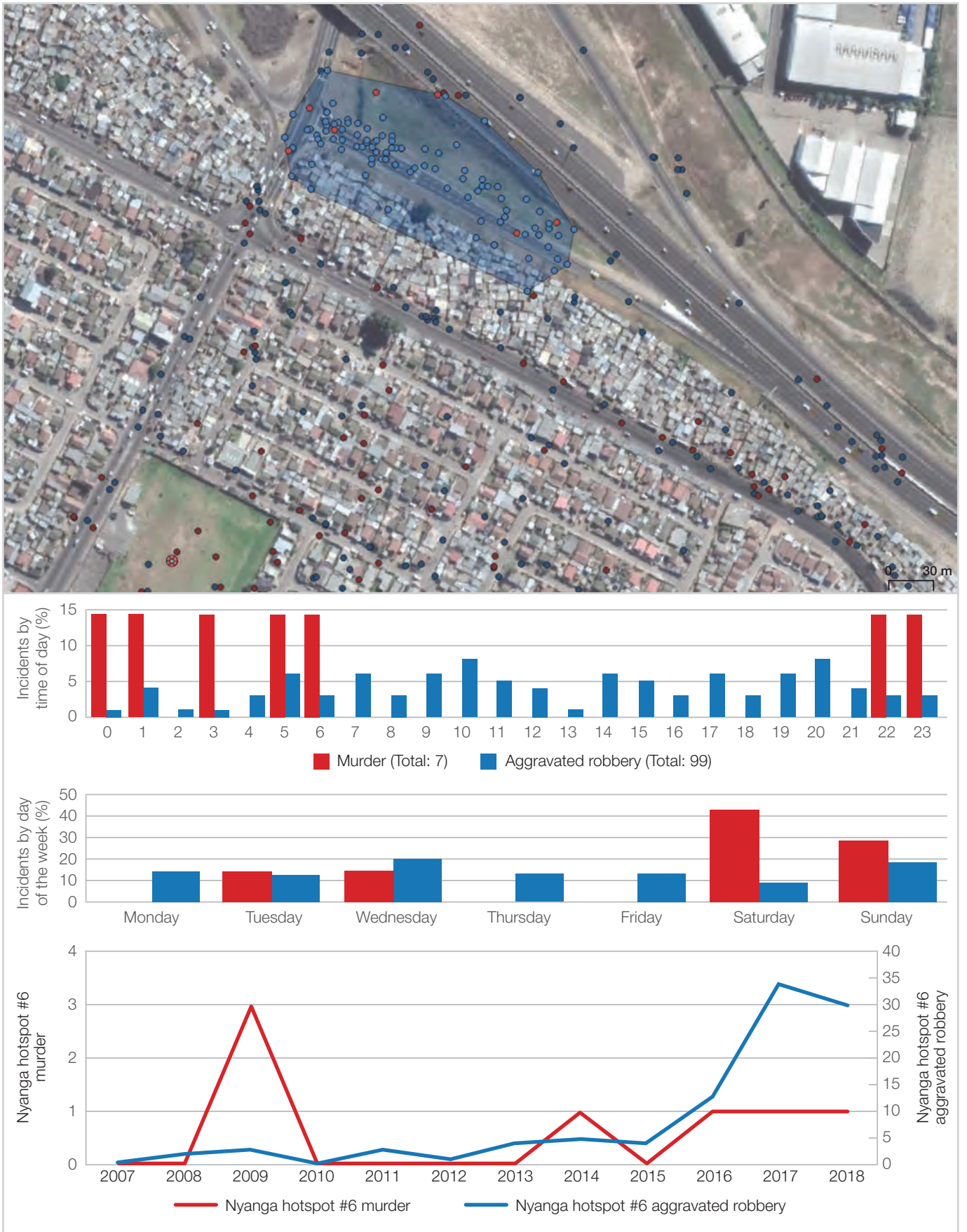
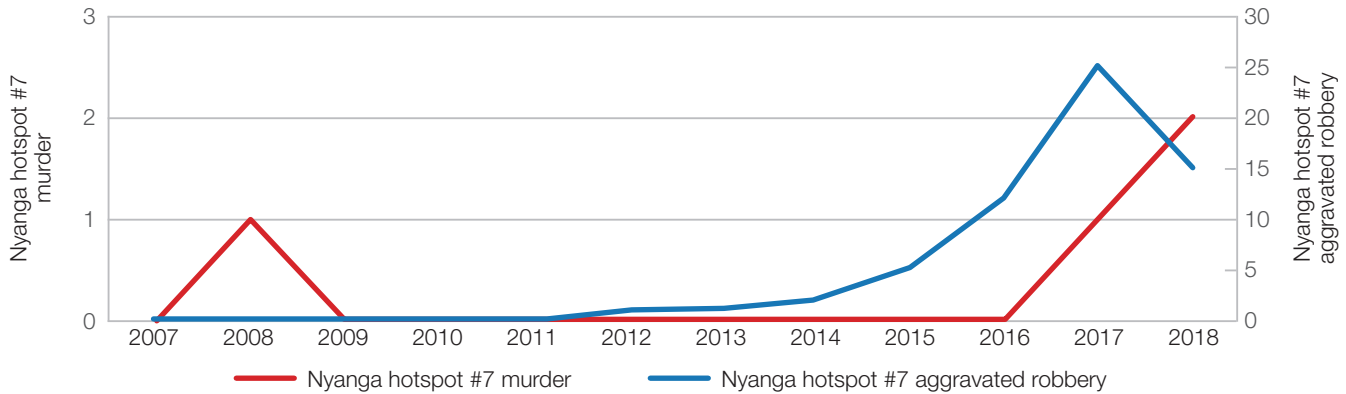
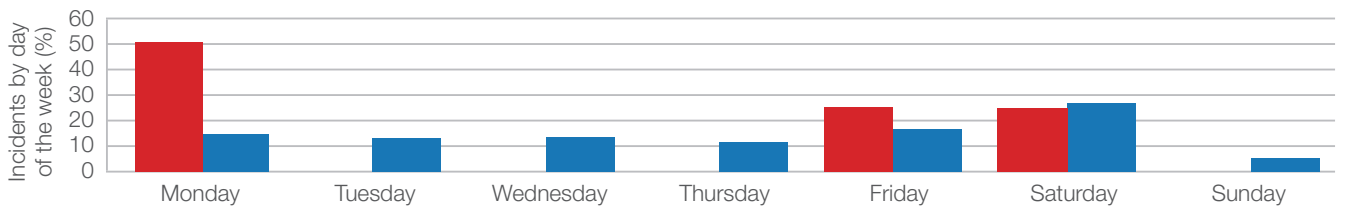
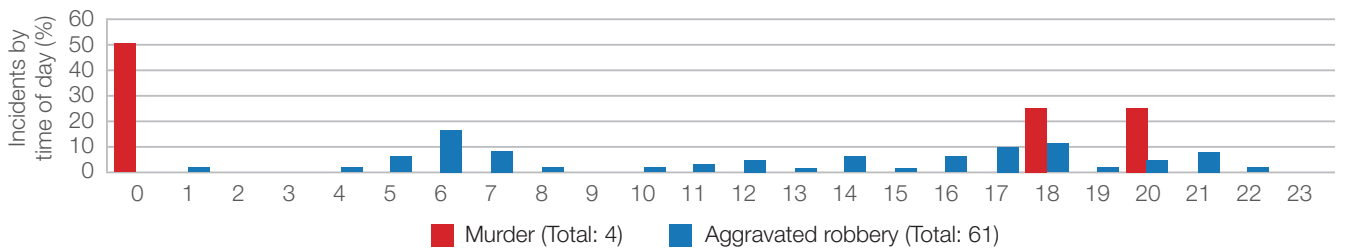


