

**Geo-analysis of offenders in Tshwane: towards an urban ecological
theory of crime in South Africa**

by

Gregory Dennis Breetzke

Submitted in partial fulfilment of the requirements for the degree of Doctor of
Philosophy (Geoinformatics)

In the Faculty of Natural and Agricultural Sciences

University of Pretoria

Pretoria

July 2008

Geo-analysis of offenders in Tshwane: towards an urban ecological theory of crime in South Africa

Student: Gregory Dennis Breetzke

Supervisor: Prof Andre Carl Horn

Department: Geography, Geoinformatics and Meteorology, University of Pretoria

Degree: Doctor of Philosophy (Geoinformatics)

SUMMARY

The identification of ecological risk factors for delinquency is a widely employed approach to a problem in which there is no single root cause. A number of theoretical and practical approaches typically provide insight into delinquency. The ecological approach in particular focuses on aspects within the urban environment that can be used to explain the disproportionate number of offenders emanating from particular locations. Remarkably, few ecological studies of delinquency have been forthcoming in South Africa which is an astonishing fact for a country plagued with high and rising levels of crime for much of its recent history.

Most explanations for the high crime levels in the country centre either on the legacy of apartheid or the transition to democracy. In terms of the former, the apartheid system was premised on the segregation of South African society and the concomitant socio-spatial marginalisation of ‘non-white’ communities. In the context of state repression, marginalisation and a consequent insurrectionary struggle, levels of crime and violence spiralled out of control. The transition to democracy in turn resulted in a

number of changes occurring in the country, most notably the rigorous transformation and restructuring of the criminal justice sector. Despite, or perhaps because of, these changes levels of recorded crime remain alarmingly high fourteen years into democracy with seemingly no end in sight and no local theory eminent to guide appropriate action.

This thesis aims to contribute towards for a better ecological understanding of delinquency in South Africa based upon the use of Geographical Information Systems (GIS) and quantitative techniques. The thesis presents a geo-analytic perspective of offenders residing within the city of Tshwane, and where possible, translates this knowledge towards an urban ecological theory of crime in South Africa. The findings of the study are used to provide practical insights into effective crime reduction policy initiatives. The study is based on an analysis of offender records obtained from the South African Department of Correctional Services (DCS) during the beginning of 2006.

DECLARATION

I, the undersigned, hereby declare that this thesis, submitted for the degree of Doctor of Philosophy (Geoinformatics), is my own and original work except where acknowledged. This work has not been submitted for a degree at any other tertiary institution.

Gregory Dennis Breetzke

ACKNOWLEDGEMENTS

Many thanks to my supervisor, Andre Horn, for his continued support, encouragement and advice while compiling this thesis; in the field, in discussions and working through the manuscript drafts. Support and patience from the staff in our department (and former staff), particularly, Paul Sumner, Keith Beavon, Ian Meiklejohn and Paul van Helden is gratefully appreciated. Thanks also to the South African Department of Correctional Services (DCS) for granting me permission to conduct research at the various correctional centres throughout Tshwane.

I am most thankful to my wife, Candice, for her love and encouragement, and for helping me to remain focussed on this thesis. I appreciate the inspiration and support that my friends and family have given me during this time. I thank my parents in particular for their support and encouragement throughout my twelve years of study.

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the NRF.

* My life and success is not determined by the absence of problems but by the
presence of God *

TABLE OF CONTENTS

Abstract	ii
Declaration	iv
Acknowledgements	v
Table of contents	vi
Chapter 1:	Introduction	1
Chapter 2:	Key requirements in the development of an urban ecological theory of crime in South Africa	20
Chapter 3:	Geographical Information Systems (GIS) and policing in South Africa: A review	57
Chapter 4:	Modeling of violent, economic and sexual offenders: A test of social disorganization in the city of Tshwane, South Africa.	96
Chapter 5:	Crossing the racial divide: a spatial-ecological perspective of offenders in the City of Tshwane Metropolitan Municipality, South Africa	139
Chapter 6:	A geodemographic profiler for high offender propensity areas in the city of Tshwane, South Africa	177
Chapter 7:	Here be dragons! Spatial symbols of crime in post-apartheid South Africa	213
Chapter 8:	Conclusion	250

CHAPTER 1

INTRODUCTION

Criminal behaviour occurs in space, and the geographical context in which this behaviour occurs often plays an important role in shaping that behaviour and the space in which it occurs; while space on its own explains little, the spatial patterning of behaviour is key to understanding and explaining much of human behaviour (Goodchild and Janelle, 2004). Indeed, it is through the mapping and visualisation of criminal behaviour that one can truly begin to examine causality and inform criminological theory and prevention efforts. Over the past decade Geographical Information Systems (GIS) have become *the* key tool in the spatial analysis and visualisation of crime. The availability of detailed socio-economic and demographic datasets combined with crime information and computerised information technologies, such as GIS, permit a large number of quantitative techniques to be used (and developed) to assess potential cause and effect relationships, particularly in the ecological analysis of crime (Ackerman and Murray, 2004). Ecological studies of crime are studies in which the units of analysis are spatially defined population aggregates (Anselin *et al.*, 2000). In social geography, the term ecological has two meanings; on the one hand it refers to the analysis of data relating to aggregates rather than individuals and second, following the tradition of the Chicago school of urban sociology, it refers to the investigation of the relationship between people and the urban environment (Evans, 1980). The ecological school stresses the correlation between environment and crime (Eloff, 2006). Subsequently the causes of crime are to be found in the way space, or the geographical areas in which people live and interact, socially create conditions that favour criminal or non-criminal behaviour.

The ecological approach has among its historical antecedents the work of Shaw and McKay (1942) who developed an 'ecological' perspective of crime and deviance after mapping thousands of incidents of juvenile delinquency¹ in the city of Chicago. The researchers based their social disorganisation theory on the notion that atrocious physical and social conditions endured by the poor, and which were a consequence of the process of urban growth, pushed residents into a life of crime (Allen, 2007). Over the past century criminologists have employed several other theoretical frameworks to acquire insight into delinquency. Whilst a comprehensive exposition of these theories can be found elsewhere (see Brown *et al.*, 1996; Bartollas, 1997), a number of the larger schools of thought are noted here.

The first is the sociological theories of crime causation which trace crime phenomena to social arrangements existing outside the individual (Schurink and Schwabe, 2000). The large number of theories that fall within this broad framework can be classified into the structural perspective, the cultural and subcultural approaches and radical or conflict theories. In all instances, the nature of the social environment is used to explain the cause of delinquency, although the various theories focus on somewhat different aspects of the social environment and their causal influence on human behaviour.

A second theoretical position is that delinquents cannot help committing their socially unacceptable behaviour. They are controlled by either biological or psychological factors that cause them to become involved in delinquent behaviour (Bartollas, 1997). Such inherent factors exist internal to the individual with the individual subsequently having little or no control over their behaviour. More recent developments in

criminological theory have attempted to integrate the plethora of existing theoretical frameworks in order to better explain the causes of delinquency. This development has been driven partly through the increased sophistication of statistical methods which has enabled researchers to look simultaneously at the effect of a number of variables upon behaviour (Brown *et al.*, 1996). The increased advancements in GIS and statistical techniques has also allowed the ecological approach to 'reawaken' much criminological theory as a result of its unique methodology which includes the usage of population or demographic data from official sources to account for varying spatial patterns of crime and delinquency.

Despite the plethora of ecological studies on delinquency however there are still considerable differences of opinion and no theoretical consensus within ecological research specifically regarding the association between community characteristics and crime (Schulenberg, 2003). From a local perspective, South Africa has contributed very little theoretically and/or empirically to the ecological tradition in criminology. In fact, with the exception of a handful of studies indicated in Table 1, the ecological determinants of crime locations in post-apartheid South Africa are largely unknown.

According to the literature presented in Table 1 a number of ecological factors characterise high crime areas in South Africa including high unemployment, a high rate of urbanisation, low income per capita, and low levels of education. All of these variables provide valuable insights into the processes influencing criminal activity with a number of variables being common ecological determinants of crime locations in international ecological studies.

Table 1: Ecological studies of crime locations in post- apartheid South Africa

Source	Spatial level	Contents
Gilfillan (1999)	Police station boundary	Correlate socio-economic variables from 1996 Census with crime statistics from 1998
Schwabe and Schurink (2000)	Police station boundary	Correlate socio-demographic variables from 1991 and 1996 Census' with crime statistics from 1997-1999
Brown (2001)	Magisterial	Correlate law enforcement, economic and socio-economic variables from 1994 OHS ^a and 1995 IES ^b with crime statistics from 1994
Blackmore (2003)	Provincial	Correlate economic, social and demographic variables from the budget review, 1991 and 1996 Census', OHS' and LFS ^c with crime statistics from 1994-2001
CJCP (2007) ^d	- Province - Police station boundary - Municipal	Correlate measures of inequality and deprivation from the CJCP Youth Study and 2003 NVS ^e with 2007 crime statistics

^a October Household Survey^b Income and Expenditure Survey^c Labour Force Survey^d Centre for Justice and Crime Prevention (www.cjcp.org.za)^e National Victimisation Study

In contrast to the ecological studies of crime locations shown in Table 1, no specific local literature could be found identifying the ecological determinants of *delinquency* in post-apartheid South Africa. A limited number of apartheid-era ecological studies were conducted however and include Lötter (1964) and Schurink (1978). Both researchers found that individual elements of social class (ie. educational level, occupation and income) correlated negatively with levels of delinquency in the former

Pretoria municipal area of apartheid South Africa. Schurink (1978) did however have to 'delineate' his own level of aggregation and only suburbs² inhabited by whites³ were considered in his analyses. While subsequent micro-level research highlight specific individual risk factors for delinquency such as age (Strijdom and van der Colff, 1975; Maree, 2003), gender (Strijdom and van der Colff, 1975; Glanz, 1990), employment status (Meletse, 1994), socio-economic status (Maree, 2003) and family status (Brown, 1984; Glanz, 1990; Schurink, 1994), few studies investigating the association between ecological variables and delinquency have occurred in the country; none in post-apartheid South Africa and none utilising GIS.

IN NEED OF AN URBAN ECOLOGICAL THEORY OF CRIME IN SOUTH AFRICA

In reference to the incidence and nature of crime at present Altbeker (2007, p.38) refers to post-apartheid South Africa as "a country at war with itself". Comparisons of pre- and post-apartheid crime statistics (incomplete and unreliable as they may be) suggest no significant decline in current crime levels from the highs experienced during the interregnum of 1990-1994. Currently, crime levels remain alarmingly high despite the adoption of a number of crime reduction initiatives since democratisation including the National Crime Prevention Strategy (NCPS) of 1996, and the National Crime Combating Strategy (NCCS) launched in 2000. For all the ambition of their authors all policies have failed to reduce levels of violent crime in the country, and served to alienate the ruling African National Congress (ANC) from its constituency. One of the main reasons often sighted for the failure to bring crime under control in South Africa, particularly in its urban environments, is the lack of theory to guide

appropriate strategies for crime combating and prevention (Dixon, 2001). Internationally (mostly North American and Western European) a number of theoretical contributions have been made to assist in the prescribing of policies that work to reduce crime (see Shaw and McKay, 1942; Akers, 1973; Cohen and Felson, 1979; Sampson and Wilson, 1995). While such ‘Western’ theories are potentially limited in their generalisability to other political, social and cultural settings, they do provide an empirical base from which to understand local crime, its causation and to inform local crime reduction initiatives.

In South Africa, ecological studies of crime and delinquency are sorely lacking. As a result local researchers are continuously confined to the social conditions - and ecological interpretations - pertinent to ‘Western’, in particular North American, theoretical frameworks when conducting local crime analyses and interpreting criminological findings. Local researchers currently bemoan the lack of any theoretical context for understanding crime and delinquency in South Africa and demand a more thorough understanding of the factors that facilitate criminal behaviour (see Dixon, 2001, Shaw, 2002; Louw, 2004; Altbeker, 2007). A cursory review of local literature reveals that while ‘Western’ theories of crime have often been used to interpret and explain research findings in the country (see Schurink, 1978; Gilfillan, 1999; Schwabe and Schurink, 2000; Davis, 2001; Weir-Smith, 2004), few contemporary crime theories have been practically implemented and assessed. Moreover, Willis *et al.* (1999, p.232) contends that while South Africa has traditionally had a “Western influence” in its criminology, the country has not yet made any significant progress in developing an indigenous perspective on crime.

The socio-political history of South Africa makes the country unique in ecological analyses of crime and delinquency. The primary reason for this being the fragmentation of space; the segregation of state-defined population groups into certain spaces; and the surveillance and control of those spaces by the former apartheid regime (Mabin, 2005). The urban spatial organisation under apartheid resulted in former 'whites-only' urban spaces being favoured in terms of the distribution of social and economic resources. Former 'non-white' spaces on the other hand became increasingly marginalised with residents being socially and economically disempowered. Fourteen years into democracy and the South African city is changing. Racial desegregation has resulted in almost every suburb in urban South Africa experiencing rapid change or anticipating it (Mabin, 2005). As a result the South African city is fast losing its original modernist-apartheid features whilst becoming globally and regionally connected and displaying more and more social diversity reminiscent of the post-modern, post-industrial city. The changing social geographies of urban South Africa provide a unique ecological platform to theorise about possibly the greatest threat facing this fledgling democracy, crime.

AIM

The primary aim of the thesis is to contribute towards an urban ecological theory of crime in South Africa through a geo-analysis of offenders using GIS.

A greater exploration into the causes of delinquency can be used to not only inform policy makers and practitioners engaged in the criminal justice sector but can also be used to design appropriate interventions aimed at targeting the 'ecological' root

causes of the problem. While both the location of crime and the location of offenders are important considerations in any crime theory or hypothesis, the dearth of ecological research focussing specifically on delinquency in post-apartheid South Africa makes addressing this shortcoming in criminological research more urgent.

From a geoinformatics perspective, there is a constant need in South Africa to develop and integrate quantitative geo-analytic techniques for synthesising and understanding crime activity as well as to correlate the output of geoinformatic analyses with the needs of police. This thesis will make a contribution in this regard by using GIS to interpret the ecological relationship between delinquency and urban location in post-apartheid South Africa. In addition leading to the improved expansion of GIS procedures to be utilised in the fight against crime.

STUDY AREA

As a geographical focus area, the region under consideration is the City of Tshwane Metropolitan Municipality (CTMM) (Figure 1) located in the Gauteng province of South Africa. The CTMM or 'city of Tshwane' (pop. 2 million; 3 200 square kilometres) provides an exemplary opportunity to explore the dynamics between offenders and ecological factors. The region represents one of the six major metropolitan areas in South Africa and was established on 5 December 2000 with the amalgamation of various local governments, and encompasses, among others, the following areas: Soshanguve, Centurion, Temba, Hammanskraal, Brooklyn, Hatfield, Mamelodi and Pienaarsrivier.

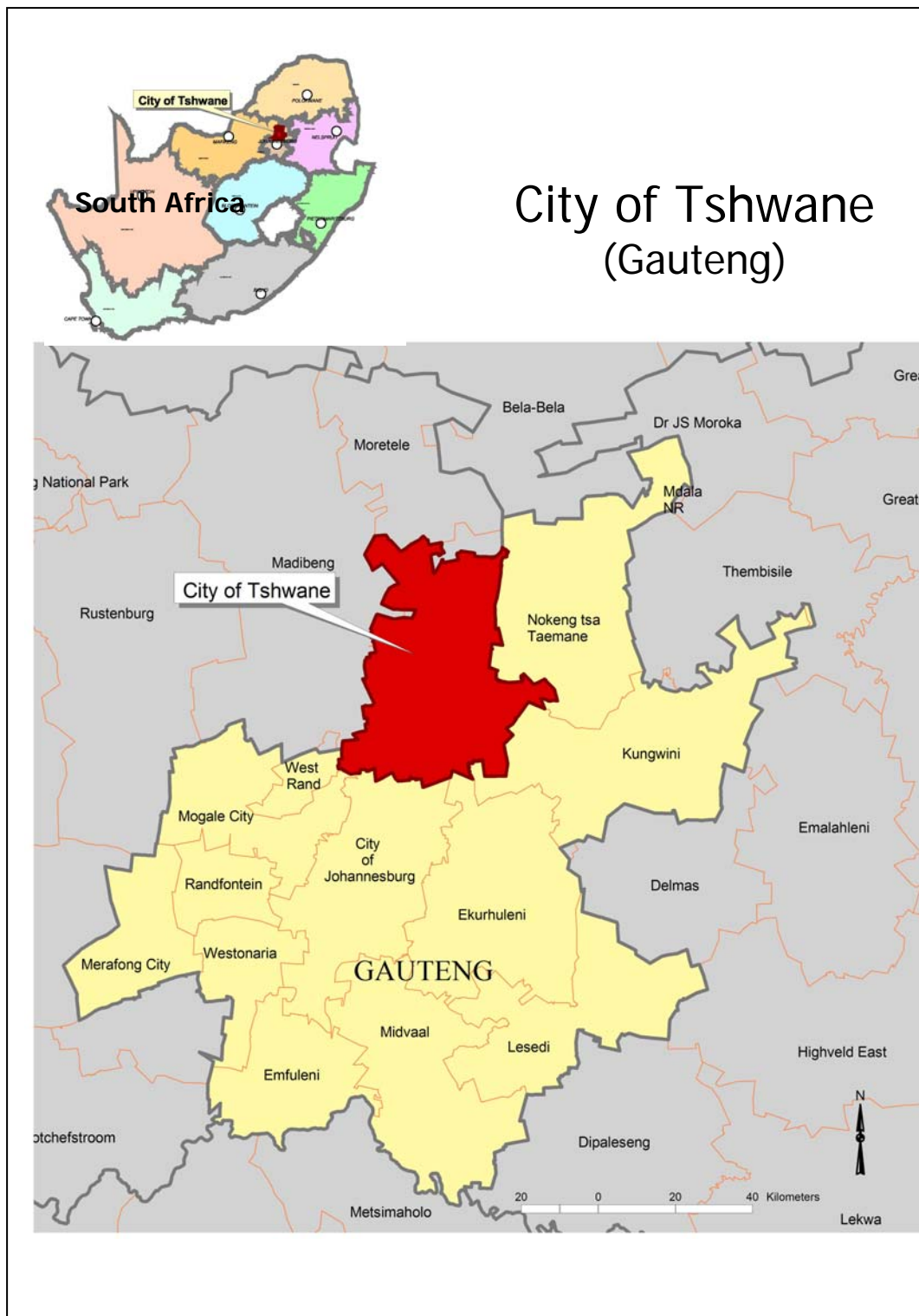


Figure 1: Location of the city of Tshwane used as a case study in the thesis

DATA

The research and results that are presented in the thesis are based on fieldwork that took place at all five correctional centres located within the city of Tshwane during March 2006. These five centres include Pretoria Central Correctional Centre (consisting of Pretoria Medium and Pretoria Maximum), Pretoria Female Correctional Centre, Odi Correctional Centre and Atteridgeville Correctional Centre. In order to conduct research at the South African Department of Correctional Services (DCS) a research application was compiled at the beginning of 2005 and submitted to the DCS in June 2005. The application was provisionally approved in January 2006 by the Research Ethics Committee (REC) of the DCS and dates were specified during which research could be undertaken at the afore-mentioned correctional centres. Planning meetings were held with the author and the DCS' Commissioner for Research, the DCS' Area Coordinator for Corrections in the city of Tshwane as well as with the relevant Area and Regional Managers at each of the five correctional centres. Each facility was visited on numerous occasions during the course of 2006 in order to obtain the offender data required.

PROCEDURE AND PRESENTATION

The thesis comprises independent yet interrelated research papers (Chapters 2-7) encapsulated by an Introduction and Conclusion. Each of the research papers in the thesis has either been published by the author (some documents are co-authored) or are in various stages of submission and review for publication in local and international academic journals at the time of the completion of the thesis. Although a number of papers are co-authored the general thesis as well as the focus and

construction of each paper within the general thesis were primarily developed by the author. The publication status of each article is noted on the chapter title page. Some theoretical and methodological repetition occurs between chapters. This is difficult to avoid since the documents are included as the text appears in the academic literature or in submission for publication. In addition, some discrepancies in the data collected from the DCS occur across chapters. These discrepancies are addressed in the respective chapters as endnotes. Relevant acknowledgements and references are presented at the end of each chapter. The style of graphical presentation is similar throughout the thesis although published documents may show some variations due to external editorial requirements. While each chapter stands individually, together they provide a comprehensive view from an interdisciplinary approach.

Chapter Two identifies five key requirements in the development of an urban ecological theory of crime in post-apartheid South Africa. Each requirement can be considered a research objective of the thesis, with each requirement being addressed in subsequent chapters.

The first requirement in the pursuit of an urban ecological theory of crime in South Africa is addressed in **Chapter Three**. The chapter details a review of GIS within a policing context in the country and identifies potential geo-analytic procedures and tools to be used in the spatial analysis of crime. Among the procedures identified and posited for future crime analysis in the country are geodemographic classification systems. A new variant of such a system is constructed in Chapter Six.

Chapter Four initiates the empirical component of the thesis with an ecological test of the social disorganisation theory within a South African context. The chapter achieves an important initial objective of the thesis in that it establishes the degree to which an archetypal ecological theory of crime can be used to account for the spatial distribution of offenders in South Africa.

Chapter Five employs a range of statistical techniques to analyse the effects of a number of socio-demographic variables on delinquency rates within the city of Tshwane. The chapter identifies and examines the various ecological risk factors that account for a high number of offenders emanating from certain urban locations. The ecological risk factors identified in this chapter are used to construct the geodemographic classification system in Chapter Six.

Chapter Six introduces a geodemographic offender profiling system for the city of Tshwane. The system employs the findings of previous chapters and combines ecological theory, aggregated GIS-based data and *k*-means clustering to produce offender risk profiles for the city of Tshwane ranging from high to low. The chapter also challenges past and present crime reduction policy initiatives.

