
MURDER AND THE SAPS' POLICING OF ILLEGAL FIREARMS IN SOUTH AFRICA

Guy Lamb¹

ABSTRACT

This study sought to determine whether a relationship exists between murder and the policing of illegal firearms by the South African Police Service (SAPS), particularly in high crime areas. The study used a case series approach that examined and retrospectively compared trends in the number of annual cases of murder and illegal possession of firearms and ammunition (IPFA) across 132 high crime police precincts in South Africa for the period from 1994/95 to 2014/15. The data for these two crime categories, which was drawn from the SAPS' crime database, were then displayed as line charts and thereafter a trajectory pattern analysis was undertaken by means of visual inspection. The trajectory pattern analysis showed that there was an apparent consistent inverse association between the murder and IPFA trajectories in close to 40 per cent of the sample. The article emphasises that an interdisciplinary approach, one that draws from both public health and criminological frameworks, is essential to a more informed understanding of the relationship between firearm controls and firearm murders.

Keywords: Firearms; murder; South African Police Service

INTRODUCTION

According to data from the United Nations Office for Drugs and Crime (UNODC), South Africa's firearm homicide rate has declined from 26.9 per 100 000 in 1998 to 17 per 100 000 in 2007 (a 40% reduction) (United Nations Office on Drugs and Crime, 2011: 140-144). This was one of the largest reductions in the homicide rate over that period in the entire UNODC homicide data set. For much of this period, firearm injuries were one of the leading causes of violence-related deaths in South Africa (Matzopoulos, Van Niekerk, Marais & Donson, 2002: 19) (Department of Community Safety, 2015: 6).

To date, only two quantitative studies, both of which have been informed within a violence prevention (public health) framework, have sought to determine the basis for this reduction in the firearm homicide rate. These studies attributed this outcome to the introduction of more rigorous firearm controls that were ushered in with the establishment of the Firearms Control Act (FCA) (Act 60 of 2000) (Abrahams, Mathews, Jewkes, Martin & Lombard, 2012; Matzopoulos, Thompson & Myers, 2014). These findings are in line with studies in other countries, which have indicated that the implementation of more stringent firearm controls have corresponded with reductions in firearm homicides (Santaella-Tenorio, Cerdá, Villaveces & Galea, 2016: 140).

At a cursory glance, the reasoning in the two South African studies appears to be plausible, given the underlying logic of the FCA. That is, this Act has chiefly sought to use restrictive firearm licensing procedures to limit individual access to firearms in order to lower the risk of firearm injuries and deaths. In addition, there were approximate parallels between the initial point at which the firearm homicide rate began to decline significantly and the finalisation of the FCA text. However, despite the text of the FCA having been approved by the South African Parliament in 2000, this Act only entered South African law in late 2004 after the promulgation of the regulations for this Act, which by then was well into the firearm homicide downturn.

1. Dr. Director: Safety and Violence Initiative, University of Cape Town. Email: guy.lamb@uct.ac.za.

An assessment of the more descriptive literature on firearm violence and firearms control in South Africa reveals that the SAPS were exceedingly active in tackling firearm crime from the late-1990s (Gould, Lamb, Mthembu-Salter, Nakana & Rubel, 2004: 234-252) and regularly claimed that their firearm control efforts had yielded crime reduction results (Meek & Stott, 2004: 33). Matzopoulos et al (2014: 459), drawing on the research of Mthembu-Salter and Lamb (2008: 189-190), generally suggest that actions by the South African Police Service (SAPS), such as firearm amnesties, confiscations and destructions, may have contributed to the decline in firearm homicides (between 2001 and 2005), but emphasised that such a decline was primarily attributable to the FCA.

Therefore, given the limitations of the public health studies mentioned above, there is a distinct need for a more nuanced study on the work of the police in relation to illegal firearms and homicide in South Africa. Consequently, this study assessed the relationship between the SAPS' actions that targeted illegal firearms since 1994 and intentional homicide (or murder) with a particular focus on high crime areas.

ILLEGAL FIREARMS AND MURDER IN SOUTH AFRICA

The widespread availability of firearms, particularly illegal firearms, in the mid-1990s was identified by the police as one of the leading contributors to violent crime in South Africa at the time (South African Police Service, 1996: 10). A 1999 report by the SAPS Joint Investigation Team suggested that there were approximately 500 000 illegal firearms in South Africa. This figure was formulated by adding an estimated 200 000 missing government firearms, 150 000 stolen from or lost by private owners, some 30 000 homemade firearms and anticipated unreported losses from all sectors (Ministry of Safety and Security, 1999: 2). SAPS and independent researchers identified the principal sources of illegal firearms at this time as the following: firearms lost by, or stolen from licensed civilians, government departments (such as SAPS, the military and the former Bantustan security forces) and private security companies; homemade firearms; and firearms illegally trafficked into South Africa, particularly from Mozambique (Altbeker et al, 2000: 21; South African Police Service, 2000: np).

Police seizures of illegal firearms during the 1990s provided limited insights into the scope of the proliferation of the different sources of illegal firearms at the time. For example, in 1994 AK-47s accounted for 11 per cent of all SAPS firearm seizures for that year, while handguns and homemade firearms accounted for 53 per cent and 21 per cent respectively. By 1998 AK-47 and homemade firearm seizures had shrunk significantly to 2.5 per cent and 15 per cent of all SAPS firearm seizures respectively, while handgun confiscations had increased to 72 per cent (Chetty, 2000: 42-43). Such trends suggested that cross-border weapons smuggling (particularly from Mozambique) had diminished considerably, as it was predominantly AK-47s and other automatic weapons that had previously been trafficked into South Africa. In this regard, the SAPS had worked closely with the Mozambican authorities to identify and destroy weapon caches that had been accumulated during the civil war in Mozambique in what was known as Operation Rachel. In addition, the 19 per cent increase in the handgun proportion of total firearm seizures over this five-year period implied that civilian licence holders (including private security companies) and SAPS firearm holdings had possibly been the main sources of illegal firearms.

At this time, key internal markets for illegal firearms, particularly handguns, were located in high crime townships and informal settlements where some residents, particularly business owners, sought to acquire illegal firearms for self-protection. The reason for this is that the official licensing route had been largely opaque and unresponsive to many black South Africans in these areas (Burger, 2015: np; IRIN,¹ 2006; Jacobs, 2004: np; Wines, 2005: np). Individuals with criminal intentions also sought to acquire illegal firearms.