Figure 26: Nyanga robbery hotspot #7



Nyanga hotspot #7

Hotspot #7 (Figure 26) is another aggravated robbery hotspot representing a 0.014km² stretch of New Eisleben Road north of the R300 highway, and bordering Heinz Park to the east. It accounts for 0.1% (n=4) of murders and 1.0% (n=61) of aggravated robberies. Khanya Primary School borders to the west and a strip of informal shacks line the road to the east.

The intersection with White Hart Lane, south of the primary school, is one of few in the precinct with traffic lights. As such, vehicles may be vulnerable when slowing down or coming to a stop. There appears to be more crime to the east in Heinz Park than to the west (which has more secured facilities, the primary school and a SAPS training college).

Robberies peak around commuting hours, 5–7 am and 4–6 pm, with higher levels on Fridays and Saturdays. Robberies in this hotspot were negligible until 2014 and increased substantially from 2015–2017. Overall, this appears to be a high-crime stretch of road approximately 400 m in length.

This data provides a strong foundation for the SAPS to intervene in crime hotspots

Focused deterrence, hotspot policing, lighting and surveillance could reduce the chances of aggravated robberies along this street segment, though it should be noted that a significant number of murders are located in adjacent Heinz Park, signifying a potentially more serious safety concern there.

Nyanga hotspot #8

This hotspot (Figure 27) is a 700 m stretch of New Eisleben Road, running north from the M9 and dividing the Nyanga main place from Phillipi East. It covers just 0.057km² and accounts for 0.4% (n=13) of all murders and 1.7% (n=107) of aggravated robberies. West of the road is a parkway lined with trees while the east side has dwellings/businesses and an open field. It includes Imbasa Primary School, and ends near a clinic and shopping centre to the south.