In **Chapter Seven** a contribution is made towards an urban ecological theory of crime in post-apartheid South Africa. The theoretical and empirical work set out in Chapters 3-6 are collated and referenced in this historical discourse on crime during the apartheid and post-apartheid periods.

The final chapter, **Chapter Eight**, presents a general conclusion drawn from the thesis. The main findings of the thesis are reviewed as independent and interlinked components. A review of the thesis highlights the complexity inherent in understanding the offender-environment nexus.

Throughout the empirical component of the thesis, which comprises Chapters 4-6, ArcGIS 9.2 was used to create the various datasets and to statistically analyse these datasets through the application of, amongst others, spatial correlation, factor analysis, and cluster analysis procedures. ArcGIS 9.2 was also used in the creation of the geodemographic offender profiling system, a new variant of geodemographic classification systems in GIS.

ENDNOTES

¹ Throughout the course of the thesis the terms *delinquency* and *offending* are used interchangeably dependent on specific editorial requirements. In both instances the word refers to a criminal act committed by an individual.

² Throughout the course of the thesis the terms *suburb* and *neighbourhood* are used interchangeably dependent on specific editorial requirements. In both instances the word is defined as a spatially delineated district within a town or city.

³ The South African population is still officially classified into racial groups. ‘Black Africans’ represent the descendants of west and central African populations. The ‘Indian’ population group represent the descendents of south Asian populations. The ‘Coloured’ group comprise a mixed population including the descendents of the

indigenous Khoisan population, imported Malay slaves, and people born out of mixed-race relations. The collective term ‘blacks’ or ‘non-whites’ from this point onwards (and throughout the thesis), refers to these groups while the ‘white’ population includes the descendents of European and other non-Indian Asians. While it might be expedient to employ the term ‘black’ or ‘non-white’ here, the group designated by the term should not be considered homogeneous.

REFERENCES

- Ackerman, W.V. and Murray, A.T. 2004. Assessing spatial patterns of crime in Lima, Ohio. *Cities*, 21, 423-437.
- Akers, R.L. 1973. *Deviant Behavior: A Social Learning Approach*. Wadsworth: Belmont.
- Allen, C. 2007. *Crime, Drugs and Social Theory*. Ashgate: Aldershot.
- Altbeker, A. 2007. *A Country at War with Itself: South Africa's Crisis of Crime*. Jonathan Ball: Johannesburg.
- Anselin, L., Cohen, J., Cook, D., Gorr, W. and Tita, G. 2000. Spatial analyses of crime. In Duffee, D. (Ed.), *Criminal Justice 2000: Volume 4. Measurement and Analysis of Crime and Justice*. National Institute of Justice (NIJ): Washington DC, 213-262.
- Bartollas, C. 1997. *Juvenile Delinquency, 4th Edition*. Allyn and Bacon: Boston.
- Blackmore, F.L.E. 2003. A panel data analysis of crime in South Africa. *South African Journal of Economic and Management Sciences*, 6, 439-458.
- Brown, S.I. 1984. A study of juvenile delinquency among Zulus in Natal with particular reference to accounts and views of the delinquency. Unpublished PhD Thesis, University of Natal, Durban.
- Brown, S.E., Esbensen, F-A. and Geis, G. 1996. *Criminology: Explaining Crime and its Context*. Anderson: Cincinnati.

- Brown, K.V. 2001. The determinants of crime in South Africa. *The South Africa Journal of Economics*, 69, 269-299.
- Centre for Justice and Crime Prevention (CJCP). 2007. Crime mapping and victimisation tool. Available at <http://196.15.148.231:8081/ka-map/>, last accessed 16 January 2008.
- Cohen, L. and Felson, M. 1979. Social change and crime rate trends: a routine activity approach. *American Sociological Review*, 44, 588-08.
- Davis, L. 2001. Victimisation risk of vehicle hijacking victims: a routine activities approach. *Acta Criminologica*, 14, 108-116.
- Dixon, B. 2001. Exclusive societies: towards a critical criminology of post-apartheid South Africa. *Society in Transition*, 32, 205-227.
- Eloff, C. 2006. Spatial technology as a tool to analyse and combat crime. Unpublished PhD Thesis, University of South Africa (UNISA), Pretoria.
- Evans, D.J. 1980. *Geographical Perspectives on Juvenile Delinquency*. Gower: UK.
- Gilfillan, T.C. 1999. *Modelling Crime Statistics with the 1996 Census Data*. CSIR Press: Pretoria.
- Glanz, L.E. 1990. Juvenile delinquency: a self-report study among urban blacks. Unpublished PhD Thesis, University of Pretoria, Pretoria.
- Goodchild, M.F. and Janelle, D.G. 2004. Foreword. In Goodchild, M.F. and Janelle, D.G. (Eds), *Spatially Integrated Social Science*. Oxford University Press: Oxford, v-vi.

- Lötter, J.M. 1964. *'n Ekologiese Ontleding van Misdaad in Pretoria*. Nasionale Buro vir Opvoedkundige en Maatskaplike Navorsing: Pretoria.
- Louw, A. 2004. Violence in South Africa: critical perspectives. Report for the Criminal Justice Initiative of the Open Society Foundation for South Africa. Open Society Foundation Violence Workshop, August 2004.
- Mabin, A. 2005. Suburbanisation, segregation, and government of territorial transformations. *Transformation*, 56, 41-64.
- Maree, A. 2003. Criminogenic risk factors for youth offending. In Bezuidenhout, C. and Joubert, S. (Eds), *Child and Youth Misbehaviour in South Africa: A Holistic View*. Van Schaiks: Pretoria, 51-79.
- Meletse, I. 1994. Primary prevention and the community. In Glanz, L. (Ed.), *Preventing Juvenile Offending in South Africa: Working Proceedings*. HSRC Press: Pretoria, 43-46.
- Newman, O. 1972. *Defensible Space: Crime Prevention Through Urban Design*. Macmillan: New York.
- Sampson, R.J. and Wilson, W.J. 1995. Toward a theory of race, crime, and urban inequality. In Hagan, J. and Peterson, R. (Eds), *Crime and Inequality*. Stanford University Press: Stanford, 37-56.
- Schulenberg, J.L. 2003. The social context of police discretion with young offenders: an ecological analysis. *Canadian Journal of Criminology and Criminal Justice*, 45, 127-157.

- Schurink, W.J. 1978. Class-based sociological theories of deviancy and relevant ecological patterns in Pretoria. In Lever, H. (Ed.), *Readings in South African Society*. Jonathan Ball: Johannesburg, 156-167.
- Schurink, W.J. 1994. Causes: some explanations for juvenile offending. In Glanz, L. (Ed.), *Preventing Juvenile Offending in South Africa: Working Proceedings*, HSRC Press: Pretoria, 47-55.
- Schurink, W.J. and Schwabe, C.A. 2000. Activity 5: Piloting of multivariate analysis to explain crime, Part 4: important social science dimensions in the multivariate analysis of crime phenomena. Research report, DACST Innovation Fund Project Number: 13102.
- Schwabe, C.A. and Schurink, W.J. 2000. Crime forecasting and multivariate analysis at a strategic level: towards a social science interpretation. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST), Pretoria.
- Shaw, M. 2002. Crime, police and public in transitional societies. *Transformation*, 49, 1-24.
- Shaw, C.R. and McKay, H.D. 1942. *Juvenile Delinquency and Urban Areas*. University of Chicago Press: Chicago.
- Strijdom, H.G. and van der Colff, J.A.L. 1975. *'n Ontleding van Suid-Afrikaanse Jeugmisdaadstatistiek: 1969-1970*. RGN: Pretoria.
- Weir-Smith, G. 2004. Crime mobility: spatial modelling of routine activities of arrestees and substance abusers in South Africa. *GeoJournal*, 59, 209-215.

Willis, C.L., Evans, T.D. and LaGrange, R.L. 1999. "Down home" criminology: the place of indigenous theories of crime. *Journal of Criminal Justice*, 27, 227-238.

Wilson, J.Q. and G.L. Kelling. 1982. Broken windows: the police and neighborhood safety. *Atlantic Monthly*, 29-38.

CHAPTER 2

KEY REQUIREMENTS IN THE DEVELOPMENT OF AN URBAN ECOLOGICAL THEORY OF CRIME IN SOUTH AFRICA

Gregory Dennis Breetzke and Andre Carl Horn¹

¹ Department of Geography, Geoinformatics and Meteorology, University of Pretoria,
Pretoria 0002, South Africa, andre.horn@up.ac.za

* A revised version of this chapter is published in the *South African Journal of Criminology*

Published: *South African Journal of Criminology*, 2008, 21(1), 123-143.

ABSTRACT

South Africa is a country ravaged by crime yet few theoretical frameworks exist by which to guide crime reduction initiatives, and fewer incorporating a spatial component. Space is becoming an increasingly important factor in crime research with both the spatial distribution of offences and offenders seemingly playing important roles. Empirical research investigating the spatial dimension of crime in South Africa is sorely lacking however which is a worrying fact given the importance this factor plays in understanding criminal behaviour. In this paper key requirements in the development of an urban ecological theory of crime in South Africa are outlined and investigated. The satisfaction of these five key requirements will not only result in a better understanding of the unique motivating factors behind crime in the country but will also serve to inform a theoretical approach to crime reduction.

INTRODUCTION

Crime is a destructive socio-economic phenomenon and the search for the rationale behind crime and its control thereof is an ongoing task. The rate and nature of crime in post-apartheid South Africa is currently perceived as one of its main challenges (Altbeker, 2007). Since 1994, two diverse strategies have been employed to control the rapid escalation of crime in the country – the National Crime Prevention Strategy (NCPS) adopted in 1996 and the National Crime Combating Strategy (NCCS) launched in 2000, both with arguably limited success (see van der Spuy, 2001; Leggett, 2004). According to Dixon (2001) a more thorough theoretical understanding of crime and its causes in the country is required in order to guide and prescribe crime reduction initiatives. According to the researcher such a theory should go beyond idealist views linking present levels of crime in the country to the continuity of apartheid divisions and he rather calls for an approach of critical realism. In addition to the legacy of apartheid a critical realistic perspective acknowledges the impact of unrealistic economic expectations linked to unequal opportunities and of a shift in state policy towards neo-liberalism (Bond, 2000) and the challenges of a typical society in transition (Shaw, 2002). Due to its socio-political history South Africa is a unique country where the rate and violent nature of crime cannot be explained alone by universal reasons for crime, the general characteristics of a typical country in transition, globalisation, neo-liberalism, and even the unique legacy of apartheid. Critical introspection should also acknowledge that crime in South Africa has become a phenomenon that ‘fuels itself’ (Altbeker, 2007), amongst others, as a result of post-apartheid moral degeneration, and a political-administrative hegemony that is increasingly in conflict with itself. Only the ignorant will argue that a new critical

realistic perspective should be devoid of a localised urban ecological interpretation of crime, a topic largely neglected in South Africa.

This paper aims to identify a number of key requirements in the development of an urban ecological theory of crime in South Africa. Methodological issues that hinder the understanding of the socio-economic, criminological and ecological interpretations of crime in the country are also noted with specific reference to geographical information technologies. The paper concludes by outlining a number of tangible benefits that could result from a better ecological understanding of crime in the country.

KEY REQUIREMENTS

The purpose of this section is to identify a number of key requirements in the development of an urban ecological theory of crime in South Africa. In each instance we delve into the requirement and provide a brief overview and assessment of its current status in the country.

Requirement 1: Assess the present status of GIS within crime science in the country

A major reason for the revival of ecological studies of crime over the past number of years has been the development of Geographic Information Systems (GIS). The rapid advancement and proliferation of GIS has increased interest in crime mapping and revolutionised crime science (Bowers *et al.*, 2004). The technology is *sine qua non* for ecological studies across all disciplines as it allows for the structuring and

manipulation of rapidly multiplying aggregated data sources and converting it into useful information (Longley and Clarke, 1995). Within a crime context this translates into the establishment and exploration of links and spatial relations between data derived from crime reports, census variables, transport information and land use, among others (Bowers and Hirschfield, 1999). GIS can additionally support both exploratory and confirmatory analysis, provide tools for both inductive and deductive approaches, and support both scientific research and the implementation of public policy based on GIS models (Mark, 1999). Recently, several tools have also been integrated into GIS software to facilitate more rigorous analyses of the spatial patterning of crime through the use of exploratory spatial data analysis (ESDA) procedures. According to Cameron (2005) the central feature of ESDA is the use of formal statistical tests to determine whether crime or offender locations show evidence of clustering or are randomly distributed. These include nearest neighbour analysis tests for point pattern data and spatial autocorrelation tests for aggregated data or event data that have intensity values applied to them. In both instances a more thorough spatial understanding of the distribution of criminal events are provided to the user.

The decreasing cost of desktop computers and the increased availability of georeferenced information at a neighbourhood-level have also allowed ever more sophisticated and flexible GIS representations to take shape (Messner and Anselin, 2004). More recent manifestations of GIS technology in crime science include hot spot analysis (Block and Block, 1995; Eck *et al.*, 2000; Bowers *et al.*, 2004), journey-to-crime modelling (Liggett *et al.*, 2003; Rossmo, 2000), geographic profiling (LeComber *et al.*, 2006; Cooper *et al.*, 2001; Laukkanen and Santtila, 2006), and

more recently, geodemographic analysis (Ashby, 2004; Ashby and Longley, 2005; Williamson *et al.*, 2006). In all these applications GIS provides an important platform from which to understand the spatial and temporal incidence of crime and in doing so analyse and extend existing criminological theory. Thus, the contemporary GIS-based ecological approach is far removed from the meta-explanation of classical ecological theory and instead offers an integrated and complementary dimension to critical crime analysis.

The use of GIS in crime science in South Africa is in its infancy. Region-specific and demographically representative monitoring of crime only began after the democratically elected government came to power in 1994 (Blackmore, 2003), while the use of crime mapping within the South African Police Service (SAPS) is at an embryonic stage (Eloff, 2006). From a governmental perspective, recent legislation has been put into place to ensure that a GIS exists (or is at least supposed to exist) at the majority of police stations in the country. Currently the Crime and Information Analysis Centre (CIAC) of the SAPS collates and coordinates crime information across the country in order to provide intelligence at all levels of policing namely station area, provincial and national (Buys, 2003). A number of semi-privatised parastatals also conduct independent geographic investigations of crime including the Human Sciences Research Council (HSRC) (see Schwabe and Schurink, 2000a; Weir-Smith, 2004) and the Council for Scientific and Industrial Research (CSIR) (see Gilfillan, 1999; Schmitz *et al.*, 2002), among others. Independent research utilising GIS within a crime context include Lochner and Zietsman (1998), Redpath (2001) and Erasmus and Mans (2005). In a number of these examples however concerns have been expressed regarding the actual ability of the government, in general, and the

SAPS, in particular, to harness the technology to supplement the policing process. Researchers express concerns ranging from incomplete spatial data (Gilfillan, 1999; Schwabe and Schurink, 2000b; Eloff, 2006) to the ineffective capturing and coding of crime information at the crime scene (Schwabe and Schurink, 2000b; Buys, 2003). These concerns not only question the ability of researchers to undertake ecological studies of crime in the country but highlight a pressing need for a more thorough investigation to assess the present use and status of GIS within crime science in the country with regards to Geographical Information (GI) infrastructure, capacity and knowledge. Within this context it is also important to highlight the various geo-analytic operations that GIS offers to crime scientists in South Africa as well as identify the major inhibitors to the potential offered by the technology to supplement policing and inform researchers regarding existing ecological approaches to crime.

Requirement 2: Gauge the applicability of international ecological theories of crime in a local context

A growing body of literature has emerged to test empirically common theories of criminal activity including the social disorganisation theory (Ouimet, 2000; Cahill and Mulligan, 2003), routine activities theory (Felson, 1997; Smith *et al.*, 2000), strain theory (Sharp *et al.*, 2001; Froggio and Agnew, 2007), and the general theory of crime (Sorenson and Brownfield, 1995; Burton Jr *et al.*, 1999). Despite these criminological theories being predominantly developed in the United States (US) cross-national analyses and testing of so-called ‘American’ theories of crime has taken place in Australia (Braithwaite, 1995), Britain (McCulloch, 2003), Yugoslavia (Separovic, 1983), China (Bao *et al.*, 2004), the Philippines (Maxwell, 2001), Korea (Kang, 1983; Moon and Morash, 2004), Japan (Fenwick, 1996) and South America (Defleur, 1970).

In each instance the theory that underlies the prospective ‘American’ approach is tested within a local context to gauge its relevancy and accuracy, with varying degrees of success. In some instances, localised concepts have been blended in with ‘American’ theory to help explain crime and delinquency. For example in Australia, Braithwaite (1995) incorporated localised shame and reintegration with ‘Western’ theory, while Korean criminologist Jin-Kew Shin incorporated concepts from Western developed countries in formulating his own ‘dynamic theory of criminal behaviour’ (Kang, 1983). Within this context Willis *et al.* (1999) bemoans the lack of attention given to theoretical developments unique to the historical, cultural, and social structural characteristics of lesser-known societies. Local researchers already highlight the lack of any theoretical context to use in understanding crime in South Africa (Dixon, 2001, Shaw, 2002; Altbeker, 2007), while Ovens (2003) has long advocated for the ‘Africanising’ of existing criminological theory.

In South Africa common criminology theories such as those of the ecological school have never been practically implemented and assessed (Eloff, 2006). A cursory review of local criminological research reveals that while ‘American’ theories of crime have often been used to interpret and explain research findings in the country (see Schurink, 1976; Gilfillan, 1999; Schwabe and Schurink, 2000b; Davis, 2001; Weir-Smith, 2004), they have never been utilised as a basis to, for instance, inform variable selection for ecological analysis or to provide a clearer specification for the use of one or more statistical model. As Eloff (2006, p.230) understates:

“There is room for improvement in environmental criminology in the South African context, as well as in the integration of specific natural science concepts within criminology to expand the knowledge base of

future criminologists to apply new technologies to improved crime prevention strategies and crime analysis.”

As a result the relevance of existing ecological theories and their associated concepts of collective efficacy, social cohesion and community fragmentation, among others, within a local context are largely unknown. There is thus a need in South Africa to assess and investigate the applicability of international ecological theories of crime in order to potentially develop and extend existing theories using local theoretical knowledge. South Africa is a country with unique social, economic, political and environmental features. Among the more prominent socio-political factors to have scarred South African society is the creation of the former homelands and urban townships that were spatially designed and implemented by the former apartheid regime (Schwabe, 2000). These townships segregated South African society on the basis of race and the results of this urban development may be spatially incongruent with an ‘American’ theory of crime where for instance, ethnic heterogeneity plays a significant facilitating role in delinquency. In addition, the impact of post-apartheid neo-liberalist exclusions, moral degeneration, and cultural and political strife on the applicability of ‘American’ theories to the mutating spatial ecology of crime in South Africa is also largely unknown.

A test of existing ecological theory is therefore a key requirement not only in evaluating the ethnocentrism of American criminology but also in the development of an urban ecological theory of crime in South Africa. If existing ecological theory is found to accurately account for the spatial distribution of crime phenomena in South Africa then the theory holds true, if not, then as Inverarity *et al.* (1983, p.31) notes:

“The problem in evaluating a theoretical statement is not one of discovering exceptions, but of imagining alternative theories that explain the phenomenon better.”

Requirement 3: Identify the ecological determinants of crime and delinquency

The location of crime and the spatial origin of offenders are both fundamental considerations in any quantitative assessment and extension of existing criminological theory. This requirement is subdivided into two separate sections dealing first with the need to identify the ecological characteristics of crime locations, and second, the need to identify the ecological characteristics of offender locations.

- Crime locations

In ecological theory the characteristics of the population and the characteristics of the place influence whether or not a crime will occur or the ‘crime potential’ of an area, ie. the likelihood that a crime will be exhibited in an area as a function of various ecological features (Brantingham and Brantingham, 1993; Brantingham and Brantingham, 1999). Two basic data requirements are essential in an ecological investigation into the spatial patterning of crime locations. The first is crime information, which typically acts as the dependent variable in the model and most often appears in the form of a crime rate; the second is some form of demographic or ‘lifestyle’ data aggregated by area acting as the explanatory variables most often in the form of census or other ancillary datasets. While variations of these two data requirements are common in international ecological crime research (see Ouimet, 2000; Cahill and Mulligan, 2003; Oh, 2005; Andresen, 2006), the basic premise is generally the same, which is to illuminate the characteristics and features of crime locations within an areal unit. Locally, crime information is released by the SAPS to

the public in the form of crime statistics. These crime statistics are released annually in an aggregated form as a crime count per police station boundary. Despite crime statistics in general being compounded by scepticism and mistrust (Herbert, 1982; Altbeker, 2005), they nevertheless represent the only official and spatially complete crime dataset available in the country. In terms of demographic or 'lifestyle' data, the primary source of information is the censuses released by Statistics South Africa (SSA). Other ancillary datasets released by SSA which can also be utilised in ecological studies of crime include the victimisation, labour force and general households surveys as well as datasets released from other government departments and parastatals including the Environmental Potential Atlas (ENPAT) of the Department of Environmental Affairs and Tourism (DEAT) and the CSIR's land cover dataset.

While it may appear as if the basic data requirements are available to ecologically analyse crime locations in the country two major methodological issues restrict investigations. The first is the misalignment of administrative units such as police station boundaries with census boundaries such as enumerator areas (EA), sub-place¹ and municipal boundaries. The result is that census data for example, as an auxiliary dataset in ecological studies of crime, can only be used from provincial boundary level upward (Eloff, 2006). This provides a very coarse ecological portrayal of the determinants of crime in the country and makes any inferences drawn from these findings more susceptible to the inherent limitations associated with the mapping defined boundaries such as the modifiable areal unit problem (MAUP) and the ecological fallacy (Bailey and Gatrell, 1995; Openshaw, 1984). Although a number of alternate disaggregation procedures have been used in South Africa to counter the

problem of spatial incongruencies (see Gilfillan, 1999; Schmitz and Stylianides, 2002; Eloff, 2006; Naude, 2007), GIS researchers often question the assumptions upon which these procedures are based (see Vickers, 2003; Singleton, 2004).