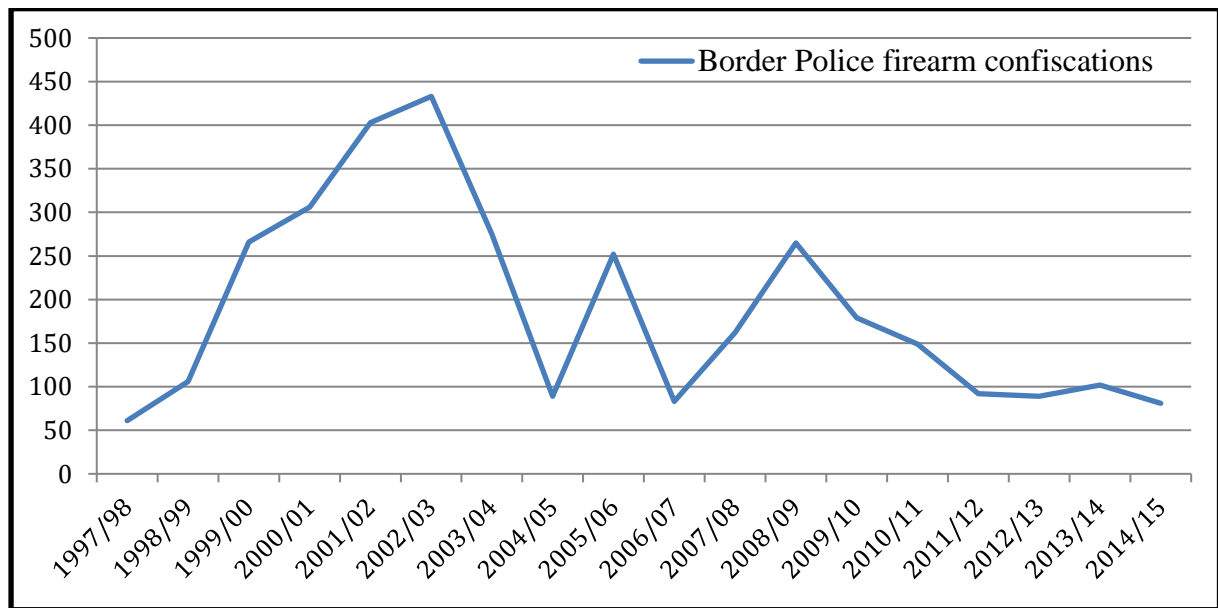
According to interviews with existing and retired senior SAPS firearm crime investigators, namely Stan Joubert, Alice Pienaar-Marais and a former senior CFR official (name withheld), most serious firearm crimes in South Africa, such as murder, attempted murder and robbery with aggravating circumstances, have been committed with illegal firearms (Anonymous, 2015: np; Joubert, 2015: np; Pienaar-Marais, 2015: np). Case studies and ethnographic research in South Africa suggests that those persons who perpetrate violent crimes with an illegal firearm, either acquire it directly from those legally in possession of such weapons by means of theft/robbery or indirectly via black market entrepreneurial intermediaries. Those individuals that steal firearms for their personal use are predominantly part of small criminal groupings that engage in street, house and business robberies where firearms were stolen in addition to other valuable items (Altbeker, 1999; Thaler, 2011: 10; Zinn, 2010: 54-68).

The illegal firearm intermediaries have often been linked to organised criminal groups (including street gangs) (Kinnes, 2000: 17; Shaw, 1998: 9; Standing, 2006: 100) that steal or buy stolen/misplaced licensed or government-held firearms, or bribe corrupt government officials which have access to firearms. In addition, some drug dealers, hostel residents, minibus taxi drivers, shebeen owners, corrupt police officials (see the section on the Central Firearm Registry below) and business owners have been implicated in trading in illegal firearms (Anonymous, 2015: np; Keegan, 2005: 83).

The exact dimensions of the current pool of illegal firearms in South Africa are unknown. Nonetheless the SAPS released data in 2015 on the loss and theft of firearms for the period 1999 to June 2015, which provided partial insights into how the illegal firearm sector has been fuelled. That is, it appears that the main sources of lost and stolen firearms in South Africa have been civilians (139,765 firearms); private security companies (18,739 firearms); government departments (18,697 firearms) and the SAPS (15,357 firearms) (Phiyega, 2015: np).

Hence, it is highly likely that the majority of firearms that have been used in the commission of crime in South Africa were originally licensed civilian firearms, both namely firearms licensed to individuals and private security companies, as together they accounted for 77 per cent of all lost and stolen firearms between 1999 and June 2015. This is a view that has been shared by the SAPS, with the Minister of Police noting in 2012 that licensed civilian firearm owners will “continue to become arsenals for criminals” (South African Police Service, 2012a: 25).

This view is somewhat supported by firearm seizure figures from the Border Police (see Chart 1 below), which indicates a general decreasing trend in firearm confiscations at points of entry into South Africa from 2002/03 onwards. The SAPS reported in 2005 that this trend could be attributed to the “tightening up of border controls” and “improving other security measures at most of the major points of entry and exit” in line with the SAPS Firearm Strategy (South African Police Service, 2005b: 78). In addition, it was likely that the arms destruction efforts by the SAPS and the Mozambican police within Mozambique that were part of Operation Rachel, had contributed to a reduction in such firearm confiscations. That is, in total, Operation Rachel resulted in the destruction of more than 50 000 firearms and 31 million rounds of ammunition (Littlejohn & Millard, 2009: 75).

Chart 1: Border Police firearm seizures, 1997/98 to 2014/15

(Source: SAPS annual reports).

These sentiments have been reiterated intermittently in subsequent SAPS annual reports. In addition, the official Southern African Development Community statement to the Fourth Biennial Meeting of States to Consider the Implementation of the UN Programme of Action to Prevent, Combat and Eradicate the Illicit Trade in Small Arms and Light Weapons in All its Aspects in 2010, did not identify cross-border smuggling of firearms in Southern Africa as a major area of concern (Bule, 2010: np).

THE SAPS' POLICING OF ILLEGAL FIREARMS

By 2001, the SAPS had resolved that between 140 and 148 police station precincts (out of approximately 1,000 police station precincts countrywide) with 'high contact crimes' would be prioritised in terms of receiving additional policing resources and police operations. The number of earmarked high contact crime police stations was subsequently increased to 169, which was underscored in the SAPS 2005-2010 Strategic Plan (South African Police Service, 2005: 41). Some of these stations received further resources through the Presidential² police station improvement programme. Furthermore, as indicated in the SAPS 2005-2010 Strategic Plan, the police focused on the seizure of illegal firearms and ammunition, as well as the arrests of criminal offenders, particularly those in possession of illegal firearms and ammunition. Such an emphasis on firearms would not only be pursued during day-to-day police actions, but would also be a primary emphasis of a series of high-density police operations in these high crime areas.