Crimes are dispersed, with a greater concentration along the road and along the eastern road-front than the boardwalk. However, there are both robberies and murders in the boardwalk area, suggesting a mix of crimes involving vehicles and pedestrians along this corridor.

Murders are more prevalent at night/early morning but are dispersed throughout the week. Aggravated robberies are also irregular but peak from 3–6 pm and 4–9 am, and on Wednesdays. Murders increased from 2016 and robberies from 2013.

Overall, this hotspot suggests a high-crime roadway where features intended to improve quality of life (a pedestrian boardwalk, field, shopping centre, school and clinic) may generate foot traffic, which attracts criminal activities.

Given the mixed-use nature of the corridor, any of the three policing strategies outlined, as well as active and passive surveillance methods, could disrupt crime patterns.

Summary of hotspot analysis

Our analysis of hotspots in Durbanville and Nyanga illustrates the potential for effective crime mapping and date/time analysis to inform policing and other violence prevention interventions in these areas. We have shown how a significant portion of serious crime occurs in very small areas and at predictable times – particularly in Nyanga.

This data, combined with the existing and growing evidence base about what works in policing and crime prevention, provides a strong foundation for the SAPS and other authorities to intervene in crime hotspots. However, this is only possible if SAPS data is accurate.

In our analysis we drew attention to a number of potential anomalies in data recording. For example, it appears as though the SAPS may geolocate crimes recorded in a general area to a particular street, building or other landmark.

Similar anomalies were identified by Edelstein and Arnott in their analysis of point-level crime data for Khayelitsha.⁵⁶ Edelstein and Arnott also identified crimes falling along a perfect grid in Khayelitsha, suggesting a major flaw in data integrity. Although not interrogated in our study, the same anomaly seems present in Nyanga.

Figure 27: Nyanga robbery hotspot #8

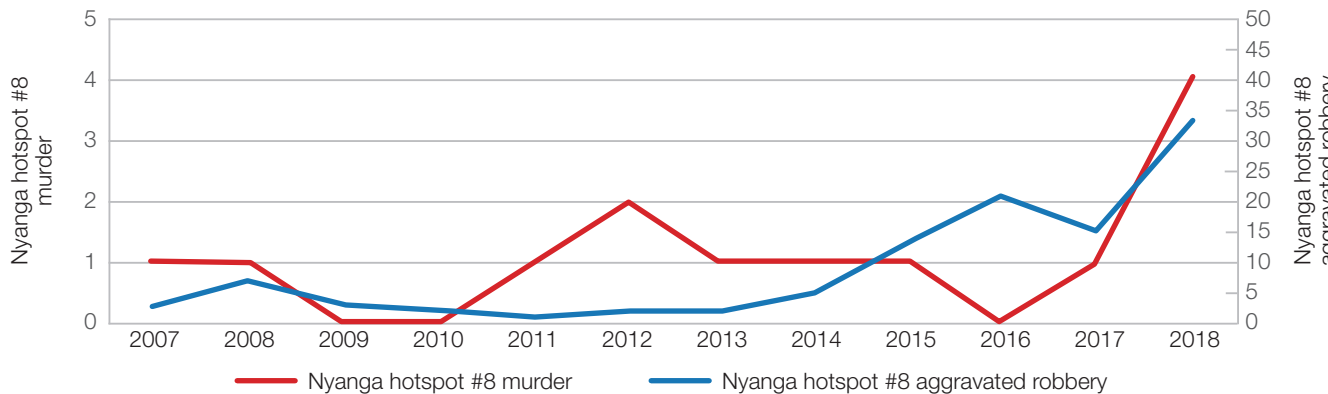
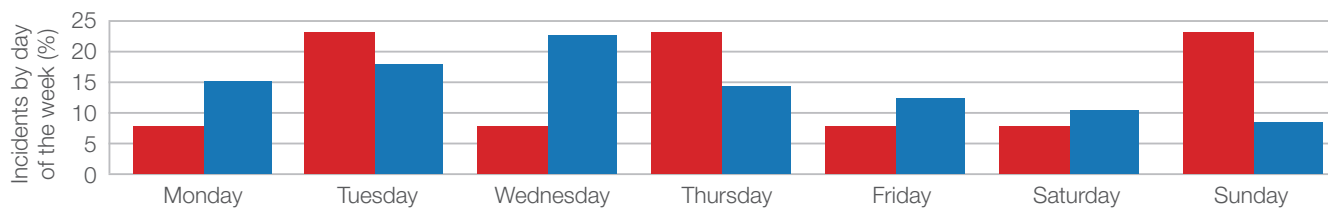
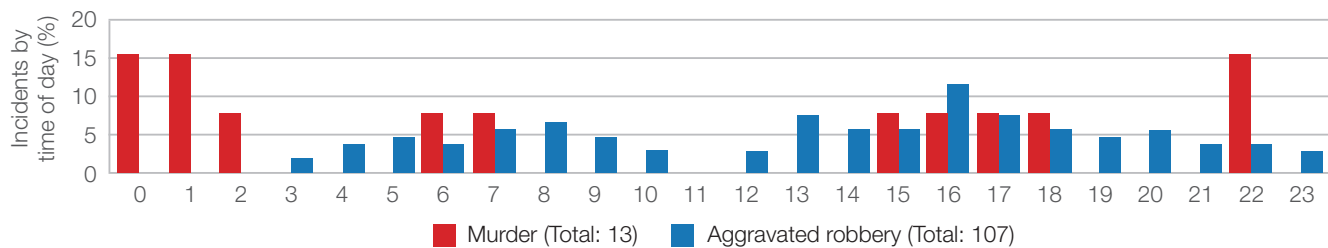