Figure 1 illustrates the misalignment of police station boundaries with sub-place and municipal boundaries for the city of Tshwane. The misalignment is clearly evident throughout Tshwane with some police station boundaries not only cutting across smaller sub-places but also spilling over into other municipalities and magisterial districts. In some instances Schmitz and Stylianides (2002) note that police stations have to serve up to five larger administrative units simultaneously, so depending on where the crime occurs within the police station's area of jurisdiction – this could result in one investigating officer being required to appear at the same time of the same day in five different courts, tens of kilometres apart! This not only provides a logistical and administrative nightmare for policing authorities but also hinders ecological studies using these spatial boundaries.

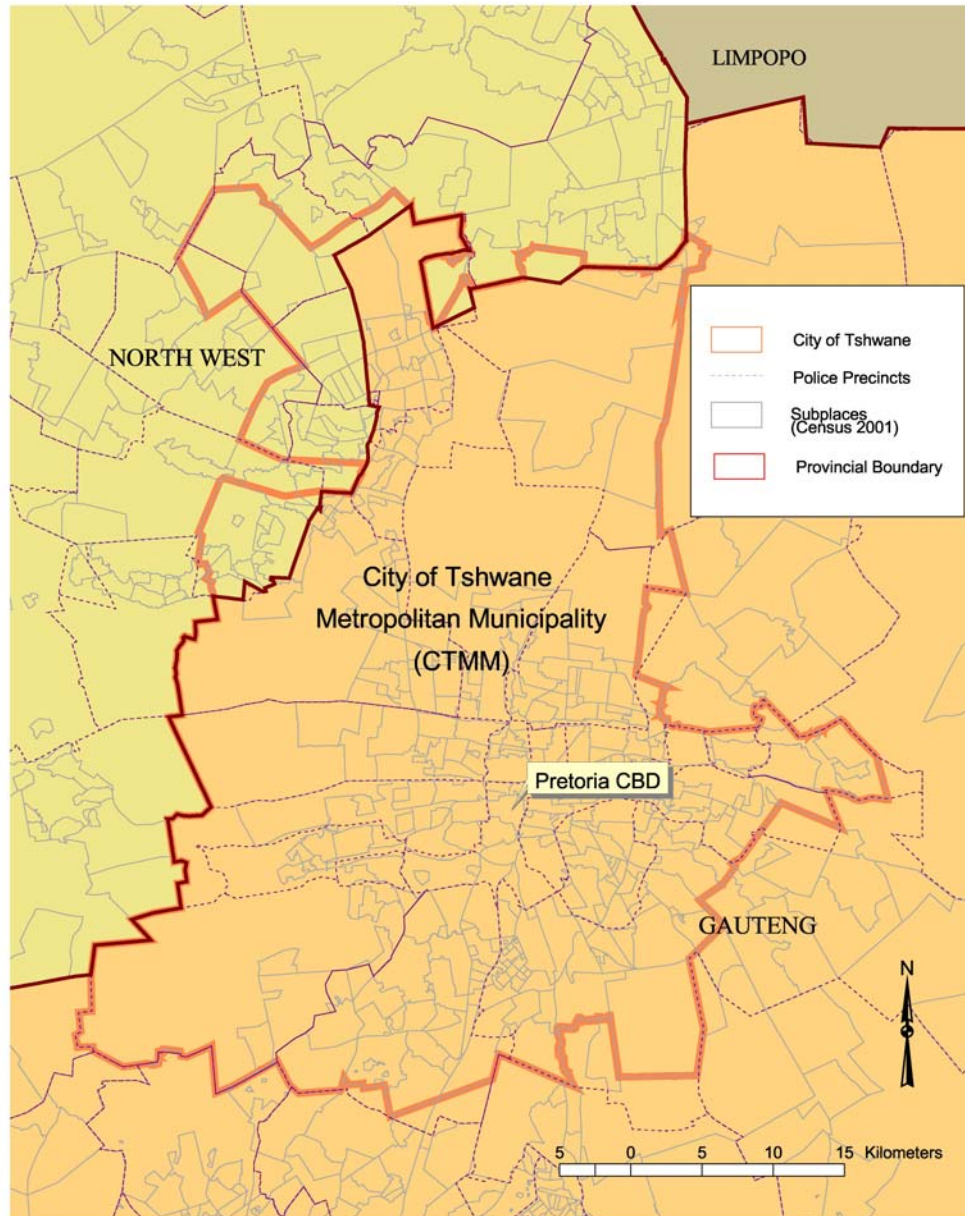


Figure 1: Misalignment of subplace boundaries within police station boundaries

The second issue that hinders ecological investigations into crime locations in South Africa is the problems related to the Case Administration System (CAS) of the SAPS. The CAS is a spatial unit that was created to record accurately information at a police station and contains information such as the code, address and time of the crime. The first problem relates to the uncertainty regarding the spatial partitioning of police station boundaries into smaller so-called CAS blocks. Embedded within police station boundaries are finer aggregated areas known as CAS blocks. When a crime occurs in South Africa it is spatially located within a CAS block, which defines what police station is responsible for managing and investigating the offence. Major problems relating to CAS blocks include the fact that they have not all been electronically captured in the country resulting in there being no clearly defined spatial boundaries for CAS blocks and an associated lack of diagnostic controls as to what they constitute (Cooper, 2007, *pers. comm*). Uncertainty abounds within the SAPS regarding the location of spatial boundaries defining CAS blocks resulting in crimes being reported and recorded at police stations outside their jurisdiction. Whereas a CAS block could entail numerous neighbourhoods it could also be defined as a road or as a railway station. To confuse matters further, a railway station may constitute a CAS block in some regions of South Africa but in other regions it could constitute part of a greater CAS block containing additional railway lines, parking facilities and other rail amenities (Eloff, 2006). When a crime occurs it could therefore be spatially located in the 'wrong' CAS block and would then be aggregated up and reported at the wrong police station level. The result is that at the initial and most integral stage of the GIS process - data collection - there is doubt regarding the accuracy and authenticity of crime data. An independent audit report in 2004 also found that effective record keeping was also not always possible within the CAS due to the lack

of computers. In one province, for instance, 29 police stations did not have computer equipment (SAPS, 2004). Another report of the auditor-general to Parliament in 2005 found ineffective monitoring and control of the CAS to the extent that dockets at certain units were assigned to members who had since left the unit; the status of cases and dockets on hand per investigator was not always reviewed and followed up by the area or provincial offices. In a single province, for example, the status of 18 407 dockets remained unchanged for more than five months, and a lack of trained staff, and controls to safeguard docket-related information resulted in ineffective docket keeping and an increased risk of dockets being lost or stolen (SAPS, 2005). For other technical problems pertaining to CAS consult Louw (1998).

Other non-spatial problems and practices involving crime data in the South African context are summarised by Schwabe and Schurink (2000b) as follows:

- The tendency to capture only the most serious offences with less serious crime phenomena not included in the crime statistics
- Inconsistency in the definition of crime phenomena and crime definitions being unclear
- Ineffective collection of relevant and comprehensive information at the crime scene, including the location where the crime was committed
- Inaccurate capturing and reproduction of crime statistics as a result of poorly trained officials
- Corruption of police officials
- Manipulation of crime statistics through the application of a variety of non-standardised weightings.

Despite these problems a limited number of studies have been undertaken in the country to examine the ecological causes of crime locations. These include Gilfillan (1999) who used regression analysis to indicate which socio-economic variables best predicted crime locations. The researcher aggregated a number of demographic variables from the 1996 census from an EA level to the police station level and constructed ordinary regression models for over 26 different crime categories ranging from murder to car hijacking. The researcher found a spatial relationship between the prevalence of poverty, low social status, and deficient social structures and norms in certain parts of the country leading to an increase in crime across certain crime types. In this instance GIS not only enabled crime to be put in its geographical context but also allowed for the effective integration of information on different crime types with demographic and other variables. With reference to the methodological issues raised earlier, Gilfillan (1999) did indicate the problems he experienced during the process of aggregating demographic variables from one spatial level into the police station level. The problems experienced were such that some demographics from the census such as unemployment and related socio-economic indices as well as family structure and cohesive indicators were not used. More recently, the Centre for Justice and Crime Prevention (CJCP) launched its Crime and Victimization Mapping Tool² that maps crime trends in different provinces, police districts and towns of the country. Among the findings, the researchers identified hot spots of criminal activity in predominantly rural areas as opposed to major metropolitan areas as well as a spatial association between high levels of inequality and house robberies and high levels of equality with more social contact crimes. Other ecological studies of crime include Brown (2001) and Blackmore (2003). In all these additional studies however a coarser magisterial or provincial unit of analysis is modelled which, as mentioned previously,

are less precise than smaller areal units and can therefore give rise to misleading inferences regarding the effects of the characteristics of neighbourhoods in relation to existing crime patterns. Nevertheless these examples indicate that despite being plagued by methodological constraints, ecological studies of crime locations and their correlation with socio-economic and other community conditions are proceeding. While this information may be encouraging to crime researchers in the country, a review of international ecological crime research indicates that a lot more needs to be done to match international spatial analytic studies of crime.

- Offender locations

In contrast to the ecological studies of crime locations, there have been no investigations into the unique spatial relationships that underlie the geographic distributions of offenders across areas in post-apartheid South Africa. As a result both the population and place characteristics of areas affected by high and low rates of offenders are unknown. A number of ecological studies of delinquency were conducted in apartheid South Africa and include Lötter (1964) and Schurink (1976, 1978). Both researchers found a correlation between the spatial distribution of offenders and 'low social class' in designated areas in the former Pretoria municipality of South Africa. An examination of local literature since these studies indicate a relative dearth in ecological studies of delinquency in the country, and no studies conducted since democratisation. There are a number of possible reasons why an investigation into this aspect of criminality in post-apartheid South Africa has been neglected. First, the methodological issues referred to earlier also holding true for ecological investigations into offender patterns in the country. Second, the sensitivity of the information involved. Knowing 'where offenders live' can potentially lead to

the negative labelling of neighbourhoods and the inferences gained from such knowledge could be construed in some parts of the country as blatant racism. Third, in a new democracy like South Africa, which has already suffered socio-spatial segregation in terms of its political history, the profiling and subsequent stereotyping of neighbourhoods as ‘high risk’ or ‘hot-spots’ could echo state policies of years gone by. A need exists in post-apartheid South Africa however to transcend the racial stigmatising of delinquency and refocus towards a spatial appraisal of offenders and their distribution. In doing so, policymakers can gain a spatially based perspective of the motivators driving criminal behaviour and integrate that knowledge in current crime reduction initiatives.

A number of non-spatial studies have however been conducted to gain more insight into offenders in post-apartheid South Africa. Local researchers highlight poor socio-economic status (Blackmore, 2003), community disorganisation (Pelser and de Kock, 2000), availability of alcohol and drugs (Maree, 2003), high unemployment (Brown, 2001; Blackmore, 2003), family characteristics (Wedge *et al.*, 2000), poverty (Maree, 2003), racial and economic inequality (Demombynes and Özler, 2005) as being general risk factors for delinquency. When contrasted with international studies assessing criminogenic risk for offenders Maree (2003) found that South African research findings do concur with foreign studies regarding the main categories of criminogenic risk factors although changes were noted regarding the sequencing of the risk factors with factors present within the family considered more often as risk factors in a local context with environmental and community risk factors also emphasised more. Ecological studies assessing criminogenic risk for delinquency are less forthcoming however and this highlights the need to gain spatially based insight

into the ecological motivations behind offenders particularly if, as Altbeker (2007) suggests, a strategic shift is required in South Africa from managing crime to managing offenders.

Notwithstanding the methodological issues referred to earlier, ecological studies examining ‘where crime occurs’ as well as ‘where offenders live’ are both important factors in the development of an urban ecological theory of crime in South Africa. It is evident from this synopsis that while a number of studies have been conducted exploring the ecological determinants of crime locations, a major shortcoming of geo-analytic based research of crime in the country is the lack of attention placed on the spatial distribution of offenders. This knowledge, supplemented with an understanding of the ecological causes of crime locations, will not only inform crime prevention programmes and policies regarding the ecological risk factors that influence offender propensity but provide a solid platform from which to develop an urban ecological theory of crime in general in the country.

Requirement 4: Profile neighbourhoods based on risk

Closely aligned with the need to identify the ecological determinants of crime and delinquency in the country (Requirements 3) is the need to generate risk profiles of certain geographic areas such as neighbourhoods. An important distinction must be drawn here; determining the ecological reasons for crime identifies either those factors that place people at risk of becoming offenders or that place neighbourhoods at risk of becoming crime locations. Generating risk profiles on the other hand takes this process a step further by dividing neighbourhoods into groups based on similarities in terms of the various ecological risk factors identified. Neighbourhoods

are clustered on the basis of social similarity, rather than locational proximity (Webber and Longley, 2003), with the classification being both mutually exclusive and collectively exhaustive (Harris *et al.*, 2005). The resultant profiles can reflect a prioritisation of neighbourhoods that require specific government intervention based on the characteristics of each ‘risk category’ profiled. Similar to requirement 3, the authors attest that the most pressing need in South Africa is to focus on offenders and in this context construct offender risk profiles of neighbourhoods in the country. By classifying neighbourhoods according to the perceived risk of predisposing residents into a criminal lifestyle, intervention strategies can target the root causes of the problem rather than the symptoms. In reviewing neighbourhood profiles Chainey and Ratcliffe (2005) differentiate between an offender profile and an offending profile. According to the researchers the former represents an investigation into a particular crime in order to determine the type of person likely to be a key suspect, while the latter identifies the more general characteristics of those likely to commit crimes. An offending profile can be obtained directly using information from existing offenders or could be inferred through an ecological examination of the offender’s area of social interaction. The emphasis is subsequently placed on the spatial location of the offender in conjunction with the contextual influences that are exerted on him or her.

A number of offender profiles have been compiled in South Africa. Mistry and Dhlamini (2001) profiled perpetrators of farm attacks as young, single, unemployed black South African males between the ages of 15 and 35 from an unstable family background, while Minnaar (2000) concluded that ‘cop-killers’ were most likely to be single, black males in their mid-20s with a low level of education, and having had a deprived childhood in a dysfunctional home. Other offender profiles have also been

compiled by Wood (2000), Delpont and Vermeulen (2004) and Hennop *et al.* (2001). The offender profiles outlined above, while important in highlighting those demographic risk factors for delinquency neglects the geographic context under which they occur. Not all unemployed black South African males commit crime, and it is often within the spatial context of his or her community that these risk factors are accentuated. The tools of spatial econometric modelling, in the form of geodemographic classification systems, are especially well suited to profile these communities at risk.

Geodemographics is posited on the now familiar ‘First law of Geography’, namely that ‘everything is related to everything else, but near things are more related than far things’ (Tobler, 1970). More colloquial expressions would be ‘birds of a feather, flock together’ or ‘You are where you live’ (YAWYL) (Sleight, 2004). In principle, geodemographics assume that two people who live in the same neighbourhood are more likely to exhibit similar characteristics (and behaviour) than two people chosen at random (Debenham *et al.*, 2001). Despite geodemographics having etched out significant research domains in both the disciplines of geography and sociology (Williamson *et al.*, 2006), the use of the technology in criminological research is relatively immature (Ashby and Longley, 2005). Williamson *et al.* (2006, p.197) finds it extraordinary that “while the recognition of crime-prone communities has a long history, geodemographic analysis of crime and offender trends is underdeveloped.” A number of exceptions do apply however and illustrate the potential of this geo-analytic technique to provide valuable insight into the location of offenders. For example, Ashby (2005) illustrated how the likelihood of offenders residing in *Municipal Dependency* neighbourhoods is over four times the average rate for all

neighbourhoods in the MOSAIC system. Similarly Williamson *et al.* (2005) found that approximately 70% of all youth crime committed in Nottinghamshire over a five-year period was attributed to young offenders residing in only 14 of the 61 different neighbourhood types as classified by the MOSAIC system. Other examples are offered in a number of works (Ashby, 2004; Ashby and Longley, 2005; Williamson *et al.*, 2006). Not surprisingly geodemographics has been used within a crime context in South Africa. Schwabe and Schurink (2000a) note the use of geodemographics to create a socio-crime classification of over 1100 police station areas in South Africa. A database consisting of over 250 census variables and 74 crime variables was created and linked to police station boundaries and entered into an ANN. Kohonen's Self-Organising Map (SOM) algorithm was subsequently used to cluster the 1100 police stations into 20 primary socio-crime categories. The 20 categories reflected a prioritisation of police stations that required specific government intervention according to the dominant crime types and socio-demographic characteristics that occurred in each category. Schwabe (2000) reports on the possible use of geodemographic systems to compile a national or provincial profile of offenders for each crime type in South Africa. The researcher hypothesises that such a system can facilitate a better understanding of the cultural diversity of the country as well as provide insight into the social context of crime and highlight the socio-economic causes of offender development. Rose (2004) also speculates on the use of geodemographics to develop offender profiles, much like retailers identify customers and areas of high market potential.

Following the ecological tradition, there is thus a need to profile neighbourhoods based on risk in South Africa. The ongoing geographic nature of social inequality and deprivation in the country linked with race and ethnicity calls for a closer investigation into this dimension of crime. As ecological risk factors may tend to cluster in certain areas, investigations paying closer attention to these clusters rather than on single variables are preferable. The advantage of an offender profiling system lies not only in the ability to profile potential offenders and thereby improve crime detection rates but more importantly to provide a spatial platform from which to develop an urban ecological theory of crime in the country. Different social structural conditions of at-risk neighbourhoods across racial and ethnic divides can additionally be investigated. According to Ericson and Haggerty (1999) policing is changing from the traditional focus on maintaining law and order to a role that is more about detecting and managing risk and communicating that risk to other institutions in society. A central task of governments should be to control these risks that cause public consternation, including that of delinquency (Giddens, 2002). Locally, Glanz and Schurink (1994) also highlight the importance of identifying *at risk* individuals as part of a short-term strategy to deal with juvenile delinquency in South Africa. By profiling neighbourhoods by risk a knowledge-based approach to the problem of crime can be obtained that focuses not only on risk factors pertaining to potential offenders, but more importantly on their incidence linked to space.

Requirement 5: Understanding the complexity of crime and the urban environment

Due to its recent political history South Africa is a country that is inherently confronted with social disorganisation and socio-spatial fragmentation (Pieterse, 2004). Increasing income inequality linked to multi-ethnicity, racial and ethnic segregation, family disruption and population mobility are main characteristics of many emerging cities of the world and due to its apartheid history South Africa's cities represents an archetype in this regard. But, before one can even think about the development of an urban ecological theory of crime in South African cities the complexity of crime, its causes and the changing nature of cities and society should be considered first.

Crime is not an empirical, uncontested fact. Rather, it is an anti-normative process that requires an examination between incivilities (anti-social behaviour), criminality (criminal tendencies) and actual crime (Davies, 2005). The study of crime is further complicated by categories of failed, actual, reported, investigated, charged, and convicted crime, as well as by notions of anomie, alienation and deviance, and by labelling and demonisation. Consequently crime is a relative, culturally contested variable across space and time. Such a relativist, hermeneutic interpretation of crime obviously challenges narrow, empirical explanations of crime. Nevertheless, criminologists have offered a multitude of alternate, sometimes overlapping, often competing theoretical explanations for crime. Based on the interpretations of Herbert (2002) and Davies (2005) five sets of explanations are considered. *Individual explanations* of crime initially linked crime to 'innate evil' in the individual and later to biological deficiency and disorder. Individual criminality may also be the result of learned behaviour among people who never socialised out of anti-social and criminal behaviours. Fonagy (2003) argues that these social and biological explanations may be converging in the individual criminal. There may also be *group or sub-cultural explanations* for criminal behaviour, for example juvenile delinquency and gangsterism, but also economic desperation and moral degeneration that are linked to notions of values, socialisation, and social, economic and political conflict. *Area explanations* link crime to the environment including

the physical environment of locality resulting from urban design, architecture and maintenance, as well as the ecological environment of the neighbourhood that, for example, could support theories of social deprivation and social disorganisation, and, third, the perceived environment representative of the cognitive-affective domain of the beholder and/or community. There are also *societal explanations* for criminal behaviour founded on so-called critical conflict theories that attribute crime to deep-seated structures or mechanisms of society such as economic materialism and apartheid resulting in dynamic consensual and conflict tendencies in society. Finally, there is the *explanation of intentional, professional crime* as an alternative way life, that is, criminality that cannot be explained by individual deficiency, environmental influence or social disorder, but rather by a premeditated choice of criminality as a mode of economic production and as a career path.

The ecological criminologist should particularly be aware of the changing structure and dynamics of cities as well as societal changes. Increased spatial mobility as a result of improved transportation and increased inter-connectivity as a result of technological advance provide impetus to urban processes such as decentralisation and urbanisation creating polycentric cities (see Pacione, 2005) that not only enlarge the area of individual's activities but also accentuates spatial polarisations of race and class, that, amongst others, result in distinctly different geographies of crime locations and offender origins in the late-modern city (Herbert, 2007, *pers. comm*). In addition, overall societal processes such as social, cultural and economic globalisation, de-industrialisation, cultural post-modernism, and changing international and regional migration patterns have a huge impact on the spatial and social expression of urban cosmopolitanism, exclusivity and the nature and patterning of crime. South African social ecology is further complicated by the dynamics and challenges of a unique society in transition where the legacy of the past, new forms of exclusion, and democratic volatility strengthen notions of relative rather than absolute deprivation, individualist immediacy, hedonism and self-actualisation, as well as ontological insecurity (see Dixon, 2001; Shaw, 2002). Thus, although the spatial ecology of crime and offenders

represents only a small part of the crime equation it nevertheless makes a very important contribution to the overall understanding and management of crime.