Table 1 below provides a list of these 169 priority stations. In recent years, the number of focal high crime station areas has not remained entirely static as the SAPS has established additional police stations where there was dire need, such as in Khayelitsha, KwaMashu, Katlehong and Mamelodi and has prioritised interventions in additional station areas with rising crime levels, such as Philippi East, Westonaria, Bhekithemba and Sundumbili.

Table 1: SAPS 169 High Crime Priority Station Areas

Eastern Cape	Kwazakele*; New Brighton; Umtata* (Mthatha); Kwanobuhle; Motherwell; Mdantsane; Bethelsdorp; Duncan Village; Gelvandale; East London; Grahamstown; Queenstown; Kamesh; Walmer; Cambridge; Humewood; Buffalo Flats; King Williams Town; Lusikisiki; Cradock; Butterworth; Inyibiba; Engcobo; Ngqeleni; Ngangelizwe; Vulindlela; Zwelitsha; Mqanduli; Mount Frere; Libode
Free State	Batho; Thabong; Park Road; Sasolburg; Bloemspruit; Bethlehem; Botshabelo; Boithuso; Kagisanong; Welkom; Odendaalsrus; Maokeng; Selosesha
Gauteng	Hillbrow*; Sophia Town; Yeoville; Johannesburg Central*; Booyens; Alexandra*; Jeppe*; Mamelodi*; Pretoria Central; Rietgat; Atteridgeville; Sunnyside; Tembisa*; Daveyton; Ivory Park*; Benoni; Katlehong*; Roodepoort; Randfontein; Krugersdorp; Evaton*; Orange Farm; Sebokeng; Vanderbijlpark; Meadowlands; Dobsonville; Lenasia; Moroka*; Kliptown
KwaZulu-Natal	Durban Central; KwaMashu*; Umlazi*; Inanda*; Empangeni; Plessislaer*; Phoenix; Point; Eshikawini*; Kwadabeka; Mount Rise; Chatsworth; Ladysmith; Madadeni; Pietermaritzburg; Mariannhill; Pinetown; Bhekithemba; Eshowe; Kwadukuza; Kwamsane; Cato Manor; Richards Bay; Osizweni; Verulam; Nongoma; Hillcrest
Limpopo	Thohoyandou; Polokwane; Mokopane; Seshego; Giyani; Tzaneen; Mankweng; Bolobedu; Maake; Lebowakgomo; Calcutta; Bushbuckridge; Letsitele; Makhado; Malamulele; Bele Bele; Tubatse
Mpumalanga	Vosman; Kanyamazane; Tonga; Nelspruit; Siyabuswa; Kwamhlanga; Embalenhle; Kabokweni; Witbank; Ermelo; Kwaggafontein; Masoyi; Piet Retief; Mhluzi
Northern Cape	Galeshewe; Kimberley; Rosedale; Upington; Roodepan; Kakamas; Groblershoop; Pababellelo
North-West	Temba; Ikageng; Rustenburg; Loate; Jouberton; Phokeng; Garankuwa; Mabopane; Mmabatho; Vryburg; Brits; Klerksdorp; Potchefstroom; Tlhabane
Western Cape	Khayelitsha; Nyanga*; Kuils River*; Mitchells Plain*; Worcester; Gugulethu*; Delft; Kraaifontein*; Elsies River; Cape Town Central; Bishop Lavis; Langa; Paarl; Oudtshoorn; Manenberg; Paarl East; Knysna
* The 2002/03 SAPS report stated that 20 per cent of all reported murders in that reporting year took place in these 23 station precincts.	

(Source: SAPS' annual reports).

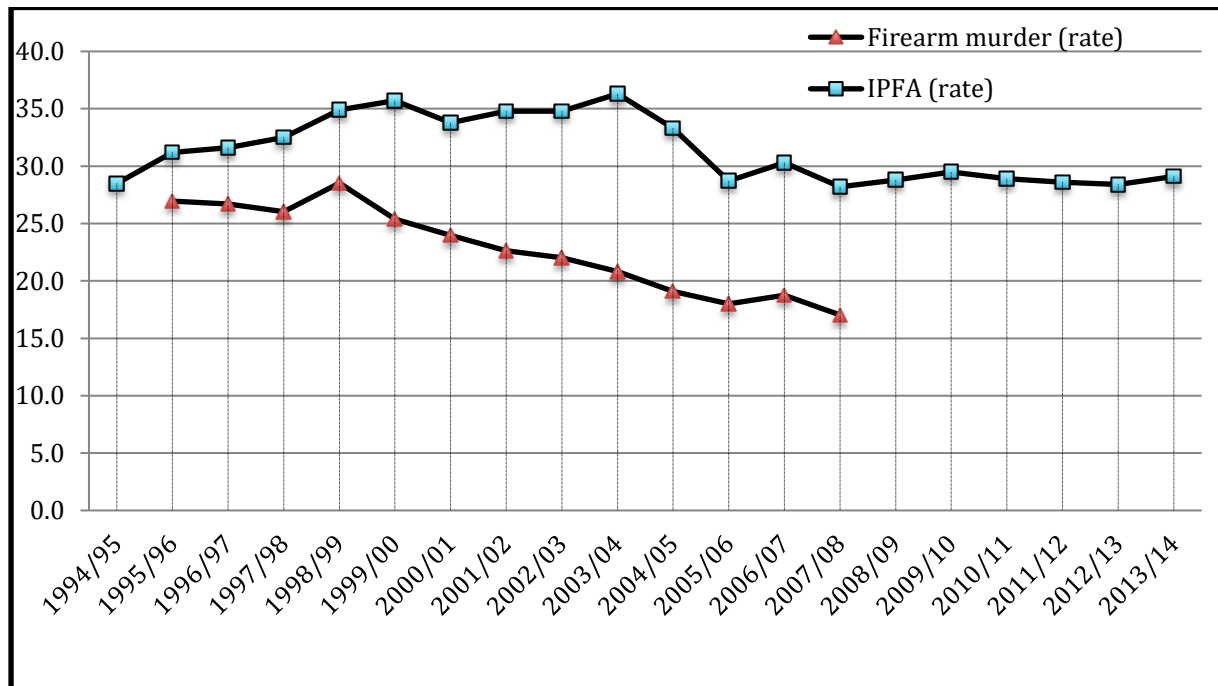
Between 1994 and 2015 the SAPS' annual reports indicated that the SAPS recovered 283 568 firearms that had either been lost or stolen from civilians, and further accumulated approximately 105,000 firearms and 1.7 million rounds of ammunition as a result of two firearm amnesties (Kirsten, 2007: 9) (South African Police Service, 2010: np). In addition, from 1 April 1999 to 31 March 2014 the police destroyed a total of 1 189 884 illegal, surplus and obsolete firearms according to data from the SAPS' annual reports.