Figure 28 shows evidence of gridded data, along a square grid, with lines spaced exactly $0,0001478^\circ$ apart on both longitudinal and latitudinal axes. Red points indicate murders falling precisely on the grid; white points do not fall along the grid. Initial inspection of only the Nyanga murder data reveals that grid-spacing may affect 20–40% of all these data points.

Detailed grid analyses have not been conducted on robbery points or on the Durbanville data (although there is also some evidence of gridded data in Durbanville).

This evidence of gridded data – and the potential lack of space precision of crime events – may have serious implications for space analysis. There are no equivalent means of testing for time data anomalies. Therefore, further data-precision issues cannot be ruled out and must be addressed if the SAPS is to effectively use data to guide its work.

Conclusion

The evidence on what works in policing and crime prevention is steadily growing. It suggests that policing that is proactive, problem-oriented and consistently fair is most likely to be effective. This requires focusing on the people, places and behaviours commonly associated with crime.

When crime and violence cluster in small geographic areas, these are referred to as hotspots. Intervening in hotspots – be it through regular patrols, problem-solving approaches or focused deterrence – is more likely to reduce crime than general, unfocused policing.

This report has shown how accurate, point-level crime analysis can be used to guide policing interventions in crime hotspots, with an emphasis on policing that is evidence-based. Police cannot be everywhere, but

Figure 28: Detail of gridded murder data near hotspot #2 in Nyanga



Note: Red dots denote murder points falling on the $0,0001478^\circ$ square grid. White dots represent murders not falling on this grid.

should be where, and do what, is likely to reduce the most harm.

As suggested by Ratcliffe, ‘Well-considered crime reduction policy, based on an objective assessment of crime hotspots combined with an objective choice of crime reduction strategy, is a difficult thing to argue against.’⁵⁷

Our analysis has explored time and space patterns of murder and aggravated robbery over a 12-year period in two distinct Cape Town communities: one, a large, spacious, relatively affluent suburb (Durbanville) and one a very densely populated, low-income township (Nyanga).

In Durbanville the highest crime concentration is seen next to the Fisantekraal township, the bulk of which falls under an adjacent police jurisdiction. The location of this hotspot hints at the challenge of effectively intervening in just a fragment of an established community (the bulk of it falling outside of the precinct).

In terms of time, murders are focused on weekend evenings while robberies are diffused into weekdays and commuting hours. A second Durbanville robbery hotspot is located in the CBD with a diffusion of incidents by time and day.

In Nyanga violent crime occurs across the precinct and so requires more detailed analysis to identify hotspots. Eight hotspots were found, covering a variety of places (residential areas, taxi ranks, school grounds, streets, intersections), spatial configurations (dispersed,

clustered, hot point and street segment) and time profiles (diffused, or focused on particular days and times).

The differing characteristics of these hotspots and the underlying built environment provide clues as to potential place-based interventions that could be implemented and assessed for impact. However, a first step would be to pursue the kinds of interventions that existing evidence suggests are likely to work.

If crime incidents are not accurately mapped, the value of the data is significantly reduced

Twenty per cent of South Africa’s murders occur in fewer than 3% of precincts. Within these precincts, violence clusters in time and place, as illustrated through our analysis of Nyanga’s murder and robbery hotspots.⁵⁸ By effectively intervening in these hotspots, the SAPS and government should be able to reduce key categories of crime and violence.

To do so, they must foster the leadership and organisational culture, and develop the systems necessary to support intentional and ongoing testing, evaluation and learning from police practices – constantly working towards practices that are most likely to achieve the desired goal while causing the least harm. This can be aided by regularly sharing data with partners so that they too are able to better direct their activities and evaluate their impact.

Notes

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