CONCLUSION

It is apparent at this juncture that South Africa is in need of an inclusive critical-realistic theory on crime embedded in space and focusing predominantly on offenders. Crime scientists are becoming increasingly aware of the importance of spatial dynamics in empirical research and as a result ecological studies of crime are returning to the forefront of criminological inquiry (Messner and Anselin, 2004). Within this context, GIS stands at the vanguard of criminological research, in measurement terms as more data is being collected about aspects of crime than ever before; and in analysis terms as the toolkit of spatial analysis GIS offers allows it to match diverse data sources and accommodate the uncertainties created by scale and aggregation effects (Longley, 2005). Indeed much of the growth in the ecological analysis of crime over the past 25 years has been supported by the development of improved procedures for the analysis of ecological data (Gruenewald *et al.*, 2006). The rapid development of GIS technology and the concomitant testing and extension of ecological theories of crime worldwide must not leave South Africa in its wake.

This paper identified a number of key requirements in the development of such an ecological theory. To satisfy these requirements would not only result in a significantly better ecological understanding of crime and delinquency in the country but in a number of important tangible benefits. From a governmental perspective, a theory inclusive of an ecological understanding of crime and, particularly, offenders, will provide a number of important benefits to the tactical, operational and strategic plans of the SAPS. In *tactical terms*, the intelligence garnered from an ecological understanding of crime in South Africa can be used to guide operational units to specific locations and individuals linked to criminal activities, potentially

leading to the arrest of wanted suspects and suspicious persons. In *operational terms*, the development of an ecological theory of crime in South Africa will inform a number of operational actions that are undertaken by the SAPS. For example, the routes for vehicle and foot patrols could be better delineated; the locations of roadblocks could be better identified; the locations of cordon-and-search and stop-and-search operations could also be better targeted. These operational locations would not necessarily take place where the ‘most crimes occur’ or where the ‘most offenders live’ but where the *risk* of crime occurring or offenders residing is high. Lastly, from a *strategic perspective*, government and other role players that deal specifically with addressing the long-term solutions to crime can utilise the knowledge to highlight the root causes of crime and measure ways to address them.

An urban ecological theory of crime in South Africa should ideally include aspects pertaining to both the location of crime as well as offenders. The exploratory work on the social ecology of crime must, of course, be expanded upon but it is the opinion of the authors that the most pressing need is to launch an investigation into the residential distribution and related geodemographics of offenders. Currently no empirical investigations have examined the potentially unique ecological relationships of offenders in post-apartheid South Africa and of its cities in particular. The formalisation of an urban ecological theory of offender distributions in South African cities will be original across the two complementary disciplines of GIS and criminology. In terms of the key requirements referred to in the article, such research would represent for the first time that GIS technology has been used to: (1) determine what ecological risk factors are associated with high or low levels of criminal behaviour in the country, (2) measure what effects location has in terms of generating an offender profile of a suspect in South Africa, i.e. the importance of space, (3) profile and develop a taxonomic delineation of neighbourhoods assessing risk of offender development, and finally, (4) develop an ecological understanding of crime in the country. The knowledge garnered from such investigations will necessarily impact on the associated field of criminology in South Africa. Local crime scientists would be able to provide feedback to the

dominance and ethnocentric bias of American criminology as well as lay a theoretical foundation for a critical-realistic and ecological understanding of crime in the country.

ENDNOTES

¹ Sub-place (SP) level is the next level up from Enumerator Area (EA) and one below the main place in the geographical area hierarchy structure of SSA and represents the highest spatial resolution at which Census2001 information has been legally provided by the South African government. SSA defines the sub place level as the combination of all EAs with a population of less than 500 with adjacent EAs within the same sub-place. 21 243 SPs were coded during Census2001 covering the entire country.

² <http://cjcp.poweredbyit.com/intro/mapintro.html>

REFERENCES

- Altbeker, A. 2005. Positive trends: the 2004/5 crime statistics. *SA Crime Quarterly*, 14, 1-11.
- Altbeker, A. 2007. *A Country at War with Itself: South Africa's Crisis of Crime*. Jonathan Ball: Johannesburg.
- Andresen, M.A. 2006. Crime measures and the spatial analysis of criminal activity. *British Journal of Criminology*, 46, 258-285.
- Ashby, D.I. 2004. Geodemographics for policing: a new approach to the analysis of geographic variations in crime and policing performance. Paper presented at the 7th International Crime Mapping Research Conference, Boston.
- Ashby, D.I. 2005. Policing neighbourhoods: exploring the geographies of crime, policing and performance assessment. *Policing and Society*, 15, 413-447.
- Ashby, D.I. and Longley, P.A. 2005. Geocomputation, geodemographics and resource allocation for local policing. *Transactions in GIS*, 9, 53-72.

- Bailey, T.C. and Gatrell, A.C. 1995. *Interactive Spatial Data Analysis, 2nd Edition*. Longman: UK.
- Bao, W., Haas, A. and Pi, Y. 2004. Life strain, negative emotions, and delinquency: an empirical test of General Strain Theory in the People's Republic of China, *International Journal of Offender Therapy and Comparative Criminology*, 48, 281–297.
- Blackmore, F.L.E. 2003. A panel data analysis of crime in South Africa. *South African Journal of Economic and Management Sciences*, 6, 439-458.
- Block, R. and C. Block. 1995. Space, place and crime: hot spot areas and hot place of liquor-related crime. In Eck J.E. and Weisburd, D. (Eds), *Crime and Place, Volume 4*. Criminal Justice Press: Monsey, 145–184.
- Bond, P. 2000. *Elite Transition*. University of Natal Press: Pietermaritzburg.
- Bowers, K. and Hirschfield, A. 1999. Exploring links between crime and disadvantage in northwest England: an analysis using geographical information systems. *International Journal of Geographical Information Science*, 13, 159-184.
- Bowers, K., Johnson, S.D. and Pease, K. 2004. Prospective hot spotting: the future of crime mapping? *British Journal of Criminology*, 44, 641-658.
- Braithwaite, J. 1995. *Crime, Shame, and Reintegration*. Cambridge University Press: New York.
- Brantingham, P.L. and Brantingham, P.J. 1993. Nodes, paths and edges: considerations on the complexity of crime and the physical environment. *Journal of Environmental Psychology*, 13, 3–28.
- Brantingham, P.L. and Brantingham, P.J. 1999. A theoretical model of crime hot spot generation. *Studies on Crime and Crime Prevention*, 8, 7–26.
- Brown, K.V. 2001. The determinants of crime in South Africa. *The South Africa Journal of Economics*, 69, 269-299.

- Burton Jr, V.S., Evans, T.D., Cullen, F.T., Olivares, K.M. and Dunaway, R.G. 1999. Age, self-control and adults' offending behaviors: a research note assessing a General Theory of Crime. *Journal of Criminal Justice*, 27, 45-54.
- Buys, J.J. 2003. Hijacking of truck with freight: a criminological analysis. Unpublished M.Sc. Thesis, University of South Africa (UNISA), Pretoria.
- Cahill, M.E. and Mulligan, G.F. 2003. The determinants of crime in Tucson, Arizona. *Urban Geography*, 24, 582-610.
- Cameron, J.G. 2005. Spatial analysis tools for identifying hot spots. In Eck, J.E., Chainey, S., Cameron, J.G., Leitner, M. and Wilson, R.E. (Eds), *Mapping Crime: Understanding Hot Spots*. Special report: National Institute of Justice, 35-63.
- Chainey, S.P. and Ratcliffe, J.H. 2005. *GIS and Crime Mapping*. John Wiley & Sons: London.
- Cooper, A.K. 2007. Personal communication. Senior Researcher, Infotek. Council for Scientific and Industrial Research (CSIR).
- Cooper, A.K., Byleveld, P. and Schmitz, P.M.U. 2001. Using GIS to reconcile crime scenes. Paper presented at the 5th Annual International Crime Mapping Research Conference, Dallas.
- Davies, W.K.D. 2005. The social construction of urban crime variations. In Murayama, Y. and Du Plessis, G. (Eds), *Cities in a Global Perspective*. College of Tourism/International Geographical Union, Urban Commission: Rikkyo, Japan, 232-350.
- Davis, L. 2001. Victimisation risk of vehicle hijacking victims: a routine activities approach. *Acta Criminologica*, 14, 108-116.
- Debenham, J., Clarke, G. and Stillwell, J. 2001. Deriving supply-side variables to extend geodemographic classification. Working paper, School of Geography, University of Leeds.
- Defleur, L.B. 1970. *Delinquency in Argentina: A Study of Córdoba's Youth*. Washington State University Press: Pullman.

- Delport, C.S.L. and Vermeulen, A. 2004. Convicted male child sex offenders: a social work perspective. *Child Abuse Research in South Africa*, 5, 41-47.
- Demombynes, G. and Özler, B. 2005. Crime and local inequality in South Africa. *Journal of Development Economics*, 76, 265-292.
- Dixon, B. 2001. Exclusive societies: towards a critical criminology of post-apartheid South Africa. *Society in Transition*, 32, 205-227.
- Eck, J.E., Gersh, J.S. and Taylor, C. 2000. Finding crime hot spots through repeat address mapping. In Goldsmith, V., McGuire, P.G., Mollenkopf, J.H. and Ross, T.A. (Eds), *Analyzing Crime Patterns: Frontiers of Practice*. Sage: Thousand Oaks, 49-64.
- Eloff, C. 2006. Spatial technology as a tool to analyse and combat crime. Unpublished PhD Thesis, University of South Africa (UNISA), Pretoria.
- Erasmus, J.C. and Mans, G.G. 2005. Churches as service providers for victims of sexual and/or violent crimes: a case study from the Paarl community. *Acta Criminologica*, 18, 140-163.
- Ericson, R. and Haggerty, K. 1999. *Policing the Risk Society*. Clarendon Press: Oxford.
- Felson, M. 1997. Routine activities and involvement in violence as actor, witness, and target. *Violence and Victims*, 12, 209-21.
- Fenwick, C. 1996. Law and order in contemporary Japan: commitment, sanctions, and the quality of life. In Fields, C.B. and Moore Jr, R.H. (Eds), *Comparative Criminal Justice: Traditional and Non-traditional Systems of Law and Control*. Waveland Press: Prospect Heights.
- Fonagy, P. 2003. Towards a developmental understanding of violence. *British Journal of Psychiatry*, 183, 190-192.
- Froggio, G. and Agnew, R. 2007. The relationship between crime and “objective” versus “subjective” strains. *Journal of Criminal Justice*, 35, 81-87.
- Giddens, A. 2002. *Sociology, 4th Edition*. Polity: Cambridge.

- Gilfillan, T.C. 1999. *Modelling Crime Statistics with the 1996 Census Data*. CSIR: Pretoria.
- Glanz, L. and Schurink, E. 1994. A national strategy for preventing juvenile offending in South Africa.
In Glanz, L. (Ed.), *Preventing Juvenile Offending in South Africa*. HSRC Press: Pretoria, 113-122.
- Gruenewald, P.J., Freisthler, B., Remer, L., LaScala, E. A. and Treno, A. 2006. Ecological models of alcohol outlets and violent assaults: crime potentials and geospatial analysis. *Addiction*, 101, 666-677.
- Harris, R., Sleight, P. and Webber, R. 2005. *Geodemographics, GIS and Neighbourhood Targeting*. John Wiley & Sons: Chichester.
- Hennop, E., Potgieter, J. and Jefferson, C. 2001. The role of firearms in crime in South Africa: a detailed analysis of police dockets. Institute for Security Studies (ISS), Monograph No.55, May 2001.
- Herbert, D. 1982. *The Geography of Urban Crime*. Longman: London, UK.
- Herbert, D. 2002. Crime and its control in urban environments. In Davies, W.K.D. and Townshend, I.J. (Eds), *Monitoring Cities: International Perspectives*. International Geographical Union, Commission on Monitoring Cities of Tomorrow: Calgary/Berlin, 541-555.
- Herbert, D. 2007. Personal Communication. Senior Pro-Vice Chancellor, University of Wales, Swansea.
- Inverarity, J.M., Lauderdale, P. and Feld, B.C. 1983. *Law and Society: Sociological Perspectives on Criminal Law*. Little, Brown and Company: Boston.
- Kang, K.C. 1983. Republic of Korea. In Johnson, E.H. (Ed.), *International handbook of contemporary developments in criminology: Europe, Africa, the Middle East, and Asia*. Greenwood Press: Westport.

- Laukkanen, M. and Santtila, P. 2006. Predicting the residential location of a serial commercial robber. *Forensic Science International*, 157, 71-82.
- LeComber, S.C., Nicholls, B., Rossmo, D.K. and Racey, P.A. .2006. Geographic profiling and animal foraging. *Journal of Theoretical Biology*, 240, 233-40.
- Leggett, T. 2004. The state of crime and policing. In Daniel, J., Southall, R. and Lutchman, J. (Eds), *State of the Nation: South Africa 2004-05*. HSRC Press: Pretoria, 144-176.
- Liggett, R., Loukaitou-Sideris, A. and Iseki, H. 2003. Journeys to crime: assessing the effects of a light rail on crime in neighborhoods. *Journal of Public Transportation*, 6, 85-115.
- Lochner, F.C. and Zietsman, H.L. 1998. Using geographical information systems (GIS) for policing in South Africa: a case study in Paarl. *South African Geographical Journal*, 80, 60-72.
- Longley, P. 2005. Geographical Information Systems: A renaissance of geodemographics for public service delivery. *Progress in Human Geography*, 29, 57-63.
- Longley, P. and Clarke, G. 1995. *GIS in Business and Service Planning*. Geoinformation International: Cambridge.
- Lötter, J.M. 1964. 'n Ekologiese ontleding van misdaad in Pretoria. Nasionale Buro vir Opvoedkundige en Maatskaplike Navorsing: Pretoria.
- Louw, A. 1998. The problem with police crime statistics. Institute of Securities Studies (ISS) Crime Index, 2(3), June 1998.
- Maree, A. 2003. Criminogenic risk factors for youth offending. In Bezuidenhout, C. and Joubert, S. (Eds), *Child and Youth Misbehaviour in South Africa: A Holistic View*. Van Schaiks: Pretoria, 51-79.
- Mark, D.M. 1999. Geographic information science: critical issues in an emerging cross-disciplinary research domain. Workshop report from the Workshop on Geographic Information Science and Geospatial Activities at National Science Foundation (NSF), Arlington.

- Maxwell, S.R. 2001. A focus on familial strain: Antisocial behavior and delinquency in Filipino society. *Sociological Inquiry*, 71, 265–292.
- McCulloch, A. 2003. An examination of social capital and social disorganisation in neighbourhoods in the British Household Panel Survey. *Social Science & Medicine*, 56, 1425-1438.
- Messner, S. and Anselin, L. 2004. Spatial analyses of homicide with areal data. In Goodchild, M. and Janelle, D. (Eds), *Spatially Integrated Social Science*, Oxford University Press: New York, 127-144.
- Minnaar, A. 2000. Profiling ‘cop killers’ in South Africa. *Crime research in South Africa*, 1,1.
- Mistry, D. and Dhlamini, J. 2001. Perpetrators of farm attacks: an offender profile. Report for the Institute for Human Rights and Criminal Justice Studies, South Africa.
- Moon, B.O. and Morash, M. 2004. Reformulation of theory for alternative cultural contexts: Agnew's General Strain Theory in South Korea. *Journal of International and Comparative Criminal Justice*, 28, 77–104.
- Naude, A. 2007. Geospatial Analysis Platform (GAP). Available at: <http://www.gapweb.co.za/default.php>, last accessed 3 October 2007.
- Oh, J-H. 2005. Social disorganizations and crime rates in U.S. central cities: toward an explanation of urban economic change. *The Social Science Journal*, 42, 569-582.
- Openshaw, S. 1984. *The Modifiable Areal Unit Problem (Concepts and Techniques in Modern Geography)*. Geobooks: Norwich.
- Ouimet, M. 2000. Aggregation bias in ecological research: how social disorganisation and criminal opportunities shape the spatial distribution of juvenile delinquency in Montreal. *Canadian Journal of Criminology*, 42, 135-156.
- Ovens, M. 2003. A criminological approach to crime in South Africa. *Acta Criminologica* 16, 67-80.
- Pacione, M. 2005. *Urban Geography: A Global Perspective*. Routledge: New York.

- Pelser, A. and de Kock, C. 2000. Violence in South Africa: a note on some trends in the 1990s. *Acta Criminologica*, 13, 80-94.
- Pieterse, E. 2004. Recasting urban integration and fragmentation in post-apartheid South Africa. *Development Update*, 5, 81-104.
- Redpath, J. 2001. The bigger picture: the gang landscape in the Western Cape. *Indicator South Africa*, 18, 34-40.
- Rose, N. 2004. Governing the social. In the future of social theory. In Gane, N. (Ed.), *Continuum*, Continuum: London, 167-186.
- Rossmo, D.K. 2000. Routine activities and foraging theory: the influence of motivation on size of criminal hunting area. Paper presented at the Meeting of the American Society of Criminology, San Francisco.
- SAPS. (South African Police Service). 2004. SAPS Annual Report 2003/04.
- SAPS. (South African Police Service). 2005. SAPS Annual Report 2004/05.
- Schmitz, P.M.U. and Stylianides, T. 2002. Mapping crime levels and court efficiency per magisterial district in South Africa. Paper presented at the 6th Annual Crime Mapping Research Conference, Denver.
- Schmitz, P.M.U., Cooper, A.K. and Quick, G. 2002. Using satellite imagery for crime mapping in South Africa. Paper presented at the 6th Annual Crime Mapping Research Conference, Denver.
- Schurink, W.J. 1976. 'n Sosiologiese ondersoek na die ekologiese verspreiding van misdaad in Pretoria: 1969-1971. Unpublished M.A. Thesis, University of South Africa (UNISA), Pretoria.
- Schurink, W.J. 1978. Class-based sociological theories of deviancy and relevant ecological patterns in Pretoria. In Lever, H. (Ed.), *Readings in South African Society*. Jonathan Ball: Johannesburg, 156-167.

- Schwabe, C.A. 2000. Towards the development of a spatial information system for crime analysis and prevention: some conceptual requirements and empirical evidence from South Africa. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST), Pretoria.
- Schwabe, C.A. and Schurink, W.J. 2000a. A classification of police stations in South Africa: towards a better understanding of crime. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST), Pretoria.
- Schwabe, C.A. and Schurink, W.J. 2000b. Crime forecasting and multivariate analysis at a strategic level: towards a social science interpretation. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST), Pretoria.
- Separovic, Z.P. 1983. Yugoslavia. In Johnson, E.H. (Ed.), *International Handbook of Contemporary Developments in Criminology: Europe, Africa, the Middle East, and Asia*, Greenwood Press: Westport.
- Sharp, S.F., Terling-Watt, T.L., Atkins, L.A., Gilliam, J.T. and Sanders, A. 2001. Purging behavior in a sample of college females: a research note on General Strain Theory. *Deviant Behavior*, 22, 171–188.
- Shaw, M. 2002. Crime, police and public in transitional societies. *Transformation*, 49, 1-24.
- Singleton, A. 2004. A state of the art review of geodemographics and their applicability to the higher education market. Centre for Advanced Spatial Analysis (CASA) Working Paper, No.74, London.
- Sleight, P. 2004. An introductory review of geodemographic information systems. *Journal of Targeting, Measurement and Analysis for Marketing*, 12, 379-388.
- Smith, W.R., Glave Frazee, S. and Davison, E.L. 2000. Furthering the integration of routine activity and social disorganisation theories: small units of analysis and the study of street robbery as a diffusion process. *Criminology*, 38, 489-523.

- Sorenson, A. and Brownfield, D. 1995. Adolescent drug use and a general theory of crime: an analysis of a theoretical integration. *Canadian Journal of Criminology*, 19–31.
- Tobler, W.R. 1970. A computer movie simulating urban growth in the Detroit region. *Economic Geography*, 46, 234–240.
- Van der Spuy, E. 2001. Crime and its discontent: recent South African responses and policies. Seminar report No. 8, South African Institute of International Affairs: Johannesburg, 167-175.
- Vickers, D. 2003. The difficulty of linking two differently aggregated spatial datasets: using a look-up table to link postal sectors and 1991 census enumeration districts. Working Paper 03/2, School of Geography, University of Leeds.
- Webber, R. and Longley, P.A. 2003. Geodemographic analysis of similarity and proximity: their roles in the understanding of the geography of need. In Longley, P. A. and Batty, M (Eds), *Advanced Spatial Analysis: The CASA Book of GIS*. ESRI Press: Redlands, 233-266.
- Wedge, P., Boswell, G. and Dissel, A. 2000. Violence in South Africa: key factors in the background of young serious offenders. *Acta Criminologica*, 13, 31-38.
- Weir-Smith, G. 2004. Crime mobility: spatial modelling of routine activities of arrestees and substance abusers in South Africa. *GeoJournal*, 59, 209-215.
- Williamson, T., Ashby, D.I. and Webber, R. 2005. Young offenders, schools and the neighbourhood: a new approach to data-analysis for community policing. *Journal of Community and Applied Social Psychology*, 15, 203-28.
- Williamson, T., Ashby, D.I. and Webber, R. 2006. Classifying neighbourhoods for reassurance policing. *Policing and Society*, 16, 189-218.
- Willis, C.L., Evans, T.D. and LaGrange, R.L. 1999. “Down home” criminology: the place of indigenous theories of crime. *Journal of Criminal Justice*, 27, 227-238.
- Wood, C. 2000. A profile of young sex offenders in South Africa. *South African Journal of Child and Adolescent Mental Health*, 12, 45-58.