An apt indicator of police action in relation to illegal firearms, is the crime category of ‘illegal possession of firearms and ammunition’ (IPFA). It entails the possession of firearms and ammunition for which one does not have an official license issued by the SAPS. The reporting of such a crime is specifically categorised by SAPS as a crime that is ‘heavily dependent on police action for detection’,³ as the illegal possession of a firearm is entirely dependent on the police to verify and investigate. That is, if the SAPS encounter a person in possession of firearms and ammunition, usually at a roadblock or during a search, they are authorised to undertake a series of actions to determine if that person is legally entitled to possess the firearm(s) and ammunition in question. This entails instructing such person(s) to produce a firearm licence; scrutinising the license (if available) and, thereafter verifying its authenticity. Where it is found that the firearm(s) and ammunition are illegal then the SAPS would open an IPFA case.

If the inspection/verification of the firearm and firearm license reveals that it is an unlicensed firearm, or the firearm license is fraudulent, then the SAPS are required to confiscate the firearm (and ammunition) and place it within the SAPS’ Section 13 stores. In this regard the SAPS are required to administer a series of tests, such as ballistics testing and at times, etching,⁴ as well as create official records about such firearms and ammunition. This process allows for verifications and audits to take place, thereby mitigating the possibility of false and duplicate reporting and underreporting. Added to this, IPFA targets are typically not overly prioritised in the SAPS’ performance charts at the station-level, and hence the incentive to intentionally misreport such crimes is minimised. It is important to note that IPFA cases relate specifically to persons whom the SAPS determine to have been unlawfully/illegally in possession of firearms and ammunition. It does not relate to the number of firearms and amount of ammunition that have been confiscated by the police. That is, a single IPFA case can range from a low-level gangster in possession of a handful of bullets to a businessman who owns a warehouse crammed with automatic weapons.

A review of aggregated national data on reported IPFA rates reveals that there was a general upward trend between 1994/95⁵ and 1999/2000, with there having been a 25 per cent increase between these two reporting years. This was followed by a slight decline the following year, which was subsequently followed by a seven per cent increase between 2000/01 and 2003/04. Thereafter the level of reported IPFA cases declined significantly (21%) during the subsequent two years, which was then followed by a general stabilisation, with some minor variations over the next nine years (see Chart 2 below). Critically, the trends in the IPFA rate appear to be closely related to the firearm murder rate⁶ determined by the SAPS. That is, sustained increases in the IPFA rate generally correspond with significant declines in the firearm murder rate. In addition, where the IPFA rate plateaued or declined, there was a corresponding slowdown and thereafter a slight increase in the firearm murder rate. However, given that that firearm crime, particularly murder, has been mostly concentrated in approximately 17 per cent of policing areas, it is essential that the data relating to firearm homicides and IPFA be astutely considered and analysed in relation to these areas.

Chart 2: National firearm murder rate and illegal possession of firearm and ammunition rate, 1994/1995 - 2013/2014⁷



Note: No firearm murder data has been available from the SAPS since 2007/08.

(Source: SAPS, 1995-2014).

METHOD

The study uses a sample of 132 high crime SAPS police station areas (or precincts) for the period from 1994/95 to 2014/15. The objective was to determine if a relationship exists between annual reported IPFA and murder cases in these 132 precincts. This study adopted a case series approach that examined and retrospectively compared trends in the number of annual cases of murder and IPFA across the 132 precincts. The data for both murder and IPFA were then displayed as line charts, and a trajectory pattern analysis was thereafter undertaken by means of visual inspection.

Using crime incident data rather than crime rates has an obvious drawback in that incident data does not reflect population growth/decline within the focal areas over the 21-year period. Nonetheless, historical crime ratio data for the SAPS' station areas is not publicly available and estimating the population size per precinct per annum for crime analysis purposes is exceedingly challenging given that numerous non-residents may be present in some areas for significant periods of time (such as for employment or entertainment purposes). Furthermore, in the majority of areas, the annual level of murder fluctuated considerably over relatively short periods of time (less than five years), which is unlikely to have been a consequence of population dynamics.

Trajectory pattern analysis

Trajectory pattern analysis was originally used by Nagin and Land (1993) to study criminal careers, in which they used this technique to categorise groups of individual criminal offenders with similar life course pathways in order to study patterns of change in criminality over a period of more than ten years. This approach was also used by Nagin and Tremblay (1999) in their study on the developmental trajectory of male juvenile delinquency. Since then a number of criminologists have used trajectory analysis to examine temporal crime trends within crime hot spots over time in order to determine if such criminogenic spaces display unique crime patterns relative to other areas (Groff, Weisburd & Yang, 2010; Ratcliffe, 2004; Stults, 2010;

Weisburd, Bushway, Lum & Yang, 2004; Weisburd, Morris & Groff, 2009). Moreover, Griffith and Chavez (2004) have used trajectory analysis to analyse homicide trends in 831 census tracts in the US city of Chicago between 1980 and 1995 and McCall, Land and Parker (2011) have used a similar approach with regards to 176 large US cities from 1976 to 2005.

Researchers that have used trajectory pattern analysis have typically grouped the multitude of trajectory observations into a small number of common patterns in order to more easily facilitate the interpretation of the research findings. A study by Weisburd et al (2004), for example, identified 18 distinctive trajectories of criminal offending for crime hot spots from an analysis of criminal incidents in close to 30,000 street segments in the US city of Seattle over a 14-year period. Thereafter three common trajectory patterns of criminality were discerned in order to frame the discussion of the study findings. Similarly, the crime hot spot study by Groff et al. (2010), which was also of street segments ($n = 24,023$) in Seattle, categorised the various trajectory findings into eight common patterns.