CHAPTER 3

GEOGRAPHICAL INFORMATION SYSTEMS (GIS) AND POLICING IN SOUTH AFRICA: A REVIEW

Gregory Dennis Breetzke

Published: *Policing: An International Journal of Policing Strategies and
Management*, 2007, 29(4), 723-740.

ABSTRACT

This paper explores the developments which have precipitated the use and integration of Geographical Information Systems (GIS) within the South African Police Services (SAPS). The paper provides a historical overview of GIS within South Africa, supplemented with the legislative origins of the integration of GIS within policing in the country. Various geo-analytic operations that GIS technology affords are highlighted to illustrate the potential that the technology offers to law enforcement agencies in South Africa. GIS is envisaged as a tool to benefit the criminal justice community by playing an important role in the policing and crime prevention process, this paper identifies the major inhibitors to the potential offered by GIS to supplement policing within a South African context.

INTRODUCTION

The reduction of crime is one of the major challenges facing South Africa. Crime has reached epidemic proportions with annual crime figures in the preceding decade continually revealing inclining broad national trends on most crime types. The crime statistics released by the South African Police Services (SAPS) in 2003 indicate that crimes such as murder, rape and hijacking are decreasing in general. These national trends however conceal vast regional differences with densely populated areas such as the Western Cape, experiencing a 35% increase in murders and a 65% increase in housebreaking (Gouws, 2004). In Gauteng, the economic hub of South Africa, incidences of assault, armed robbery and hijackings are on the increase, and more violent serial offences such as murder remain stable but high by international standards. An important impact of crime is its effect on society. The social welfare costs of crime are less tangible than perhaps the economic costs. Nevertheless these costs accrue as a rise in crime precipitates the development of various social phenomena such as the increasing urban occurrence of ‘closed neighbourhoods’ and ‘gated communities’, which since the 1990s have experienced phenomenal growth in South Africa (Landman and Schönteich, 2002). Such urban developments fuel further negative public sentiment regarding the South African government in general, and the SAPS, in particular. Local researchers emphasise the role of economic (eg. Glanz, 1990; Demombynes and Özler, 2005), social (eg. Schurink, 1976; Louw and Parry, 1999) and demographic (eg. Redpath, 2002; Standing, 2003) variables as determinants of the high crime rate, but besides highlighting certain criminogenic risk factors, these studies don’t propose any technologically tangible solutions to the scourge of crime. With mounting crime levels remaining one of the key challenges

facing South Africa, Geographical Information Systems (GIS) are envisaged as tools to facilitate policing through crime mapping and analysis. Internationally, GIS has been widely utilised to supplement crime-fighting strategies (eg. Wendelken, 1995; Hirshfield *et al.*, 1995; Bowers *et al.*, 2004; Ashby, 2005; Ashby and Longley, 2005); locally, however, the question remains whether South Africa, and the SAPS, have the necessary Geographical Information (GI) infrastructure, capacity and knowledge required to supplement the policing process.

This article is structured into four main sections. The first section provides a brief history of GIS and policing within South Africa. The second section outlines the legislative developments that led to the integration and implementation of GIS within the SAPS. The third section of the paper highlights future possibilities of the application of GIS in local crime fighting initiatives. The paper concludes by identifying certain critical success factors for the SAPS if the potential of GIS to supplement policing is to be fully realised.

A BRIEF HISTORY OF GIS IN SOUTH AFRICA

Zietsman (2002, p.34) reports that despite numerous initiatives by international and local institutions, GISes “have not really penetrated Africa to any significant degree” with van Teeffelen and Kwant (1999) reporting only 1,3% of all licensed GISes being located in Africa. South Africa has always been considered more progressive than other African countries in terms of their use of information and communications technology (Saint, 1999) and this has partly contributed to the more rapid growth of GIS in South Africa than in other parts of Africa. The 1980’s in South Africa were

characterised by a general lack of awareness in national and provincial governmental departments regarding what spatial data was available as well as what capabilities GIS offered in practice (Schwabe *et al.*, 1997). This lack of awareness has since dissipated, in part, through the provision of a mandate, in the 1990's, to state institutions such as the Chief Directorate: Surveys and Mapping and the Chief Surveyor-General of South Africa. These institutions were tasked with driving the growth and development of GIS in South Africa and currently play a vital role in providing a basic geospatial framework for data (Zietsman, 2002). The availability of large-scale population datasets and the proliferation of open source desktop mapping systems in the 1990's have resulted in GIS becoming a fast-growing industry in South Africa. The technology is currently being harnessed by government, semi-privatised institutions, and the private sector for research, planning as well as business purposes. Although several years behind first world countries, GIS has developed along similar lines in South Africa (Schwabe, 2001). The initial use of the technology lay in the environmental field before being 'discovered' by larger metropolitan areas and municipalities who saw the value of GIS for managing their information and infrastructure (Schwabe, 2001). The application of GIS technology in South Africa has provided the country with a crucial link to developments in international spatial mapping technology (da Cruz, 1999) and become a pivotal decision-making tool in a variety of application areas, including health (eg. Davids, 2002; Martin *et al.*, 2002), social welfare (eg. Ashton *et al.*, 1995) and the more recently, crime (eg. Lochner and Zietsman, 1998; Redpath, 2001; Erasmus and Mans, 2005).

LEGISLATIVE ORIGINS OF THE INTEGRATION OF GIS WITHIN THE SAPS

Two main policy documents have governed policing in South Africa since the inception of the African National Congress (ANC) government in 1994. They are the National Crime Prevention Strategy (NCPS) of 1996 and the National Crime Combating Strategy (NCCS) of 2000. These strategies were intended to ensure that crime levels were stabilised during the transformation process (Department of Safety and Security, 2003) and represent the legislative origins of the integration of GIS within policing in South Africa.

The National Crime Prevention Strategy (NCPS)

The South African cabinet adopted the National Crime Prevention Strategy (NCPS) in May 1996. The NCPS was the first official document of the new democracy that attempted to advocate a macro-strategy towards crime; and aimed at shifting the emphasis from reactive 'crime control' towards proactive 'crime prevention' (NCPS, 1996). The NCPS was based on a four pillar approach to crime prevention that included the reforming of the criminal justice system; changing the public's values and attitudes to crime; reducing crime through environmental design; and combating transnational crime. Sweeping as the strategic framework of the NCPS may have been, researchers (see Simpson and Rauch, 1999) were soon critical of the overly strong focus on policy and the lack of implementation of the strategy (van der Spuy, 2001). As a discursive framework and operational strategy the NCPS did however have some lasting influences including the establishment and implementation of various crime prevention projects throughout the country (van der Spuy, 2001). From

a GIS and policing perspective, the most pertinent project was an undertaking by a consortium comprising of three semi-privatised institutions, the Council for Scientific and Industrial Research (CSIR), the Human Sciences Research Council (HSRC) and the Medical Research Council (MRC). The project was funded by the South African Department of Arts, Culture, Science and Technology (DACST) and was tasked with enhancing the capability of the SAPS through, among others, developing and piloting innovative analytical methods and decision support systems (DSS) tools (Stylianides, 2000). A key activity in the project was a pilot study initiated by the SAPS's Crime Information Analysis Centre (CIAC) together with a project team comprising of all consortium members. The pilot study was conducted within the Johannesburg area and involved utilising GIS within the following types of crime mapping and analyses (Stylianides, 2000):

- Mapping the types of crime per Crime Administration System (CAS) block¹
- Identifying weekly variations of crime
- Pin-mapping of priority crimes
- Correlating hijackings of vehicles with recoveries of vehicles
- Mapping crime according to time-of-day and day-of-the-week per CAS block
- Generating mosaics of CAS blocks according to magnitude of the given crime
- Identifying 'hot spots' of crime.

Detailed reviews of the work done in the Johannesburg area pilot study are provided by Cooper *et al.* (1998); Schmitz *et al.* (1999) and Stylianides (2000).

The pilot study was the first time the SAPS had utilised GIS technology in practice and represented somewhat of a watershed in the development and integration of GIS within policing in South Africa. Included in the pilot study was the informal training

in November 1998 of a handful of police officers in the techniques utilised in the pilot study as well as in the software used to create the maps and to do the analyses. Output from the pilot study conveyed spatially based insight into the development of criminals and allowed the SAPS to observe other direct benefits of utilising GIS such as cost savings, staff savings, savings in storage space and the ability to produce customised maps immediately on request (Schmitz *et al.*, 2000). The project made the following additional significant impacts to the development of GIS within South African policing (Stylianides, 2000):

- The provision of training in databases and multivariate analysis to explain crime to researchers of the SAPS
- The development of a simulation model to assist the Johannesburg emergency police in the planning of their patrols
- The provision of crime mapping assistance to the Brixton Murder and Robbery Squad in Johannesburg in two cases of serial killing
- The use of crime mapping (cellular calls, crime scenes, *et cetera*) in two court cases in the Western Cape; including the successful conviction of two murderers and hijackers in the first case and of a murderer in the second case as a result of, *inter alia*, the evidence provided by the maps
- Workshopping with international geographical profiling expert Dr Kim Rossmo.

A final significant output of the project was the development of a national crime GIS database at a police station level. Approximately 1100 police station boundaries were captured into GIS and integrated with crime statistics from 1997 to 1999 and to socio-demographic information from the 1991 and 1996 censuses (Schwabe and Schurink,

2000). This development allowed the SAPS for the first time to link crime statistics with police station boundaries as well as allowing the SAPS to explore the relationship between crime types and socio-demographic variables through the use of multivariate statistical techniques (eg. Schurink and Schwabe, 2000). The study was completed on the 31 March 2000; with various key activities in progress including the provision of assistance to the State Information Technology Agency (SITA) for the rollout of a web-enabled GIS; and the development of a spatial information system to provide further information on crime.

A critical review of the NCPS was undertaken in 1999 (NCPS, 2000) in response to the ideas encapsulated in the White Paper for Safety and Security (1998). The White Paper advocated closer coordination of law enforcement and crime prevention; an expansion of partnerships; and moved towards a closer definition of the role of different tiers of government in respect of crime prevention (van der Spuy, 2001). The NCPS was renamed the National Crime Prevention Centre, and tougher legislation was sought to transcend the “nebulous philosophical disposition” that was the NCPS (van der Spuy, 2001, p.171-172).

The National Crime Combating Strategy (NCCS)

The National Crime Combating Strategy (NCCS, 2000) was launched in April 2000 to guide operations and resources at a police station level. The NCCS adopted a more intelligence driven approach to policing and aimed to reduce crime in selected crime spots throughout the country which accounted for nearly 50% of all crime incidences (Nqakula, 2003). The NCCS advocated a ‘geographic approach’ in which areas affected by high crime rates, particularly violent crime, were clustered into ‘crime-

combating zones', which were then targeted for aggressive high density street level policing (Mokonyane, 2000). One of the main steps taken in the initiation of the strategy was the continuation of assistance to SITA for the rollout of a web-enabled GIS and the mapping and analyses of crime at a police station level. The action resulted in the implementation of a GIS for crime pattern analysis at five police stations within Johannesburg in 2001. The GISes focused specifically on map searches; crime pattern analyses of plotted crimes; time and grid analyses of plotted crimes and was eventually rolled out to 340 priority police stations in 43 police areas covering almost 80% of the country (Committee of Safety and Security, 2004). The rollout came into operation upon the release of crime statistics in July/August/September in 2001. The SAPS enlisted 72 new data analysts and 600 data typists, as well as trained 1800 members to 'increase the service's ability to analyse crime information as well as to implement and utilise these systems (Streek, 2001). While GIS was a key tool in the implementation of this legislative strategy, it is difficult to evaluate the NCCS, and hence assess the rollout of GIS within the SAPS given the fact that no public document has ever been issued describing the strategy in any detail (Leggett *et al.*, 2003). There is also an alarming lack of documentation from the SAPS regarding the implementation and detailed operations of the GISes at these 340 priority police stations countrywide. An increase in crime levels and a lack of public awareness regarding new technologically driven crime intelligence initiatives would seem to suggest a slow start to the integration of GIS within the SAPS. Presently, the CSIR continues to provide assistance to the SAPS in developing its crime mapping and analysis capabilities as well as providing specialised analyses for detectives working on selected prioritised cases (Cooper *et al.*, 2001). A number of these cases have been presented at International Crime Mapping Research

Conferences held annually in the United States (US) (eg. Cooper *et al.*, 1999; Schmitz and Cooper, 2000; Cooper *et al.*, 2000; Cooper *et al.*, 2001; and Schmitz *et al.*, 2002). For examples of independent crime mapping research in South Africa consult Lochner and Zietsman (1998); Geldenhuys (2001); Redpath (2001); Redpath (2002); Weir-Smith (2004); Parker and Dawes (2003) and Erasmus and Mans (2005).

POTENTIAL GIS APPLICATIONS FOR USE BY THE SAPS

The possibilities of utilising GIS to supplement local crime fighting strategies are unlimited. Harries (1999) describes the future of crime mapping as lying in integrating certain technologies within a GIS, such as GPS, orthophotography, digital photography, digital videography, the Internet and a wide range of local databases with relevance to policing. The following discussion proposes potential crime mapping possibilities for South Africa. It is noted that the possibilities mentioned may already be realities in a number of more developed countries; nevertheless, the challenges to their potential use and introduction within the SAPS are discussed.

Interactive Internet-based crime mapping

South Africans today have access to more information about the country's crime situation than ever before (Du Plessis and Louw, 2005). Crime information is released on the SAPS' website annually and provide detailed levels of reported crime at a national, provincial, and police station level. Although extremely useful in monitoring and understanding the crime rate in the country, the tabular format of the crime data negates the geographic aspect inherent in criminal activity. A controversial type of information to which people have increasing access to is crime-related data and maps

on the Internet (Wartell and McEwen, 2001). These are often in the form of interactive Internet-based crime mapping websites offering spatial and statistical queries and analysis tools. Police departments in the US were the first to put crime maps on the web and there are currently many policing agencies that use web mapping technology to inform the public regarding crime patterns (GisLounge, 2001; Chainey and Ratcliffe, 2005). The dissemination of crime data on an Internet Map Server (IMS) can provide residents of a particular area with easy access to the vast database of crime information in the possession of the SAPS, and put crime into its spatial perspective. The result for the SAPS could potentially be a reduced work load, in that fewer calls can be made to the SAPS CIAC for data requests if the maps are readily available; the facilitation of partnerships with researchers and other agencies, and increased accountability for various police departments (Wartell and McEwen, 2001). The result for the government is a constituency better informed and aware of criminal incidents in their towns and cities. Lochner and Zietsman (1998) hypothesise about the possibility of geographically displaying South African crime data on-line. The researchers state that through the use of a GPS, crime locations and associated attributes can quickly be registered and then transferred to a GIS by means of a cellphone or data logger. The eventual aim being to have temporal and spatial crime data available on-line to aid planning and decision-making.

Residents working online should be able to access specialised mapping applications so that they can find out about crime in their area (Boba, 2005). In this sense interactive Internet-based crime mapping can be used as an effective communication tool between the SAPS and the public. Online initiatives can additionally empower community members to become involved in local Community Policing Forums (CPF)

where GIS has already been used to plot crimes and potential criminal activities in certain regions of South Africa (see Papenfus, 2005). South Africans can currently report crime online at the ‘CrimeStats’ website² which provides the opportunity for online users to view the levels and type of crime in a particular area of the country. A logical next step would be the provision of mapping functionality for the dissemination of crime information. The HSRC’s GIS centre in South Africa is in the process of developing a web mapping facility³, which will provide detailed crime statistics at a police station level for the entire country. For the moment however, this initiative is still in development and not yet operational. The US government’s Mapping and Analysis for Public Safety programme⁴ provides useful online information on crime analysis and mapping information. For examples of websites displaying crime maps consult the Amethyst Information Hub⁵, Crime and Disorder Information Exchange (CADDIE)⁶ and the City of San Antonio Police Department websites⁷.

Geographic profiling

Geographic profiling is a progressive criminal investigative methodology with huge potential for policing in South Africa. This methodology was developed by Dr Kim Rossmo, and is an aspect of offender profiling, which focuses on determining the most probable area of an offender’s residence based on locations of a connected series of crimes (Canter *et al.*, 2000; Rossmo, 2000a). It is an analytical tool which is gaining ground worldwide in investigations of serial violent and sexual crimes and is being promoted as one of a set of tools to be used in South Africa (CSIR, 1999). In brief, crime locations are entered by address, (ie. latitude/longitude, or digitised) and are “analysed with a patented criminal hunting algorithm that produces a probability

surface showing likelihood of offender residence” (Rossmo, 2000a; Rossmo, 2000b, p.197). A range of geographic profiling strategies may be employed (see Snook *et al.*, 2005) and are inserted into a computerised geographic profiling system (ie. Rigel™ (Rossmo (2000a); Dragnet (Canter *et al.* (2000)) to produce a three-dimension probability map, or ‘jeopardy’ surface. This surface represents a topographical map indicating peaks and valleys colour ramped to highlight the areas most likely to be the residence of the offender. The greatest benefit of geographic profiling in police investigations is in its generation of a prioritisation of a large number of suspects (LeComber *et al.*, 2006). The addresses of known suspects are evaluated according to their ‘hit’ percentage on a probability chart (z-score histogram), which prioritises registered offenders or other known criminals (Harries, 1999). Prioritised suspects can then be further monitored using a range of investigative techniques (Rossmo, 2000a).

Geographical profiling is not a stand alone technique but should be used to supplement conventional policing strategies and tactics such as tip and suspect prioritisation, address-based searches of police record systems, database searches (eg. government and business databases, motor vehicle registration), patrol saturation, stakeouts, neighborhood canvasses, missing bodies and DNA screening prioritisation (Beauregard *et al.*, 2005; Rossmo, 2000a, 2000b; Krish, 2003). In 1999, a geographic profiling consultant conducted a workshop at the CSIR in Pretoria and presented the principles behind geographic profiling to a selected number of members of the SAPS and CSIR. Following the workshop, geographic profiling techniques were used to assist the CSIR and the Brixton Murder and Robbery Unit in Johannesburg in two serial killer cases (eg. Cooper *et al.*, 2000). Although the suspect had already been arrested, geographic profiling software was used to analyse the case, and the resultant

maps, showing the activity space and probability surfaces, were forwarded to the SAPS investigating team as well as to the CSIR project team (Stylianides, 2000). The maps proved to be remarkably accurate in determining the place of highest probability of the serial offender's residence (Cooper *et al.*, 2000). Geographic profiling systems are currently not in use within the SAPS, and currently there are a limited number of South Africans who have completed an authorised geographic profiling analysis course. With almost 50 serial murderers having been identified in South Africa in the preceding two decades (Hodgskiss, 2004) and with South Africa rated as second in the world with respect to serial sex related crimes (Builta, 1995), it is easy to see the potential of such a tool for the SAPS. For more detailed reviews of geographic profiling consult Rossmo (1997); Rossmo (2000a) and Rossmo (2000b); for examples of its application consult LeComber *et al.* (2006); Cooper *et al.* (2000); Santtila *et al.* (2003) and Laukkanen and Santtila (2006).

Geodemographic segmentation systems

Geodemographics is posited on the now familiar 'First law of Geography' (Tobler, 1970) and is essentially the clustering of a population at a particular spatial level into categories or neighbourhoods based on their demographic and socio-economic characteristics (Schwabe, 2000). The origins of geodemographic segmentations lay specifically in marketing research with geodemographic 'cluster systems' being used to reach new customers, choose new business locations and to target direct mail (Mitchell, 1995). This focus is changing, however, with Singleton (2004) noting a growing trend to utilise geodemographic neighbourhood segmentation systems in a variety of fields including health (eg. Aveyard *et al.*, 2000; Tickle *et al.*, 2000; Stafford and Marmot, 2003), education (eg. Tonks, 1999; Tonks and Farr, 1995) and

crime (eg. Massimo *et al.*, 2001; Bowers and Hirschfield, 1999). In the latter, Ashby and Longley (2005) demonstrated how geodemographics could be used to better deploy police resources at a variety of spatial scales throughout England and Wales; while Williamson *et al.* (2005) used geodemographics to examine the extent to which the level and the pattern of youth offending varied between different types of neighbourhood and the schools they attend.

Geodemographic segmentation systems are not new in South Africa. A number of marketing firms employ geodemographic techniques to define the types of communities within which their clients are residing as well as identifying potential markets. Additional specialised marketing companies provide customer insights to businesses empowering them to make informed decisions on their customers and markets. Schwabe (2000) notes the segmentation of the South African population into 20 categories at an EA level using the 1991 census data. Artificial neural network (ANN) technology was used as a clustering algorithm to define 20 categories based on socio-economic gradients such as population size, income, language, race and education, among others (Schwabe and O'Donovan, 1998). The 20 categories reflected a socio-economic profile of South African society and had resultant applications in terms of planning, business and the dissemination of surveys. In a project for the SAPS, Schwabe and Schurink (2000) report on the use of ANN to create a socio-crime classification of over 1100 police stations in South Africa. A database consisting of over 250 census variables and 74 crime variables was created and linked to police station boundaries and entered into an ANN and Kohonen's Self-Organising Map (SOM) algorithm was used to cluster police stations into 20 primary categories. The 20 socio-crime categories reflected a prioritisation of police stations

that required specific government intervention according to the dominant crime types and socio-demographic characteristics that occurred in each category. Schwabe (2000) reports on the possibility of the SAPS to use geodemographic segmentation systems to compile a national or provincial profile of victims and offenders for each crime type. Demographic variables, available from SAPS databases, as well as lifestyle variables associated with the area in which the victims and offenders reside can be utilised in such a system. Using these profiles, predictions can be made on victims and offenders based on changes in the demographic and lifestyle characteristics of certain areas (Schwabe, 2000). In this sense, geodemographic segmentation systems will not only facilitate a better understanding of the cultural diversity of the country but more importantly, emphasise the types of crime that dominate differing policing regions and the distinct socio-demographic variables that are associated with such areas (Schwabe, 2000; Schwabe and Schurink, 2000). These systems can additionally provide insight into the social context of crime in South Africa (Schwabe and Schurink, 2000) and highlight the socio-economic causes of criminal development. Descriptive benefits includes the provision of detailed descriptions per environment (ie. human, social, physical and economic) that contribute to crime and the prioritisation of areas not only by the SAPS in their crime prevention strategies, but also by public works programmes to, for instance, improve local infrastructure or service delivery.

CRITICAL SUCCESS FACTORS

While potential GIS crime mapping applications undoubtedly exist to assist South African policing in the future, a variety of factors constrain the present ability of the SAPS to harness the technology. GIS is often claimed as a unique field of interest and expertise; the challenge lies in exploiting the technology to provide valuable analytic benefits to the SAPS. Several critical success factors are considered for the continued integration and future success of GIS within the SAPS.

A spatial information system for crime

Schwabe (2000) investigated the use of information management systems within the SAPS and found that the SAPS' management had committed itself to the implementation of information systems, including spatial information systems. The predominant information system currently in use by the SAPS is their Case Administration System (CAS). The CAS is the primary source of information on victims and offenders (Schwabe, 2000) and is essentially a docket management system that gathers information at a police station level on crime cases such as the address and time of the crime. The system runs on the central computers of the SAPS, with all users across South Africa accessing it over the SAPS network (Stylianides, 2000). Besides the CAS, the SAPS has incorporated GISes at over 340 priority police stations countrywide and developed a 'pilot' spatial information system at a police station level. While the commitment of the SAPS to implement and utilise these information systems is evident, problems abound in these existing systems including the unavailability of the CAS at a number of police stations countrywide, and the non-alignment of the CAS with the census boundaries of South Africa. The CAS is

additionally not linked with any GIS mapping technology, making a spatial description and interpretation of criminal activity impossible. A spatial information system for crime analysis and prevention is required for the SAPS in order to increase its effectiveness and efficiency and better distribute its often-limited resources.

An important conceptual requirement identified by Schwabe and Schurink (2001a) for the development of such a spatial information system is an information technologically orientated police culture. This requirement translates into a culture of using information to prevent and detect criminal activities (Schwabe and Schurink, 2001a). The organisational culture of the SAPS should additionally be supportive in its desire to utilise the information system. Schwabe and Schurink (2001a) refer to the example of New York City, which implemented the CompStat approach that ensures that detailed information on crime incidents are collected and used by police officials at different stations on a daily basis. Station commanders are held responsible for the reduction of crime in their areas of jurisdiction by making use of spatial information and appropriate prevention strategies (Schwabe and Schurink, 2001a). The SAPS is currently struggling to adapt to a more intelligent information-driven approach to crime prevention with Schwabe (2000) stating that the SAPS have only recently started developing questionnaires for recording detailed information on certain crime types. Lochner and Zietsman (1998, p.71) additionally note “...one of the biggest problems regarding the implementation of GIS in policing is still the ignorance and negative attitudes amongst employees regarding the value of technology in decision-making.” Parker and Dawes (2003) tested the utility of the SAPS’ GIS information to ascertain the high-risk areas for child abuse in Atlantis in the Western Cape province of South Africa. The researchers noted the failure of the GIS system and

recommended that the SAPS utilise their GIS resources better to understand the nature of crime in their area (Parker and Dawes, 2003, p.16). It is evident that while the SAPS' management has indeed committed itself to the implementation and use of information systems, including spatial information systems, a lot more problems need to be overcome before these systems become an integral part of their day-to-day operation.

Crime statistics

In crime analysis the quality of output depends on the quality of input. Good quality data provides the backbone for sound tactical, operational, and strategic plans (van der Spuy, 2001), while poor quality data undermines the intelligence that can be garnered from crime analysis studies (Chainey and Ratcliffe, 2005). In South Africa it has become an accepted practice to argue that official crime statistics — those collected and released by the SAPS — provide a poor indication of levels of crime in the country (Shaw, 1998). In the past crime figures were compounded by mistrust and suspicion associated with the apartheid government but the new democracy has still not brought an acceptance of police statistics (Louw, 1998). On the 20th of July 2000, the former Minister of Safety and Security adopted a moratorium inhibiting the access to crime statistics for analysis and dissemination purposes. The reason being the questionable accuracy of the statistics as a result of among others, insufficient note-taking at the crime scene and inefficient capturing of the data on the SAPS' CAS (Schwabe and Schurink, 2001b). The task team appointed to develop a strategy to improve the reliability of the data unearthed during the previous calculation of national crime statistics the following (Martin, 2001):

- The incorrect recording and registration of reported incidents of crime
- Inadequate supervision and control in respect of this recording and registration of incidents
- Incorrect extraction and analysis of crime information
- A number of systems and procedural issues that required improvement and modernisation.

The moratorium on the release of crime statistics was lifted in July 2001 amid some uncertainty regarding what methodological changes had actually been made to the statistics generation process (Schönteich, 2002).

Schwabe *et al.* (2000) note that crime incident data collected by the SAPS has many gaps and that crimes are seldom recorded accurately in terms of their physical location. In a spatial sense the accurate reporting of the location where the crime took place is vitally important to geocode crimes and subsequently gain a visual inspection of its distribution. Louw (1998) reports that many police members don't anticipate any benefits of crime statistics, and therefore data input receives little attention, and the quality of the statistics suffers accordingly. The Deputy Divisional Commissioner of the Training Division of the SAPS (Govender, 2001, p.4) reported the need for timely, reliable, accurate and valid crime information but refers to the fact that

“...while police departments are aware of the need for information, not all collect the same kinds of information, nor do they collect it in the same ways. Some are collected systematically, producing reliable results; some are careless and more haphazard.”

An appreciation of data quality procedures needs to be inculcated in the SAPS including generating an awareness in those who take notes at the crime scene, and

those who enter data into the SAPS' systems as to the extent to which these data are important and depended on by those conducting crime analyses.

Geocoding

Geocoding is vitally important in spatial crime analysis (Ratcliffe, 2004) and "...is the name commonly given to the process of converting street addresses to latitude and longitude, or some similarly universal coordinate system" (Longley *et al.*, 2005, p.125). In a crime context, geocoding is analogous to traditional pin mapping and is required in order for crime or crime-related data to be spatially displayed in a GIS (Harries, 1999; Chainey and Ratcliffe, 2005). GIS requires that each crime incident within a police station area is provided with a geographic co-ordinate and that each point on the map has detailed information relating to the crime scene, victim and suspect/offender. Crime data pose particular challenges for geocoding (see Chainey and Ratcliffe, 2005), with two predominant challenges facing the spatially mapping of crime incidents in South Africa. First, comprehensive and accurate attribute and spatial information on all crimes committed within an area must be recorded. According to Schwabe (2000, p.11), the SAPS currently gather a "...minimal amount of information on crimes and crime scenes and consequently, are unable to effectively undertake linkage analysis between one crime and another." With the result being that with the exception of a few independent research studies (eg. Cooper *et al.*, 2000; Geldenhuys, 2001; Parker and Dawes, 2003; Weir-Smith, 2004) crimes have generally not been spatially located in South Africa (Schwabe, 2000). Additional logistical challenges lie in distinguishing between the ambiguous addresses of the physical crime address noted by the SAPS and the GIS databases that contain corresponding address data (Chainey and Ratcliffe, 2005). The problem can be as a

result of sloppy police work through an inaccurate recording of address level data at the crime location, human errors such as misspelling, or incomplete data or data omissions within the police docket. Leggett (2004) notes that in addition, many residents in South Africa live on properties in informal settlements, as well as around mine dumps and in undeveloped areas, in which there is an absence of any physical address, as well as no formal or well-defined road network. These properties or 'street segments' are extremely difficult, if not impossible, to geocode.

A second major difficulty arises when attempts are made to geocode an address for a street that does not exist or is not yet added to the GIS database at the SAPS. Address data cleaning and GIS database maintenance and management are important pre-geocoding tasks that need to be accomplished in order to improve the geocoding-hit rate of crimes in South Africa. This difficulty is particularly pertinent in South Africa which has experienced phenomenal growth in urban and rural property development in the past decade. An automated geocoding system is required to define the geographic location of crimes in a police station area, especially high priority crimes in priority police stations (Schwabe, 2000). The system would ideally be simple to use, accessible and able to effectively integrate with existing systems in the SAPS (Schmitz *et al.*, 2000).

Continued support of the South African government and policymakers

A reciprocal relationship exists between governments and GIS. Geographic Information (GI) plays a significant role for governments in the context of the global information economy, while governments can create a supportive platform from which implementation policies can be developed and maintained. Masser (1998)

summarises the significance of GI for government as lying in four different conceptual standpoints:

- As a resource, wherein GI can be seen as an available source of wealth that may be drawn upon when needed
- As a commodity, wherein GI can be bought, sold and have multiple life cycles
- As an asset, wherein GI is a valuable item owned by the government, and lastly
- As an infrastructure.

The continued growth and integration of GIS within the SAPS can provide all these benefits to the South African government and to its public but requires national directives strong enough to guide local action, and that have the support of local and provincial government. Since it is the responsibility of the South African cabinet for determining national policing policy, the future of advanced GIS crime information analysis effectively lies at the hands of the South African government. While GIS practitioners would argue that the benefits of linking GIS to all crime prevention strategies is unlimited, policy makers require that provincial executives, in particular, firstly, state their need for GIS as a priority for their specific province's police, and secondly, outline specific protocol and steps for the successful integration of GIS in their policing strategy. The benefits of GIS within policing have been identified by significant government role-players including the former Minister of Safety and Security, Mr Steve Tshwete (2001) and the current Minister of Safety and Security, Mr Charles Nqakula (2003). Both officials saw the potential of GIS to enhance the capability of the SAPS in terms its strategic, tactical and operational planning, and instigated legislation that saw the introduction of GIS with the SAPS. Continued

governmental support in the form of sustained policies and guaranteed funding are however required to further guide the successful integration of GIS within all aspects of the SAPS.

CONCLUSION

The future success of GIS within policing in South Africa is to some extent predetermined by the present status of the technology in current use by the SAPS. Further pronouncements of policy and funding will not necessarily guarantee success however, as although the SAPS may be legislatively charged with utilising GIS in policing, serious questions must be asked regarding their actual ability to do so. While legislation has been put into place to ensure that a GIS exists (or is at least supposed to exist) at the majority of police stations in the country, more effective guidelines are required to gauge the implementation of these systems and to evaluate the current crime analysis and mapping occurring at the SAPS. While the use of GIS has supplemented the intelligence-driven crime-fighting arsenal of the SAPS, various fundamental challenges are faced by the SAPS to tap into the full potential of the technology. These challenges can perhaps best be illustrated by Altbeker (1998, p.10) who investigated the functioning of the criminal justice system in the rural town of Tsolo in the Eastern Cape province of South Africa:

“These problems have not entirely escaped the notice of the providers of logistical support in the SAPS - a brand-new white Pentium PC has been delivered, gleaming in the gloom of the police station, with its colour monitor reflecting the sun coming through the holes where windowpanes ought to be. The PC is not connected to police mainframe systems such as

the crime administration system (CAS), which is used to record details from dockets and their progress.... The computer was off when I visited the station, because the one person trained to use it was off duty. But it seemed a surprising priority for procurement: this is a station that needs a horse, not a computer; it needs the basic implements for 20th-century investigation, not those of the 21st.”

The future of GIS and subsequent crime mapping in policing in South Africa revolves primarily around the ability of the GIS private sector, local and provincial government, and the broader GIS community in South Africa to overcome the basic problems regarding lack of infrastructure, be they human, capital or technical before widespread GIS integration within the SAPS can be achieved.

ENDNOTES

¹ Areas within a police station boundary defined for planning purposes

² <http://www.crimestats.co.za>

³ <http://www.hsrc.ac.za/gis/webMapping/>

⁴ <http://www.ojp.usdoj.gov/nij/maps/related.html>

⁵ <http://www.amethyst.gov.uk/>

⁶ <http://www.caddie.gov.uk/>

⁷ <http://www.sanantonio.gov/sapd/maps.htm>

* This paper was an award winner at the International Emerald Literary Network Awards for Excellence held in the US in 2007. The prize was given to the paper nominated by the Editorial Board of each journal published by Emerald for a paper that they felt had been that title's most outstanding from the previous 12 months.

REFERENCES

- Altbeker, A. 1998. Solving crime: the state of the SAPS detective service. Institute for Security Studies (ISS), Monograph No.31, November 1998.
- Ashby, D.I. 2005. Policing neighbourhoods: exploring the geographies of crime, policing and performance assessment. *Policing and Society*, 15, 413-447.
- Ashby, D.I. and Longley, P.A. 2005. Geocomputation, geodemographics and resource allocation for local policing. *Transactions in GIS*, 9, 53–72.
- Ashton, P.J., van Zyl, F.C. and Heath, R.G. 1995. Water quality management in the Crocodile River catchment, Eastern Transvaal, South Africa. *Water Science and Technology*, 32, 201-208.
- Aveyard, P., Manaseki, S. and Chambers, J. 2000. Does the multidimensional nature of super profiles help district health authorities understand the way social capital affects health? *Journal of Public Health Medicine*, 22, 317-323.
- Beauregard, E., Proulx, J. and Rossmo, D.K. 2005. Spatial patterns of sex offenders: theoretical, empirical, and practical issues. *Aggression and Violent Behaviour*, 10, 579-603.
- Boba, R. 2005. *Crime Analysis and Crime Mapping*, Sage: Thousand Oaks.

- Bowers, K. and Hirschfield, A. 1999. Exploring links between crime and disadvantage in northwest England: an analysis using geographical information systems. *International Journal of Geographical Information Systems*, 13, 159-184.
- Bowers, K., Johnson, S.D. and Hirshfield, A.F.G. 2004. Closing off opportunities for crime: an evaluation of alley-gating. *European Journal on Criminal Policy and Research*, 10, 285-308.
- Buila, J. 1995. South Africa: Crime is on the increase. Available at:
<http://158.135.23.21/cjcweb/college/cji/index.cfm?ID=510>, last accessed 16 January 2006.
- Canter, D., Coffey, T., Huntley, M. and Missen, C. 2000. Predicting serial killers' home base using a decision support system. *Journal of Quantitative Criminology*, 16, 457-478.
- Chainey, S. and Ratcliffe, J.H. 2005. *GIS and Crime Mapping*, John Wiley & Sons: Chichester.
- Committee on Safety and Security. 2004. Report of the ad hoc committee on safety and security on budget vote 25 – safety and security. Available at:
<http://www.pmg.org.za/docs/2003/comreports/040624pcsafetyreport2.htm>, last accessed 16 January 2006.
- Cooper, A.K., Gilfillan, T.C., Potgieter, M.A., Schmitz, P.M.U. and Stylianides, T. 1998. Operational analysis of crime information for the prevention and management of crime: Johannesburg area pilot. CSIR (Mikomtek), research report No. 0164-0004-715-A1, Pretoria, South Africa.

- Cooper, A.K., Gilfillan, T.C., Potgieter, M. A, Schmitz, P.M.U. and Du Plessis, P.M. 1999. Crime clocks and target performance maps. Paper presented at the 3rd Annual International Crime Mapping Research Conference, Orlando.
- Cooper, A.K., Rossmo, D.K., Schmitz, P.M.U. and Byleveld, P. 2000. Using GIS and digital aerial photography to assist in the conviction of a serial killer. Paper presented at the 4th Annual International Mapping Research Conference, San Diego.
- Cooper, A. K., Byleveld, P. and Schmitz, P.M.U. 2001. Using GIS to reconcile crime scenes. Paper presented at the 5th Annual International Crime Mapping Research Conference, Dallas.
- CSIR (Council for Scientific and Industrial Research) 1999. Closing in on serial criminals. Available at: http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE038_ARTICLE?ARTICLE_NO=4410132, last accessed 16 January 2006.
- Da Cruz, P.R. 1999. GIS as a social technology. *South African Geographical Journal*, 81, 119-125.
- Davids, A.S. 2002. Where have all the ambulances gone? The role of GIS in injury surveillance. Paper presented at the Human Sciences Research Council (HSRC) seminar series, Pretoria, South Africa.
- Demombynes, G. and Özler, B. 2005. Crime and local inequality in South Africa. *Journal of Development Economics*, 76, 265-292.

- Department of Safety and Security. 2003. 2002 Estimates of national expenditure, vote 24: Safety and security, 53. Available at: http://www.treasury.gov.za/documents/budget/2002/ene/vote_24.pdf, last accessed on 16 January 2006.
- Du Plessis, A. and Louw, A. 2005. The 2003/04 SAPS crime statistics: the tide is turning. *SA Crime Quarterly*, 12, 1-8.
- Erasmus, J.C. and Mans, G.G. 2005. Churches as service providers for victims of sexual and/or violent crimes: a case study from the Paarl community. *Acta Criminologica*, 18, 140-163.
- Geldenhuys, B.B. 2001. Patterns of crime in Hatfield. Unpublished M.A. Thesis, University of Pretoria, Pretoria.
- GisLounge. 2001. Crime mapping: GIS goes mainstream. Available at: <http://gislounge.com/features/aa101100.shtml>, last accessed on 16 January 2006.
- Glanz, L.E. 1990. Juvenile delinquency: a self-report study among urban blacks. Unpublished PhD Thesis, University of Pretoria, Pretoria.
- Gouws, A. 2004. The impact of crime on the legitimacy of the South African political system. *Acta Criminologica*, 17, 78-89.
- Govender, D. 2001. Crime information management and analysis (A practical approach for policing). Paper presented at the 2nd World Conference of Crime Investigation, Durban.

- Harries, K. 1999. *Mapping Crime: Principle and Practice*. National Institute of Justice (NIJ): Washington DC.
- Hirshfield, A., Brown, P. and Todd, P. 1995. GIS and the analysis of spatially-referenced crime data: experiences in Merseyside, UK. *International Journal of Geographic Information Systems*, 9, 191-210.
- Hodgskiss, B. 2004. Lessons from serial murder in South Africa. *Journal of Investigative Psychology and Offender Profiling*, 1, 67-94.
- Krish, K. 2003. Application of GIS in crime analysis and geographic profiling. Available at: <http://www.gisdevelopment.net/application/military/overview/mi03146.htm>, last accessed 16 January 2006.
- Landman, K. and Schönteich, M. 2002. Urban fortresses: gated communities as a reaction to crime. *African Security Review*, 11, 71-85.
- Laukkanen, M. and Santtila, P. 2006. Predicting the residential location of a serial commercial robber. *Forensic Science International*, 157, 71-82.
- LeComber, S.C., Nicholls, B., Rossmo, D.K. and Racey, P.A. 2006. Geographic profiling and animal foraging. *Journal of Theoretical Biology*, 240, 233-240.
- Leggett, T. 2004. By-laws and regulations for high impact crime prevention: Why wait? *SA Crime Quarterly*, 8, 11-16.

- Leggett, T., Louw, A., Schönteich, M. and Sekhonyane, M. 2003. Criminal justice in review 2001/2002. Institute for Security Studies (ISS), Monograph No.88, October 2003.
- Lochner, F.C. and Zietsman, H.L. 1998. Using geographical information systems (GIS) for policing in South Africa: a case study in Paarl. *South African Geographical Journal*, 80, 60-72.
- Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. 2005. *Geographic Information Systems and Science*, 2nd Edition. John Wiley & Sons: Chichester.
- Louw, A. 1998. The problem with police crime statistics. Institute of Securities Studies (ISS) Crime Index, 2, June 1998.
- Louw, A. and Parry, C. 1999. Drugs, alcohol and crime: a survey of arrestees. Institute of Securities Studies (ISS) Crime Index, 3, November 1999.
- Martin, A. 2001. The integrity and reliability of statistics in a contextual focus. Available at: [http:// www.gcis.gov.za/docs/publications/buamag/buaaug01.pdf](http://www.gcis.gov.za/docs/publications/buamag/buaaug01.pdf), last accessed on 16 January 2006.
- Martin, C., Curtis, B., Fraser, C. and Sharp, B. 2002. The use of a GIS-based malaria information system for malaria research and control in South Africa. *Health & Place*, 8, 227-236.
- Masser, I. 1998. *Governments and Geographic Information*. Taylor & Francis Ltd: London.
- Massimo, C., Haining, R. and Signoretta, P. 2001. Modelling high-intensity crime areas in English cities. *Urban Studies*, 38, 1921-1941.

Mitchell, S. 1995. Birds of a feather. *American Demographics*, 17, 40-42.

Mokonyane, N.P. 2000. ANC daily news briefing by the Gauteng provincial Minister for Safety and Security. Available at:
<http://www.anc.org.za/anc/newsbrief/2000/news1019.txt>, last accessed on 16 January 2006.

NCCS (National Crime Combating Strategy). 2000. Pretoria, South African Department of Safety and Security.

NCPS (National Crime Prevention Strategy). 1996. Pretoria, South African Department of Safety and Security.

NCPS (National Crime Prevention Strategy). 2000. Biannual newsletter. Available at:
www.doj.gov.za/2004dojsite/newsletter/ncps1_1.pdf, last accessed on 16 January 2006.

Nqakula, C. 2003. Department of Safety and Security media briefing by the Minister of Safety and Security. Available at:
<http://www.info.gov.za/speeches/2003/03090812461003.htm>, last accessed 16 January 2006.

Papenfus, C. 2005. *Crime plotted out*. Available at:
www.eepublishers.co.za/view.php?sid=3250, last accessed on 16 January 2006.

Parker, Z. and Dawes, A. 2003. Child sexual abuse in Atlantis. Research report, Children's Institute, University of Cape Town, South Africa.