Such studies have typically used statistical modelling techniques, but there have been some studies that have used visual inspection, along with other methodological techniques, to determine common patterns (Allard, Chrzanowski & Stewart, 2013; Braga, Papachristos & Hureau, 2010; Payne & Gallagher, 2016). Visual inspection or visual analysis is a sub-category of visual research methods that has most commonly been employed within anthropology and sociology (Pauwels, 2010), and is gaining currency within other social science disciplines (Hamilton, 2006; Wiles, Coffey, Robison & Prosser, 2012). The reason is that it can potentially provide a “deeper and more subtle exploration of social contexts and relationships” that are less possible with more established social science research methods (Spencer, 2011:1). It has primarily been used to scrutinise visual data, such as photographs, video footage, and graphics (usually in the form of charts and maps). Moreover, it is a technique that has been used to identify patterns of societal phenomena; the relationship between such patterns and the relative strengths and weaknesses of these patterns and pattern relationships (Grady, 2008). It has also been used to determine the effectiveness of certain treatment interventions in psychology (Bulté & Onghena, 2012), with statisticians underscoring the need to scrutinise graphical representations of data prior to embarking on more sophisticated statistical analysis (Wilkinson & Task Force on Statistical Inference, 1999).

In criminology some researchers have increasingly suggested that graphical representations of criminal justice data can “provide insights that would not have been possible using standard statistical methods”, especially in terms of “complex, non-linear relationships” and “dynamic interactions” between variables (Maltz, 2010:28). In the area of crime mapping, visual inspection has been a commonly used method of research and analysis (Bowers, Johnson & Pease, 2004; Buerger, Cohn & Petrosino, 1995; Hiropoulos & Porter, 2014). Visual inspection has also been used as one of a number of methods to study transnational trafficking in illicit goods (Barberet, 2014), organised criminal networks (Malm, Bichler & Van De Walle, 2010), as well as the trajectories of criminal careers (Greenberg, 2016).

A lack of available and reliable population, socio-economic and disaggregated case data (such as seasonal or monthly variations in reported crime) at the station level precluded a more sophisticated trend analysis. Small-scale civil society and/or local government violence prevention interventions have been initiated in some of the station areas, such as in Nyanga and Inanda. However, no reliable data on the impact of such interventions was available for analysis, and the scale of such projects meant that they were unlikely to have had a noticeable impact on murder trends throughout the entire precinct. Furthermore, international and South African evidence suggests that the availability of alcohol and excessive alcohol consumption have directly contributed to violence (Livingston, 2008: 619; Matzopoulos, 2005: 114-115), but similarly no such comprehensive data on alcohol availability and use at the station area level existed at the time of this study.

Sampling strategy

In order to assess the potential impact of police actions in terms of IPFA cases on murder in South Africa, a criterion purposeful sampling strategy was adopted. The logic of such a strategy was to “review and study all cases that [met] some predetermined criterion of importance” (Patton, 2002: 238). This entailed the selection of “the most productive sample to answer the research question” (Marshall, 1996: 523). In terms of this study such a strategy involved the selection of a sample of station areas that were drawn from those high crime precincts that the SAPS prioritised for crime prevention and crime combatting.

Consequently, given this state of affairs, it was essential that the largest possible sample be constructed from these 169 station areas in order for valid inferences to be established about the possible effects of SAPS’ operations in these station areas. Such an approach mitigated the possibility of selection bias, which has been common to retrospective studies, as well as improved the significance, accuracy and representivity of the findings (Marshall, 1996: 522). A large sample also greatly increased the prospects that outliers would be identified, and the likelihood that the external validity or generalisability of the results would be enhanced. Accordingly, there are four considerations about the reliability and accuracy of the SAPS station-level data that were taken into account in order to finalise the sample size.

Firstly, since 2002 the SAPS has constructed an additional 27 fully-fledged police stations and demarcated new station areas, many of which have been within existing high crime precincts, such as Khayelitsha, KwaMashu, Lenasia, Mamelodi, Upington, Kuilsriver, Paarl, Queenstown, Witbank, Sasolburg, Potchefstroom, Pinetown and Klerksdorp. This has ostensibly been an attempt to improve policing effectiveness and public reporting on crime. The subdividing of station areas has significant implications for historical analyses of crime statistics, as crime reporting becomes split between the original station area and the new area(s). Firstly, the construction of new police stations has the potential to change the relationship between residents and SAPS personnel, which in turn can affect crime-reporting patterns during the focal period. Hence, such station areas were not included in the sample. Secondly, for similar reasons, station areas that were re-zoned between provinces during the focal period were omitted. Thirdly, station areas with consistently low levels of murder were excluded from the study, as murder levels were unlikely to have been notably influenced by the implementation of police operations. Fourthly, station areas where the credibility of the crime data had been called into question were not included in the sample.

Nonetheless, some exceptions were made due to the importance of certain station areas. The Lentegeur police station area was established within the boundaries of the Mitchells Plain precinct in 2013/14, but despite this development, Mitchells Plain was included in the sample, since this precinct has consistently had one of the highest annual levels of reported murder and IPFA cases. In addition, the timing of the establishment of SAPS’ Lentegeur, only had an impact on crime reporting in the last two focal years. Similarly, within the Katlehong, Mankweng and Tembisa precincts, new policing areas, namely Katlehong North, Sebayeng and Tembisa South police stations were founded in 2012/13, 2013/14 and 2014/15 respectively. These developments arguably only had a marginal impact on the trend analysis (South African Government News Agency, 2013: np; South African Police Service, 2014: np).

Concerns have been raised about the integrity of crime data (particularly under reporting and intentional misclassification) at the Bishop Lavis, Knysna, Oudtshoorn and Paarl East stations. However, these data problems reportedly did not relate to murder or IPFA cases (Bruce, 2010) and hence these four station areas were retained in the sample. Globally, murder (or homicide) is widely regarded as one of the most statistically reliable crime categories as it is most often linked to a corpse, with such a corpse typically being examined by a medical official who is required to declare the apparent manner of death. This information is then logged in the death registry and a death certificate is issued (United Nations Office on Drugs

and Crime, 2011: 9-10). In terms of IPFA, confiscated arms and ammunition are subjected to various checks and verifications by the SAPS, thereby mitigating the possibility of false and duplicate reporting and underreporting.

Hence the final sample includes 132 station areas from all nine provinces, with the breakdown as follows: Western Cape (13); Gauteng (24); KwaZulu-Natal (24); Eastern Cape (29); Free State (11); North-West (8); Limpopo (9); Mpumalanga (11); and Northern Cape (3). The full listing of station areas is provided in Table 2 below.

Table 2: Study sample - 132 high crime SAPS station areas

Code	SAPS station area	Code	SAPS station area	Code	SAPS station area	Code	SAPS station area
	Western Cape	Se	Sebokeng	Dv	Duncan Village	We	Welkom
Bl	Bishop Lavis	Te	Tembisa	El	East London		North West
De	Delft	Ye	Yeoville	Nc	Ngcobo (Engcobo)	Br	Brits
Er	Elsies River	Va	Vanderbijlpark	Ge	Gelvandale	Ik	Ikageng
Gu	Gugulethu		KwaZulu-Natal	Gr	Grahamstown	Jo	Jouberton
Kn	Knysna	Bh	Bhekithemba	Id	Idutywa	Mm	Mmabatho
Kr	Kraaifontein	Cm	Cato Manor	Iy	Inyibiba	Pk	Phokeng
La	Langa	Ch	Chatsworth	Kh	Kamesh	Ru	Rustenburg
Ma	Manenberg	Dc	Durban Central	Kt	King Williams' Town	Tl	Tlhabane
Mp	Mitchells Plain	Em	Empangeni	Kb	Kwanobuhle	Vr	Vryburg
Ny	Nyanga	Es	Eshikawini/ Esikaleni	Kk	Kwazakele		Limpopo
Ou	Oudtshoorn	Eh	Eshowe	Lu	Lusikisiki	Bg	Bolobedu
Pe	Paarl East	Hc	Hillcrest	Li	Libode	Gi	Giyani
Wo	Worcester	In	Inanda	Mn	Mdantsane	Le	Lebowakgomo
	Gauteng	Kw	Kwadabeka	Mw	Motherwell	Mr	Maake
Al	Alexandra	Kz	Kwadukuza	Mf	Mount Frere	Mx	Mankweng
At	Atteridgeville	Km	Kwamsane	Mq	Mqanduli	Pw	Polokwane
Be	Benoni	Ls	Ladysmith	Mt	Mthatha	Ss	Seshego
Bo	Booyens	Md	Madadeni	Nb	New Brighton	Ty	Thohoyandou
Da	Daveyton	Mh	Mariannhill	Nq	Ngqeleni	Tu	Tubatse
Do	Dobsonville	Ng	Nongoma	Ps	Port St Johns		Mpumalanga
Ev	Evaton	Os	Osizweni	Vu	Vulindlela	Eb	Embalenhle
Hi	Hillbrow	Ph	Phoenix	Wa	Walmer	Eo	Ermelo
Ip	Ivory Park	Pb	Pietermaritzburg	Zw	Zwelitsha	Ke	Kabokweni
Je	Jeppe	Pl	Plessislaer		Free State	Ky	Kanyamazane
Jc	Johannesburg Central	Po	Point	Bt	Bethlehem	Kf	Kwaggafontein
Ka	Katlehong	Rb	Richards Bay	Bs	Bloemspruit	Kx	Kwamhlanga
Kl	Kliptown	Um	Umlazi	Bi	Boithuso	Ms	Masoyi
Kd	Krugersdorp	Ve	Verulam	Bb	Botshabelo	Nl	Nelspruit
Me	Meadowlands		Eastern Cape	Kg	Kagisanong	Pi	Piet Retief
Mo	Moroka	Bd	Bethelsdorp	Mk	Maokeng	Sy	Siyabuswa
Of	Orange Farm	Bf	Buffalo Flats	Od	Odendaalsrus	To	Tonga
Ra	Randfontein	Bu	Butterworth	Pr	Park Road		Northern Cape
Ri	Rietgat	Ca	Cambridge	Sl	Selossha	Gw	Galeshewe
Ro	Roodepoort	Cr	Cradock	Th	Thabong	Gh	Grobliershoop
						Ki	Kimberley

RESULTS

Each of the line charts from the 132 SAPS station areas presented a unique trajectory pattern of annual murder and annual IPFA data for the study period. Nonetheless, six general trajectory patterns that related to the level and direction of the sequential changes in the two crime categories over time were identified. Such a categorisation exercise allowed for a more structured analysis of the relationship between the trajectories of the two crime types. These six general patterns are described and discussed below with Chart 3 providing a graphical representation of the patterns.

Converging crossover

This pattern entailed an elevated level of murder during the mid to late 1990s, while IPFA levels were relatively low at this time. Thereafter the murder trend line declined until 2010/11 (or thereabouts). From that point onwards, the murder trajectory displayed minor variations or plateaued. The IPFA trend line increased from 1994/95 until around 1999/00. The trajectory of the IPFA trend line subsequently converged with the IPFA line in a general downward direction (with some variability) and crossed over the murder trend line at least at one point in time. The greatest number of station areas (31%) displayed this general type of pattern.

Converging connection

This pattern is similar to the converging crossover pattern in that murder levels were at their highest during the mid-1990s, while at the same time IPFA levels were relatively low. Thereafter the murder trend line generally declined until around 2010/11. From that point onwards, the murder trend line displayed minor variations or plateaued. The IPFA trend line increased from 1994/95 to around 1999/00 with it being noticeably elevated between 1999/00 and 2004/05. The two trend lines do not cross, but converged closely after 2003/04, both in a general downward direction. A total of 18 precincts displayed this general pattern (13.6%).

Variable convergence

In this pattern the murder and IPFA trajectory pathways varied considerably with the murder trend line mostly being above the IPFA trend line. The IPFA trend line displayed noticeable peaks particularly between 1998/99 and 2001/02, and in 2003/04. In many such cases the murder and IPFA trend lines converged at a number of points, with there being some minor crossovers at various points in time, and then typically converged towards the end of the focal period. This general pattern was exhibited in 30 station areas (22.7%).

Variable crossover

In this pattern both the murder and IPFA trend lines varied considerably throughout the focal period, with murder levels being mostly higher than IPFA levels, although both trend lines prominently intersected on at least one occasion. This pattern array was exhibited in 21 station areas (15.9%).

Variable inverted

In this pattern both the murder and IPFA levels were significantly elevated in 1994/95, with the IPFA trend line remaining above the murder line for most of the focal period. Murder levels varied throughout the focal period, but generally declined from the late 1990s and then mostly escalated after 2010/11. Such a trajectory pattern was most common in precincts in the Western Cape and Eastern Cape that have regularly been affected by gang violence.

Variable separation

With respect to this pattern the murder trend line remained well above the IPFA trend line over the 21-year period. Both lines generally varied over time and the trajectory lines did not cross one other but may converge in later years. Thirteen precincts (9.9%) displayed such a pattern, which included some of the most violent police areas in South Africa, such as Nyanga and Umlazi.