- Ratcliffe, J.H. 2004. Geocoding crime and a first estimate of a minimum acceptable hit rate. *International Journal of Geographical Information Science*, 18, 61-72.
- Redpath, J. 2001. The bigger picture: the gang landscape in the Western Cape. *Indicator South Africa*, 18, 34-40.
- Redpath, J. 2002. Children and sexual offences: an analysis of some custody and arrest trends. Research report of the Community Law Centre, University of the Western Cape (UWC), South Africa.
- Rossmo, D.K. 1997. Geographic profiling. In Jackson, J.L. and Bekerian, D.A. (Eds), *Offender Profiling: Theory, Research and Practice*. John Wiley & Sons: Chichester, 159–175.
- Rossmo, D.K. 2000a. *Geographic Profiling*. CRC: Boca Raton.
- Rossmo, D.K. 2000b. Routine activities and foraging theory: the influence of motivation on size of criminal hunting area. Paper presented at the Meeting of the American Society of Criminology, San Francisco.
- Saint, W. 1999. Tertiary distance education and technology in sub-Saharan Africa. ADEA Working group on higher education, The World Bank, Washington DC.
- Santtila, P., Zappalà, A., Laukkanen, M. and Picozzi, M. 2003. Testing the utility of a geographical profiling approach in three rape series of a single offender: a case study. *Forensic Science International*, 131, 42-52.

- Schmitz, P.M.U., Cooper, A.K., Gilfillan, T.C. and Stylianides, T. 1999. Johannesburg area pilot study, Part 1: Overview. CSIR (Mikomtek), research report No. 0282-0001-553-B1, Pretoria, South Africa.
- Schmitz, P.M.U. and Cooper, A.K. 2000. Mapping crime scenes and cellular telephone usage. Paper presented at the 4th Annual Crime Mapping Research Conference, San Diego.
- Schmitz, P.M.U., Potgieter, M., Du Plessis, P., Cooper, A.K. and Schwabe, C.A. 2000. Activity A7: Packaging and rollout, Part 1: Theoretical aspects of GIS and geocoding. Research report, DACST Innovation Fund Project Number: 13102.
- Schmitz, P.M.U., Cooper, A.K. and Quick, G. 2002. Using satellite imagery for crime mapping in South Africa. Paper presented at the 6th Annual Crime Mapping Research Conference, Denver.
- Schönteich, M. 2002. 2001 crime trends: a turning point? *SA Crime Quarterly*, 1, 1-7.
- Schurink, W.J. 1976. 'n Sosiologiese ondersoek na die ekologiese verspreiding van misdaad in Pretoria: 1969-1971. Unpublished M.A. Thesis, University of South Africa (UNISA), Pretoria.
- Schurink, W.J. and Schwabe, C.A. 2000. Activity 5: Piloting of multivariate analysis to explain crime, Part 4: important social science dimensions in the multivariate analysis of crime phenomena. Research report, DACST Innovation Fund Project Number: 13102.

- Schwabe, C.A. 2000. Towards the development of a spatial information system for crime analysis and prevention: some conceptual requirements and empirical evidence from South Africa. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST).
- Schwabe, C.A. 2001. African renaissance: towards the development of a spatial information system for socio-economic development in Africa. Paper presented at the 5th AfricaGIS Conference, Nairobi, Kenya.
- Schwabe, C.A., O' Leary, B.M. and Sukai, S.B. 1997. A model for the provision of spatial information to bring about reconstruction and development in South Africa. Paper presented at the 3rd AfricaGIS Conference, Gaborone, Botswana.
- Schwabe, C.A. and O'Donovan, M. 1998. The use of census data to develop a lifestyle segmentation system or geo-demographics for South Africa. Available at: www.hsrc.ac.za/gis/papers/geoDemographics/index.html, last accessed 16 January 2006.
- Schwabe, C.A. and Schurink, W.J. 2000. A classification of police stations in South Africa: towards a better understanding of crime. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST).
- Schwabe, C.A., Schurink, W.J. and Makakase, M. 2000. Activity A2: Investigation into the most useful crime forecasting methodologies, Part 3: information required for strategic and operational crime forecasting. Research report, DACST Innovation Fund Project Number: 13102.

- Schwabe, C.A. and Schurink, W.J. 2001a. Towards more effective crime prevention in South Africa. *Servamus*, 94, 54-56.
- Schwabe, C.A. and Schurink, W.J. 2001b. Crime analysis and forecasting in South Africa: the need for information. *Servamus*, 94, 44-46.
- Shaw, M. 1998. Of crime and country: reported crime trends in South Africa (1980 to 1997) and future scenarios. Institute for Security Studies (ISS) Crime Index, 2, June 1998.
- Simpson, G. and Rauch, J. 1999. Reflections on the first year of the National Crime Prevention Strategy. In Maharaj, G. (Ed.), *Between Unity and Diversity: Essays on Nation-Building in Post-apartheid South Africa*. David Philip: Cape Town, 295-314.
- Singleton, A. 2004. A state of the art review of geodemographics and their applicability to the higher education market. Centre for advanced spatial analysis (CASA) working paper, No.74, London, UK.
- Snook, B., Zito, M., Bennell, C. and Taylor, P.J. 2005. On the complexity and accuracy of geographic profiling strategies. *Journal of Quantitative Criminology*, 21, 1-26.
- Stafford, M. and Marmot, M. 2003. Neighbourhood deprivation and health: does it affect us all equally? *International Journal of Epidemiology*, 32, 357-366.
- Standing, A. 2003. The social contradictions of organised crime on the Cape Flats. Institute for Security Studies (ISS) Occasional Paper No. 74.

- Streek, B. 2001. Dodgy crime stats released to SA. *Mail & Guardian Newspaper*, 1 June 2001.
- Stylianides, T. 2000. Crime analysis and decision support in the South African Police Service: enhancing capability with the aim of preventing and solving crime. Consolidated final research report, DACST Innovation Fund Project Number: 13102.
- Tickle, M., Moulding, G., Milsom, K. and Blinkhorn, A. 2000. Socioeconomic and geographical influences on primary dental care preferences in a population of young children. *British Dental Journal*, 188, 59-562.
- Tobler, W.R. 1970. A computer movie simulating urban growth in the Detroit region. *Economic Geography*, 46, 234-240.
- Tonks, D. 1999. Access to UK higher education, 1991-98: using geodemographics. *Widening Participation and Lifelong Learning*, 17, 26-36.
- Tonks, D. and Farr, M. 1995. Market segments for higher education: using geodemographics. *Market Intelligence & Planning*, 13, 24-33.
- Tshwete, S. 2001. ANC daily news briefing, 1 June 2001. Available at: www.anc.org.za/anc/newsbrief/2001/news0601.txt, last accessed on 16 January 2006.
- Van der Spuy, E. 2001. Crime and its discontent: Recent South African responses and policies. Seminar report No. 8, 167-175, South African Institute of International Affairs: Johannesburg.

- Van Teefelen, P. and Kwant, T. 1999. Tussen belofte en werkelijkheid: GIS-toepassingen in ontwikkelingslanden. *Geografie*, 8, 36-39.
- Wartell, J. and McEwen, J.T. 2001. Privacy in the information age: a guide for sharing crime maps and spatial data. Research report: National Institute of Justice (NIJ).
- Weir-Smith, G. 2004. Crime mobility: spatial modelling of routine activities of arrestees and substance abusers in South Africa. *GeoJournal*, 59, 209-215.
- Wendelken, S. 1995. GIS enhances preventive law enforcement. *GIS World*, 8, 58-61.
- White Paper on Safety and Security. 1998. White Paper on Safety and Security: In service of safety: 1999-2004. Pretoria, South African Department of Safety and Security.
- Williamson, T., Ashby, D.I. and Webber, R. 2005. Young offenders, schools and the neighbourhood: A new approach to data-analysis for community policing. *Journal of Community and Applied Social Psychology*, 15, 203-228.
- Zietsman, H.L. 2002. Geographic information science in South Africa. *South African Geographical Journal*, 84, 30

CHAPTER 4

MODELING OF VIOLENT, ECONOMIC AND SEXUAL OFFENDERS: A TEST OF SOCIAL DISORGANIZATION IN THE CITY OF TSHWANE, SOUTH AFRICA

Gregory Dennis Breetzke

* A revised version of this chapter has been accepted (pending revision) for publication in
Criminal Justice Studies

Accepted (pending revision): *Criminal Justice Studies: A Critical Journal of Crime,
Law and Society*

ABSTRACT

Post-apartheid South Africa has experienced an insidious increase in crime across all categories. While local researchers postulate the proximate causes of crime, few ecological theories of crime have been used as a basis to investigate the location of offenders in the country. The current study examines, for the first time in a South African context, the spatial origin of offenders across three crime categories: violent, economic and sexual. The causes of these spatial origins are examined using variables informed by the social disorganization theory as input into a series of spatial regression models. Overall little support is found for the social disorganization theory in the city of Tshwane with findings highlighting historically based unemployment as being the driving force behind the rising crime levels in the country.

INTRODUCTION

South Africa is affectionately referred to as the 'rainbow nation' by local and international commentators. This term, born out of the multi-racial and -cultural components that comprise South African society, paradoxically conceals the vast social and economic inequalities that exist in the country. South Africa has one of the highest rates of racially defined social and economic inequalities in the world (Frank, 2006). These high levels of inequality have also been linked to the high and rising crime rate in the country (Hodgskiss, 2004; Demombynes and Özler, 2005). Since the inception of the African National Congress (ANC) government in 1994, South Africa has experienced an increase in crime levels across all crime categories (Pelser and de Kock, 2000; du Plessis and Louw, 2005). Du Plessis and Louw (2005) report that in the 2003/04 financial year, approximately 20 000 murders were committed in South Africa, which equates to 42.8 murders per 100 000 of the population. In comparison, the United States (US) which has a population six times that of South Africa, reported 16 137 murders in 2004, which equates to 5.5 murders per 100 000 of the population. Every day fifty people are murdered in South Africa (du Plessis and Louw, 2005), an area less than twice the size of Texas. The unabated levels of crime in the country are comparable to crime levels in other post-conflict countries and have lead researchers to question whether crime is a threat to national security (Hough, 2003).

In international literature, a number of ecological theories have emerged to investigate crime. Chief among these theories is the social disorganization theory of Shaw and McKay (1942). The social disorganization theory focuses on issues of social/economic deprivation, ethnic heterogeneity and residential mobility as

predictors of the spatial patterns of criminal activity. This study aims to use the social disorganization theory as a basis to examine the origin and distribution of violent, economic and sexual offenders in the city of Tshwane, South Africa. Tshwane is located in the Gauteng province of South Africa and has a population of roughly 2 million inhabitants. Data of offenders was obtained during March 2006 from the management information systems (MIS) of the South African Department of Correctional Services (DCS) at five correctional centres within the city of Tshwane: Pretoria Central Correctional Centre (consisting of Pretoria Medium and Pretoria Maximum), Pretoria Female Correctional Centre, Odi Correctional Centre and Atteridgeville Correctional Centre.

This study is different to previous literature on the geography of crime in a number of ways. First, data of offenders has rarely been analysed at any spatial scale in South Africa. Second, common ecological theories within criminological literature such as the social disorganization theory have never been empirically employed to analyse rates of delinquency in South Africa. While the theory has also been universally applied and tested (see McCulloch, 2003; Lanier and Huff-Corzine, 2006; Chaix *et al.*, 2006) its applicability within an 'African' context has not yet been empirically assessed. Third, a distinction is made between three different offender categories in this study (ie. violent, economic, and sexual) in an attempt to examine the extent to which different demographic, social and economic variables drive different categories of offenders in Tshwane. Fourth, South Africa holds a unique position in terms of its previous political history as well as its current social and economic position. Findings can potentially reveal interesting insights related to criminogenic risk factors in the emerging post-apartheid city and lead to the extension of existing theories of crime.

The article is composed of four sections. The second section provides a brief theoretical history of social disorganization theory and its potentially unique application in South Africa. The results and discussion are presented in section three, followed by the conclusion in section four.

SOCIAL DISORGANIZATION THEORY

Social disorganization has been defined as the inability of a community structure to realise the common value of its residents and maintain effective social controls (Sampson and Groves, 1989). The concept is synonymous with Chicago researchers Shaw and McKay (1942) who developed their social disorganization theory through mapping incidents of juvenile delinquency and analyzing the relationships between delinquency and various social conditions. The researchers introduced structural factors into research on community social organization and delinquency (Hayslett-McCall, 2002). Social disorganization and resulting crime and delinquency depended on a neighborhood's level of social/economic deprivation, residential mobility and ethnic heterogeneity (Cahill and Mulligan, 2003). For social order to exist, a sense of community or community cohesion should prevail which allows the community to uphold common goals and regulate itself through formal and informal measures (Jacob, 2006). The definition of the social disorganization theory at the neighborhood level has enabled the theory and its constructs to be utilised by a number of researchers worldwide in ecological studies of crime (Fein, 2002; Andresen, 2006). In Canada, Jacob (2006) examined the applicability of social disorganization theory to female youth crime, and found partial support for the application of the theory, while Andresen (2006) found strong support for some social disorganization constructs in

his investigation into the spatial dimensions of automotive theft, break and enter, and violent crime in Vancouver. Ouimet (2000) found that social disorganization variables predicted delinquency rates ‘fairly well’ at a census tract aggregation level in Montreal. In the US, Freisthler (2004) examined the role of social disorganization and alcohol access on child abuse and neglect rates and found that increased levels of social disorganization were associated with higher child maltreatment rates. Kawachi *et al.* (1999) found consistent results between the social disorganization constructs of deprivation and social capital and levels of violent and property crime for the whole of the US. While Oh (2005) examined the impact of urban economic change with measures of social disorganization in 153 central US cities and found that use of the social disorganization measures had an effect on central-city crime rates. Other social disorganization research in the US and Europe include Thylor (1996), Cahill and Mulligan (2003), Lanier and Huff-Corzine (2006), Mustaine *et al.* (2006), McCulloch (2003) and Chaix *et al.* (2006). While these and a plethora of other studies have aided in the investigation of ecological determinants of crime throughout much of the developed world, the use of these constructs and the application of social disorganization theory has not been empirically tested in South Africa.

SOUTH AFRICA AND SOCIAL DISORGANIZATION

The recent political history of South Africa is inherently intertwined with social disorganization and community fragmentation. While a few examples may exist elsewhere, no other country in the world has endured such a direct and sustained attack on the social fabric of its society through state laws and policies aimed at enforcing and accentuating spatio-social segmentation. This disorganization and

fragmentation was seen as essential by the apartheid government to maintain class exploitation and to prevent unified resistance by the majority black African population (Emmett, 2003). According to Horn (1998) the apartheid ideology was implemented on three levels:

- Regional (macro-scale), whereby black African and some Coloured and Asian communities were relocated to separate development areas
- Urban (meso-scale), whereby residential and commercial segregation took place within the urban environment, and
- Personal (micro-scale). Through the exclusion of black Africans from quality education, employment opportunities and public amenities

Among the legislative tools used to create this ideology, and directly affecting the social fabric and organisation of South African society, the following:

Migrant labor system

The demands of the mines drove the migrant labor system in the country which saw scores of non-whites migrating to urban centres to work (Manuel, 2006). The system served the dual purposes of restricting the movements of non-white people and securing a cheap supply of labor (Lalthapersad, 2003). The exploitive nature of the system resulted in non-white families being prohibited from joining migrants and being instead required to secure special rights in order to 'cross the line' for visits. The migrant labor system not only lead to the disruption of family life (Thomas, 1987), but enforced ruralization and the entrapment of poverty (Emmett, 2003). Other associated regulations such as the institution of pass laws, forced removals and restrictions on the construction of black housing in urban areas were used to prevent

black urbanization and the development of community cohesion among migrants (Emmett, 2003; Lalthapersad, 2003).

Group Areas Act

The Group Areas Act of 1950 (Act 41) formed the basis of urban re-organization in apartheid South Africa (Horn, 1998) and provided for the comprehensive racial segregation of South African cities (Mabin, 2005). The Act involved the forced removal of non-white families into predominantly outlying rural areas, with Platzky and Walker (1985) estimating that almost 1.5 million South Africans were moved as a result of the group area proclamations. The influx of black Africans into urban areas was also strictly controlled through a network of labor recruitment bureaus in the black African reserves (Horn, 1998). The enforced urban relocation aimed at weakening the collective bonds between non-white populations and had a devastating effect on families not only because it uprooted families from their communities but also removed households to areas far from their workplaces (Emmett, 2003). The results were overcrowding of residences and schools (Pinnock, 1984) as well as the destruction of social capital (social relationships and networks) and with it the sense of continuity, security and social control (Pinnock, 1984; Emmett, 2003).

Bantu Education Act

The Bantu Education Act of 1953 was a carefully thought through process in the segregation of South African society (Mahlalela-Thusi and Heugh, 2002). The policy was based on the ‘mother-tongue’ principle and the concept that education should be racially divided. Non-whites would be provided with an ‘appropriate’ curriculum (excluding mathematics) in their own language at schools in the African reserves or

‘ethnic homelands’ (Morrow *et al.*, 2004). Bantu education was met with vigorous opposition and as a consequence schools became a mouthpiece through which learners and teachers alike could voice their condemnation of the apartheid system. Boycotts and riots led to schools becoming centres of violence and conflict with a large number of children and adolescents leaving the education sector to undergo military training, while others were inducted into militarized self-defence units (SDUs) (Emmett, 2003).

The establishment of these, and other, state policies not only contributed to the social disorganization of South African society but also resulted in the depletion in the stock of social capital and the establishment of a climate of distrust and fear between and within races. A number of studies worldwide have shown that these levels of social cohesion and social capital are important in understanding levels of crime and delinquency (see Sampson and Groves, 1989; Simcha-Fagan and Schwartz, 1986; Bursik and Grasmick, 1993; Taylor *et al.*, 1984). Social capital can be defined as those “features of social organization, such as trust, norms and networks – that can improve the efficiency of society by facilitating co-ordinated action” (Putnam, 1993, p.167). The legacy of apartheid completely eroded the social structures of the vast majority of South African society and has resulted in poor and crime ridden communities not only poor in economic resources but also in social capital to address their problems (Emmett, 2003). Whilst apartheid has often been blamed for the scourge of crime engulfing the country (see Tshiwula, 1998; Schönteich and Louw, 2001), no ecological study has determined whether the ‘social disorganisation’ generated by apartheid has had any influence on the spatial distribution of offenders in contemporary South Africa.

METHOD

Methods utilised in the study comprise three components: first, an offender index (OI) locating the area of residence of offenders was constructed at a suburb level of aggregation for three categories of delinquency: violent, economic and sexual; second, variables and indices were selected and developed to represent social disorganization theory. Last, these scores were introduced as input into a series of spatial regression models in order to determine the effect of each score on each crime category, which acted as the dependent variables. Discussions that follow refer to the suburb level of aggregation and not to infer to the level of the individual.

Data

The offender indices were constructed using the residential addresses of sentenced offenders as well as the crime for which the offender is currently incarcerated. In instances where an offender was incarcerated for more than one type of crime, the crime for which he/she was serving the longest sentence was used in the analysis. Crimes are grouped into three main categories by the DCS: violent, economic and sexual. Violent crimes include murder, attempted murder, serious and common assault; economic crimes typically include common theft, burglary, robbery and fraud and forgery; and sexual crimes include rape, attempted rape, indecent assault, and incest. While it is readily acknowledged that certain crimes can occur simultaneously ie. economic crime can be violent in nature; the aim of the author is to provide a broad perspective of delinquency within a community.

Using a cross-sectional ecological design, the study examined all incarcerated offender records from March 2006 at all five correctional centres located within Tshwane. A total of 1004¹ incarcerated offenders residing within the 371 suburbs in Tshwane were obtained, verified and aggregated to a suburb level. Although obtained from reliable sources the 1004 offenders included in the study are to be viewed with caution for a number of reasons. First, this number includes only incarcerated offenders and excludes awaiting trial detainees (ATD) as well as parolees. According to Kriel (2005) approximately 28% of the prison population are awaiting trials and 60% of this number are usually acquitted as a result of cases being withdrawn. It takes an average of three months for ATDs to appear in court, while the situation is worsened by unnecessary arrests, unaffordable bail and dawdling in the finalization of cases. Second, there is a very low conviction rate in the country with McCafferty (2003) reporting that for every 1000 crimes committed in South Africa, only 430 criminals are arrested, only 77 are convicted and despite the high number of serious crimes of violence committed (a third of all South Africa's crime is violent), only 8 are sentenced to 2 or more years of imprisonment; and third, the under-reporting of crime. The offender data obtained may therefore not be representative of the exact number of offenders residing within Tshwane but is representative of the most serious and frequently occurring offenders and is the most reliable and complete dataset available by which to draw inferences and conduct analysis.

Unit of Analysis

In South Africa, the suburb is the finest spatial unit provided by Statistics South Africa (SSA) and consists of between 150 – 300 households. On average, there are 5353 residents per suburb in Tshwane with a minimum of 0 and a maximum of 82002 residents. In accordance with other ecological studies (see Coulton *et al.*, 1995; Ernst, 2001; Lockwood, 2004), the neighborhood is defined as a suburb or census area.

Distribution of violent, economic and sexual offenders

The three offender indices are mapped in Figure 1 and are expressed in rates per 1000 population over the age of 18. Delinquency rates are classified in terms of their standard deviation from the mean rate with high rate areas being expressed as those suburbs with a rate in excess of one standard deviation above the mean rate for each crime category.