Chart 3: General trajectory pattern types: Murder and IPFA

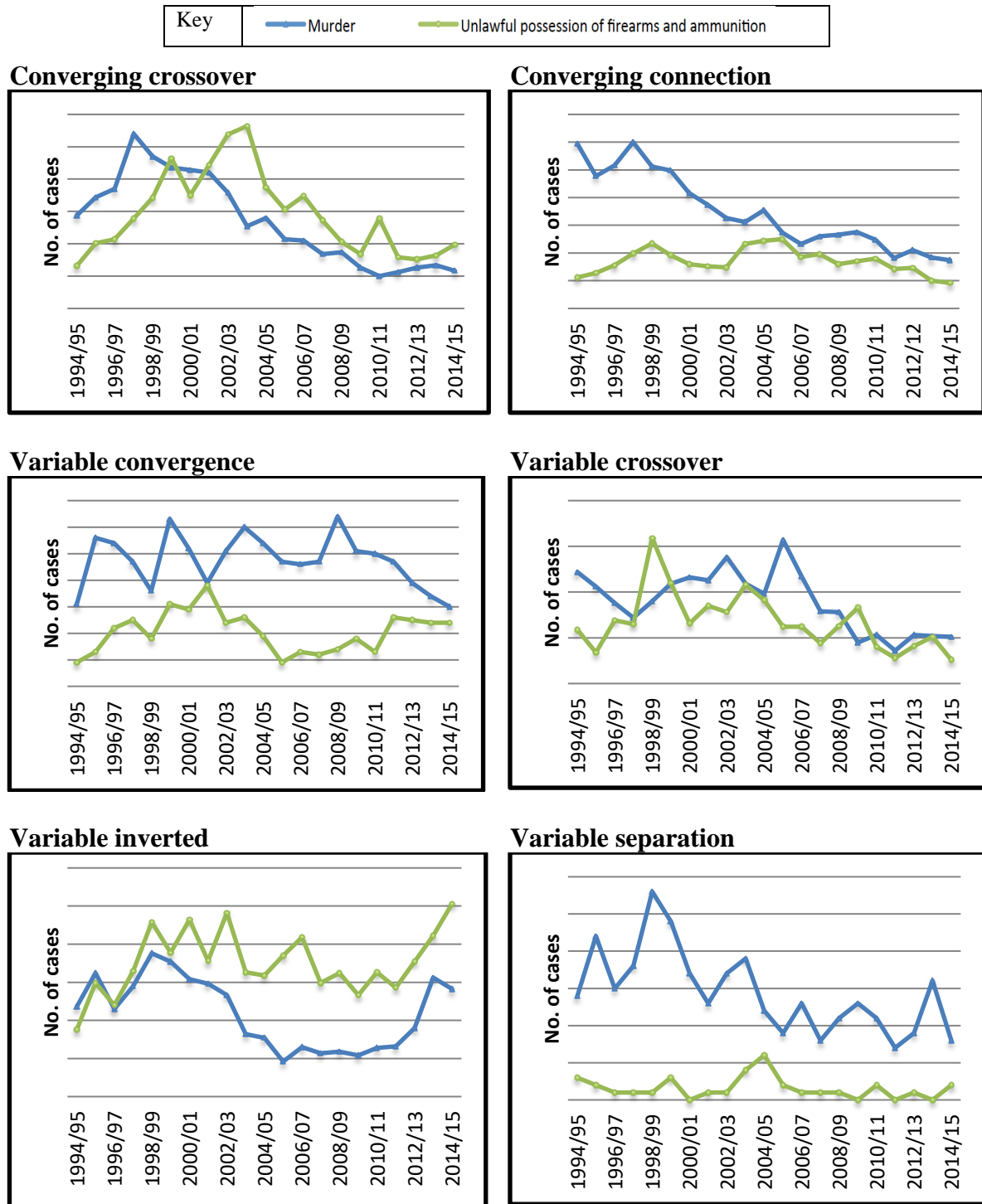


Table 3: Trajectory pattern type by SAPS station area

Pattern type	Relevant precincts	No. of station areas	% of total stations
Converging crossover	Pe; Wo; Al; Bo; Da; Ev; Hi; Je; Ka; Kl; Kd; Me; Of; Ri; Ra; Se; Te; Ng; Nq; Bt; Pr; Le; Ky; Nl; Sy; To; Dc; Em; Hc; In; Km; Pb; Mq; Ik; Pi; Eh; Ph; Bu; Gi; Mo; Po	41	31.1
Converging connection	Bh; Pl; Gr; Iy; Kh; Kt; Kk; Mn; Os; Od; Pk; Mx; Eb; Mh; Md; Mt; Th; Mw	18	13.6
Variable convergence	Kr; La; Kn; Ou; Gu; Dv; El; Id; Bf; Nc; Li; Mf; Nb; Kg; Jo; Wa; Br; Ru; Tl; Mr; Ty; Ss; Tu; Eo; Ki; Kw; Va; Bb; Ny; Um	30	22.7
Variable crossover	At; Ip; Ro; Cm; Ch; Ls; Rb; Ve; Bd; Lu; Be; Mm; Vr; Pw; Kx; Ke; Es; Kf; Ms; Jc; Do	21	15.9
Variable inverted	Bl; Er; Ma; Mp; De; Ge; Kz; Ps; Ye	9	6.8
Variable separation	Cr; Ca; Kb; Vu; Zw; Mk; Bi; We; Bg; Gh; Gw; Sl; Bs	13	9.9
Total		132	100

An analysis of the six general trajectory patterns described above reveals that for a noteworthy number of SAPS' station areas a striking trajectory pattern characteristic was displayed. That is, there appeared to be a significant inverse association between the murder and IPFA trajectories. More specifically, in a significant number of precincts over at least two consecutive years an increase in the annual number of IPFA cases corresponded with a decline in the annual number of reported murders during the same two (or more) years. Moreover, during the period of at least two consecutive years where there was a decrease in the number of reported IPFA cases, there was a corresponding increase in the number of murder cases over the same period.

This seemingly symbiotic association was visibly observable in at least 34 of the 132 SAPS station areas (26%). In addition, within at least 15 of these 34 precincts the apparent symbiotic association was observable on at least two occasions between 1994/95 and 2014/15. This possible symbiotic relationship was not consistently demonstrated in terms of all six general patterns, with it being more prevalent in station areas that presented the converging crossover pattern (18 stations); the variable crossover pattern (7 stations) and the variable convergence pattern (6 stations). Of the precincts where the variable inverted pattern was visible, only two precincts displayed such a dynamic, while it did not occur in any of the station areas with the variable separation pattern.

In at least 17 other station areas across three pattern types (converging crossover; converging connection and variable crossover) there appeared to have been a delayed inverse association between IPFA and murder trajectories. That is, murder levels did not decline significantly in the same year as a noticeable increase in the number of IPFA cases, and only decreased the following year. In addition, another ten precincts displayed elevated IPFA levels that corresponded with consistent declines in annual murder cases over a period of several years (60% of which displayed converging crossover patterns). Minor troughs in the IPFA trend lines did not result in significant increases in murder, but did appear to equate with a slackening-off in the declining trajectory of murder cases, or negligible increases.

In at least 15 station areas, however, there appeared to be no consistent inverse association between the trajectories of the two data categories, with there being no corresponding decrease in murder levels relative to increases in IPFA cases and vice versa. These station areas were representative of all pattern types, with the exception of the converging crossover pattern. Moreover, in at least a further three station areas, it was not possible to discern any clear relationship between the IPFA and murder trajectories, as there are no significant variations in the IPFA trend line. This was especially the case with the variable separation pattern, which included mostly police areas with relatively low IPFA levels.

In addition, in at least six more precincts, some degree of inverse association between the IPFA and murder trajectories was observable for most of the focal period, but during some consecutive years, particularly after 2009/10, increases in IPFA were matched with increases in murder. This was notably prevalent in areas that exhibited the variable inverted pattern such as Delft, Elsies River, Manenberg and Mitchells Plain. These areas have traditionally been prone to gang violence. Bethelsdorp and Kraaifontein, which are similarly known to be gang violence hot spots, also displayed such a trajectory array.

DISCUSSION

The Violence prevention (public health) theory can partly account for the apparent inverse association between the IPFA and murder trajectories in more than half of the 132 SAPS' station areas. This was especially the case in those areas where there was a seemingly immediate interdependent inverse association between the two trajectory lines. That is, various public health studies have shown that a reduction in the availability of firearms can lead to significant decreases in homicide (Chapman, Alpers, Agho & Jones, 2015: 365; Loftin, McDowall, Wiersema & Cottey, 1991: 1615; Villaveces et al., 2000: 1205). However, the inclusion of criminological theory can provide further insight and understanding, given its focus on policing and offenders.

Numerous studies on the use of police strategies that have focused on reducing the illegal possession and misuse of firearms in crime hotspots, have shown that such strategies have been correlated with reductions in firearm crime (Braga, 2001: 104; Koper & Mayo-Wilson, 2006: 227). The findings from such studies have credence in terms of South Africa, given the SAPS' concentration of its firearm crime reduction efforts in high crime areas. In addition, a key component of the SAPS approach to illegal firearms was the arrest of offenders and suspected offenders responsible for firearm-related crime in high crime areas. There is considerable North American research that indicates that the imprisonment of violent offenders can have crime reduction effects in the short- to medium-term (Marvell & Moody, 1998: 513; McDowall, Loftin & Wiersema, 1992: 383; Spelman, 2000: 419; Zimring & Hawkins, 1995: 173-174). Hence, it is possible that murder levels may have declined in high crime areas in South Africa due to the incarceration of violence-prone individuals from these areas.

However, such frameworks do not account for the absence of an inverse association. That is, the trajectory patterns in at least 15 station areas, chiefly those that displayed the variable separation and variable inverted patterns, revealed that significant increases in IPFA cases did not consistently correspond with a subsequent downturn in the murder trajectory. This may have been the consequence of the murder often being the outcome of the interplay of a variety of socio-ecological risk factors, in addition to the availability of firearms. These could include (in the South African context): excessive alcohol consumption (Peltzer & Ramlagan, 2009: 1); violence in the minibus taxi industry (Ntsebeza, 2005: 51-80); political or collective violence (Taylor, 2002: 473); harmful cultural practices and beliefs, namely unsafe circumcision procedures (Douglas & Hongoro, 2016: 597) and witchcraft (Ashforth, 2005: 1-4). Police violence, where police are responsible for significant numbers of firearm-related deaths, may also have accounted for this state of affairs. (Bruce, 2015: np). Reports by the

Independent Police Investigative Directorate have also shown that SAPS members have perpetrated murders in Daveyton, Giyani, Groblershoop, Hillbrow, Mankweng, New Brighton, Orange Farm and Rietgat. The predominant use of weapons other than firearms (such as knives) in murder cases (Matzopoulos et al., 2013: 25) may have accounted for a lack of an inverse relationship between IPFA and murder in some areas.

In areas renowned for gang violence, particularly in the Western Cape, such as Delft, Manenberg and Elsies River, corresponding increases in both IPFA and murder since 2010/11 may in fact have been the result of the transfer of approximately 2,000 illegal firearms to criminal gangs in these areas by a corrupt SAPS official (Thamm, 2016: np). In 2017 it was reported that SAPS investigators had linked 888 of these illegal firearms to 1,066 murders between 2010 and 2016, many of which took place in the above-mentioned areas (Dolley, 2017: np).

CONCLUSION

This South African case study further corroborates the findings of numerous international studies that indicate that the implementation of firearm controls, broadly defined, has the potential to contribute to reductions in firearm homicide. However, it emphasises that an interdisciplinary approach, one that draws from both public health and criminological frameworks, is essential to a more informed understanding of the relationship between the implementation firearm control measures by the police and firearm murders. Furthermore, focusing on policing areas where firearm murders are concentrated, reveals a more nuanced appreciation of the strengths and limitations of police efforts to reduce murder.

ENDNOTES

1. IRIN is the acronym for a news agency that was formally known as the Integrated Regional Information Network.
2. This relates to special funding provided to previously underdeveloped police stations that were prioritised by the South African President to receive additional resources in order to fast track improved policing capacity and service delivery.
3. Other crime categories that have also been classified as such include drug-related crime and driving under the influence of alcohol or drugs.
4. Etching is a process by which an acid-type liquid or gel is applied to the surface of a firearm in an attempt to recover serial numbers and/or markings on firearms that have been damaged, modified or erased.
5. The SAPS crime data reporting year is 1 April to 31 March, and hence the annual figures relate to a combined year format, such as 2015/16.
6. Murder, according to SAPS entails the unlawful and intentional killing of a human being, while homicide typically includes both intentional and unintentional or accidental killing of human beings. Unintentional killings with a firearm constitute a very small proportion of the firearm homicide data in South Africa.
7. The SAPS did not release crime rate data for 2014/15 and 2015/16.

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