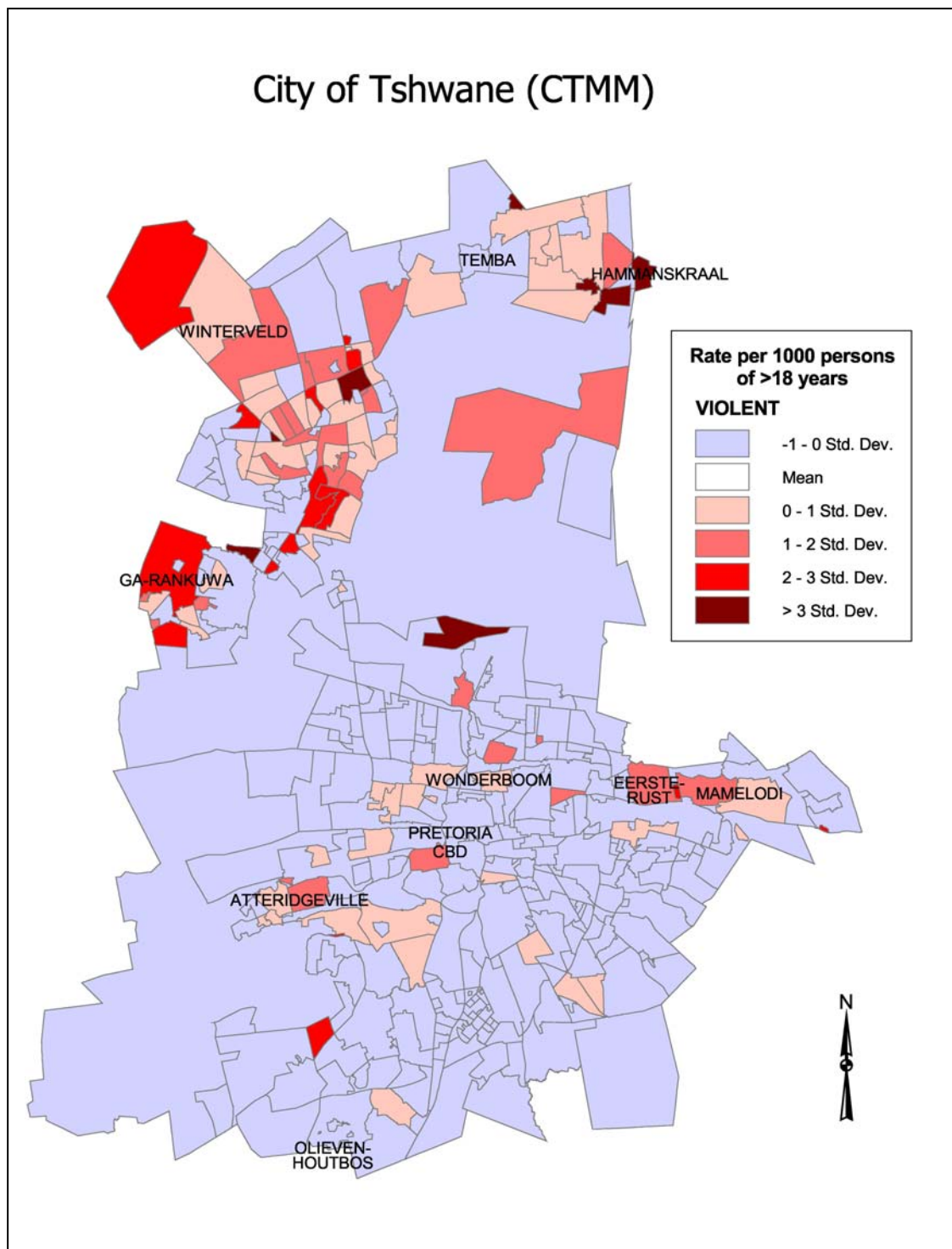


Figure 1a: Violent delinquency rate per 1000 population over 18

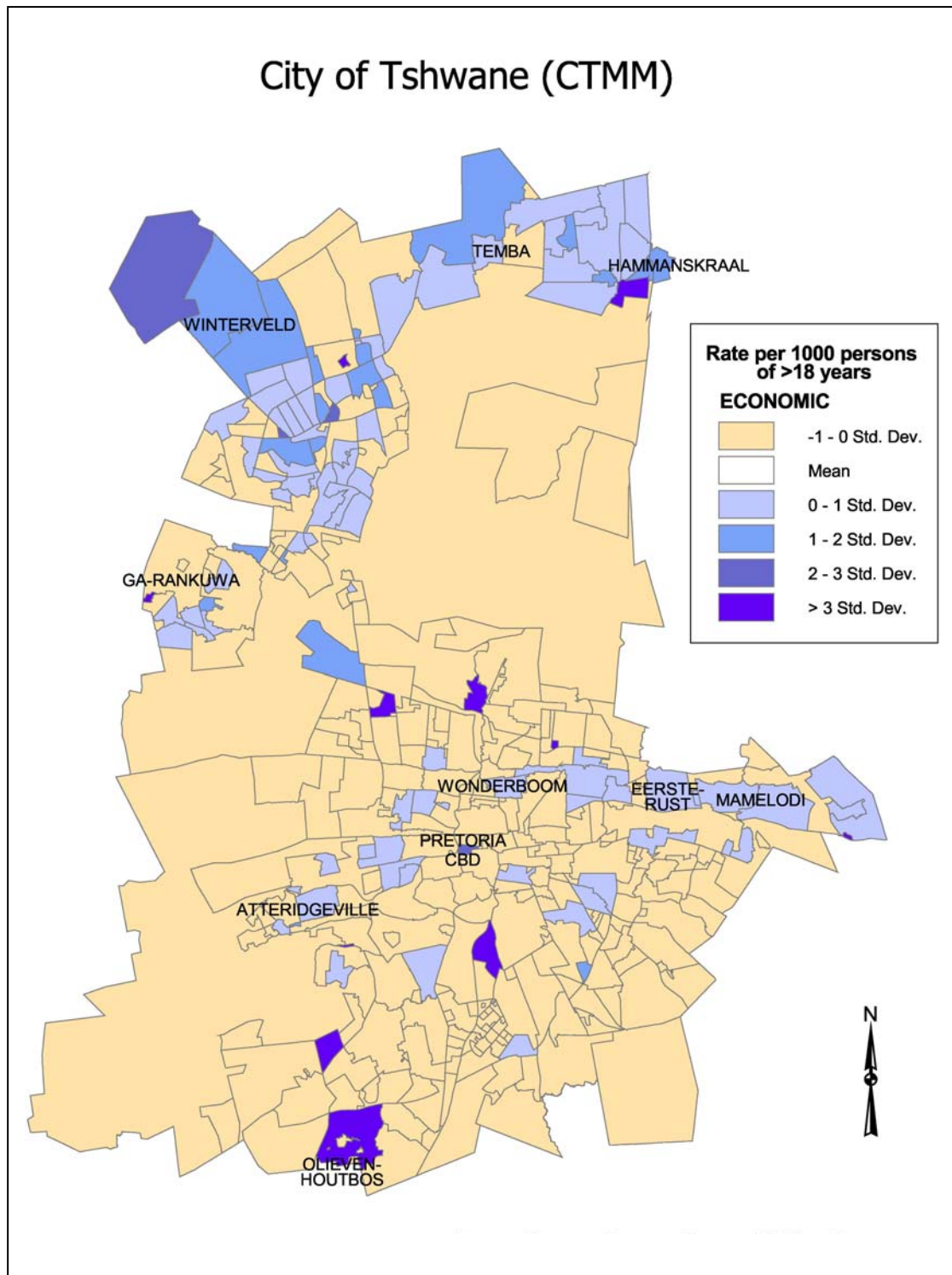


Figure 1b: Economic delinquency rate per 1000 population over 18

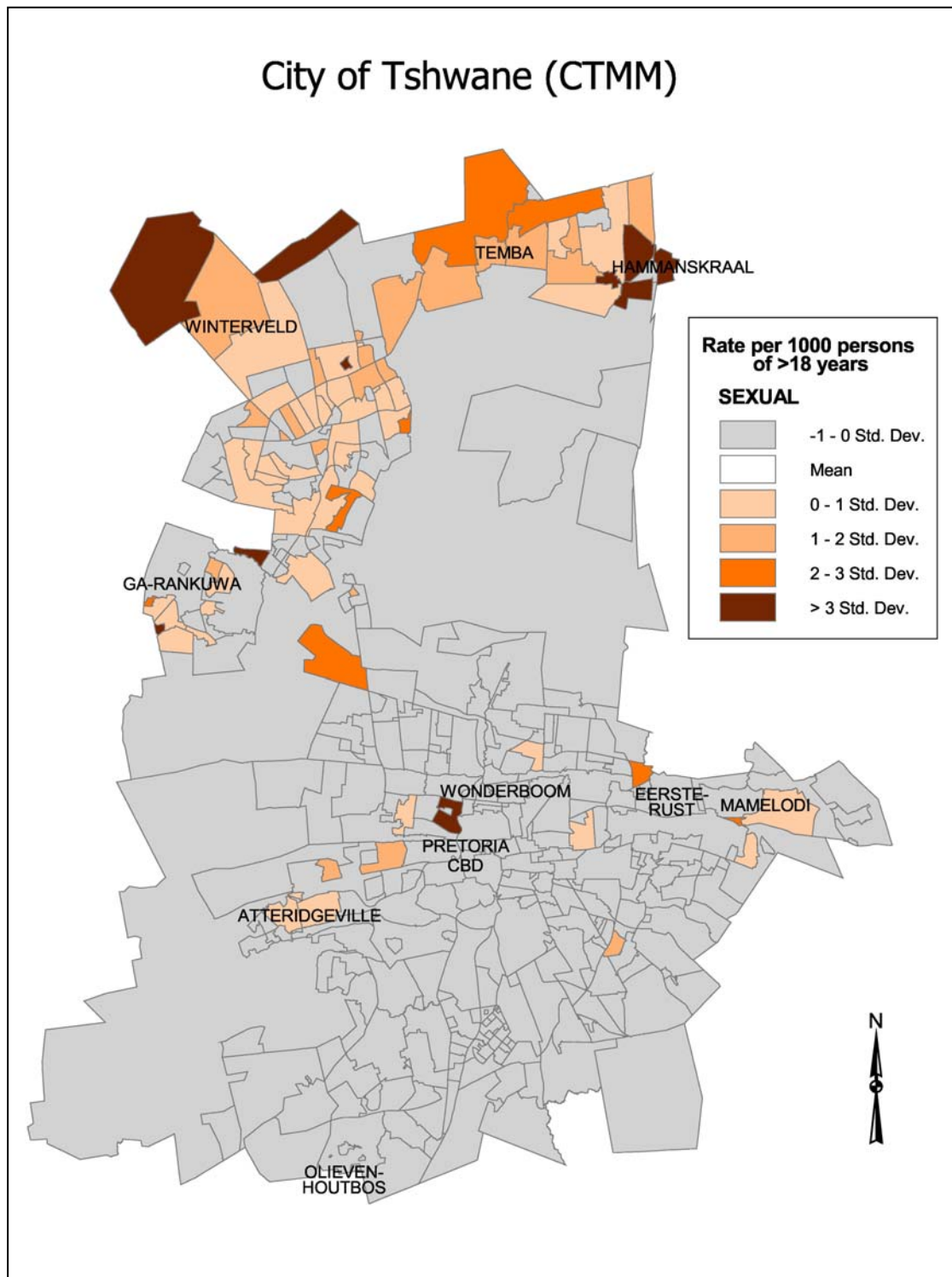


Figure 1c: Sexual delinquency rate per 1000 population over 18

Figure 1 shows a similar spatial pattern occurring across the three crime categories within Tshwane with the majority of suburbs on the periphery of the city exhibiting high delinquency rates. The majority of these suburbs are located in the far northern part of Tshwane and are examples of black African townships that emerged as part of the relocation policies instigated in accordance with the Group Areas Act. In fact 87% of offenders incarcerated within Tshwane emanate from suburbs located in these townships, which illustrates the highly skewed geographical distribution of offenders. The prevalence of violent offenders within the 371 suburbs varied between 0 to 5.75 offenders per 1000 population and its spatial distribution is comparable with the economic and sexual offenders in which high rates are again concentrated in the townships on the northern periphery of Tshwane. The violent offender distribution does however show a less sporadic pattern and contains more isolated suburbs exhibiting high rates. Existing prevalence of economic offenders within the 371 suburbs varied from 0 to 12.12 offenders per 1000 population. The economic crime category exhibited high rates in areas within Tshwane that are traditionally low-to-middle income black African township areas such as Winterveld, Hammanskraal, Soshanguve and Mamelodi. The prevalence of sexual offenders within the 371 suburbs varied from 0 to 11.24 offenders per 1000 population over 18.

Independent variables

The socio-economic and demographic variables selected to represent social disorganization were obtained from the SSA 2001 census dataset. Ethnic heterogeneity, social/economic deprivation, family disruption and residential mobility are typical representations of social disorganization (Sampson and Groves, 1989; Sun *et al.*, 2004; Andresen, 2006). As far as possible, single variables were used to

represent each dimension, however in instances where a number of variables exist for the representation of a single dimension such as social/economic deprivation, an index was developed using Principal Components Analysis (PCA). The following variables/indices were used to capture each measure of social disorganization: *ethnic heterogeneity* is measured by the percentage of residents foreign born. This measure is consistent with social disorganization theory (see Sampson *et al.*, 1997) and represents the percentage of residents who were born outside South Africa. This measure should exhibit a positive relationship with the delinquency rates according to the social disorganization theory. The second dimension, *social/economic deprivation* is measured using two scores: first, the unemployment rate and second, a factor-analysed index based on the United Nations Development Program's (UNDP) (2003) parameters for deprivation in five dimensions: the percentage of residents living in informal housing, percentage of households with no flush toilet, the percentage of households with no water supply and no electricity, and the percentage of households with no refuse removal. A correlation matrix was constructed to examine the relationships between these five variables of social/economic deprivation, and expectedly revealed a high degree of inter-correlation (average $r = 0.659$, $P < 0.001$), resulting in the threat of multicollinearity. As a way to synthesize the variables and simultaneously deal with the problem of multicollinearity, a PCA with varimax rotation was employed to create a social/economic deprivation index. One component was retained explaining 80.2% of the variance. The third dimension, *family disruption*, is measured using the percentage of females as head of the household. In previous ecological studies the percent single-parent variable is commonly used as the measure of family disruption (see Rice and Smith, 2002; Andresen, 2006; Jacob, 2006). In South Africa however, this variable is not included in the census and similar

to previous social disorganization research, the percentage of female-headed households was used (see Freisthler, 2004; Oh, 2005; Krivo *et al.*, 2006). The fourth dimension, *residential mobility* is measured by three variables, the percentage of residents who have moved in the last 5 years, the percentage of residents who do not sleep at the same address for longer than four nights of the week, and the percentage of rental households. In accordance with the social disorganization theory, it is expected that high ethnic heterogeneity, high unemployment, a low social/economic index, high family disruption and residential mobility will all exhibit a positive relationship with the delinquency rates. The descriptive statistics for the measures used in the spatial regression analysis are provided in Tables 1 and 2.

Table 1: Descriptive statistics of social disorganisation measures

	Mean	SD
Ethnic heterogeneity	4.79	4.91
Percent unemployed (%)	13.99	13.98
Social/economic deprivation index	0.20	0.28
Female as head of the household (%)	32.26	12.07
Resident moved in last 5 yrs (%)	31.37	21.09
Residents don't reside in the same place (%)	2.53	8.35
Rentals (%)	22.97	21.65

NOTE: The spatial units are suburbs in Tshwane (n = 371), shown in Figure 1.

Table 2: Descriptive statistics of delinquency rates

Offender type ^a	Count	Mean	SD
Violent offender	294	0.17	0.52
Economic offender	501	0.35	1.07
Sexual offender	209	0.20	0.93
Overall offender ^b	1004	0.72	2.02

^a Rate per 1000 population over 18

^b A combination of violent, economic and sexual delinquency rates

NOTE: The spatial units are suburbs in Tshwane (n = 371), shown in Figure 1.

The descriptive statistics display some interesting findings most notably the fact that almost a third of all households in Tshwane have females at the head and almost a third of all residents having moved within the previous 5 years. This is indicative of a highly mobile population coupled with a disrupted family. The small sample sizes of the crime categories indicated in Table 2 does make the analysis vulnerable to outliers. However in an adjustment similar to Bukenya (2005), all observations which deviated by more than five standard deviations from the mean, were replace with the mean values calculated only over the positive observations. The count for the economic crime category almost doubles the violent and sexual categories and could provide an initial indication of the possible economic motivation behind the majority of crime. In the violent crime category, 71 of the 371 suburbs had a number of offenders more than one-half standard deviation above the mean. These 71 suburbs (19.1% of the suburbs of Tshwane) account for 85.4% of violent offenders within Tshwane. In the economic crime category, 59 suburbs had a number of offenders more than one-half standard deviation above the mean. These 59 suburbs (15.9% of the suburbs of Tshwane) account for 64.3% of economic offenders within Tshwane while 35 suburbs had a number of sexual offenders more than one-half standard deviation above the mean accounting for 52.6% of sexual offenders within Tshwane. Also interesting to note is that 15 suburbs (4% of the suburbs of Tshwane) had delinquency rates one-half standard deviations above the mean across all three crime categories. These 15 suburbs account for almost 20% of the number of offenders across all categories and are again indicative of the highly skewed distribution of offenders within Tshwane illustrated in Figure 1.

Spatial regression estimation

The general functional form of the spatial lag model is:

$$y = pWy + XB + \varepsilon$$

Where y represents the number of offenders of a particular crime category per 1000 population at risk, Wy is the weighted mean of the local values of y in neighboring areas, p is the parameter, X is the set of offender motivators, B is a vector of coefficients to be estimated and ε is the error term. Spatial autocorrelation is modelled using Rook's contiguity for census areas. The results from the spatial regression models are presented in Table 3.

Table 3: Spatial regression results for the city of Tshwane

<i>Variables</i>	(1) <i>All offenders</i>	(2) <i>Violent offender</i>	(3) <i>Economic offender</i>	(4) <i>Sexual offender</i>
Constant	0.238 (0.191)	0.025 (0.051)	0.164 (0.114)	0.082 (0.056)
Ethnic heterogeneity	-0.010 (0.012)	-0.004 (0.003)	-0.005 (0.007)	-0.002 (0.004)
Percent unemployed (%)	0.021*** (0.007)	0.007*** (0.002)	0.013*** (0.004)	0.003 (0.002)
Social/economic deprivation index	0.062 (0.078)	-0.006 (0.021)	0.035 (0.047)	0.031 (0.023)
Female as head of the household (%)	0.005 (0.005)	0.002 (0.001)	0.001 (0.003)	0.001 (0.001)
Resident moved in last 5 yrs (%)	-0.005* (0.003)	-0.002* (0.001)	-0.003 (0.002)	-0.001 (0.001)
Residents don't reside in the same place (%)	-0.003 (0.006)	-0.001 (0.002)	-0.002 (0.004)	-0.001 (0.002)
Rentals (%)	0.002 (0.003)	0.000 (0.001)	0.002 (0.002)	-0.000 (0.001)
Observations	1004	294	501	209
Pseudo <i>R</i> -squared	0.179	0.190	0.138	0.191

NOTE: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; standard errors in parenthesis

RESULTS AND DISCUSSION

A series of four spatial regression models were estimated, including an overall model to supplement the three crime category models. The results were not very encouraging with all models exhibiting a pseudo- R^2 , which approximates the amount of variation explained by the model, below 20%. The first model (overall crime category) used the total offender index as the dependent variable and accounted for 17.9% of the variation across suburbs for rates of offenders. The signs of the coefficients in the overall model are contrary to the expectations of the social disorganization theory with only the percentage unemployed - a proxy for social/economic deprivation - exhibiting a significant positive relationship. A comparison of the overall model with the models based on the three crime categories provides a similar, albeit discouraging picture. The sexual offender category provided the best result with 19.1% of its variation being explained by the variables representing social disorganization; this is followed by the violent offender (19%) and the economic offender (13.8%). Similar to the overall offender category, the only positive and significant coefficient for the economic and violent offenders were the percent unemployed, while the sexual offender category exhibited no positive relationships with any social disorganization constructs. A number of important observations and conclusions can be drawn from these findings.

Ethnic heterogeneity

It is not surprising that ethnic heterogeneity, measured as percent foreign born, was not significant in any of the regression models as the measure exhibits no correlation with the overall offender index ($r = -0.407$). The lack of support for the ethnic heterogeneity measure is consistent with Jacob (2006) and, Rice and Smith (2002) who attribute this inconsistency to the differential development of urban areas in Canada as opposed to the US as well as the inability of the variable to capture neighborhood cohesion, respectively. Some researchers argue that increased ethnic heterogeneity may even lead to the lowering of crime as immigrants may lessen the impact of concentrated disadvantage and can lead to immigration revitalization (Lee and Martinez, 2002; Sampson and Wilson, 1995). While no local ecological studies have been conducted to assess the relationship between ethnic heterogeneity and crime to draw comparison, the results of the study contrast sharply with other local researchers who attest to the large number of illegal immigrants, particularly African-immigrants, being responsible for a significant proportion of crime in Tshwane (Strydom and Schutte, 2005). A recent report from the United Association of South Africa (UASA) (2006) estimated roughly 10 million illegal immigrants currently in South Africa from neighboring Mozambique and Zimbabwe as well as from other African countries such as the Democratic Republic of the Congo (DRC) and Nigeria. In a country of roughly 50 million people that constitutes 20% of the population. Over 200 000 illegal immigrants are deported annually in South Africa, compared with 186 000 in the US (Schussler, 2006). At least half of these illegals are from Zimbabwe where economic and social turmoil has engulfed the country since the establishment of the land redistribution scheme in 2000 (Chasan, 2002). The majority of illegal immigrants settle in former homeland townships on the periphery of urban centres and

having illegal status in the country would be undocumented. The strong negative correlation between the ethnic heterogeneity and the percent unemployed ($r = -0.508$) and social/economic deprivation index ($r = -0.181$) implies that documented immigrants in Tshwane are generally employed and experience a decent standard of living, while those illegally in the country are generally unemployed or are severely underpaid for their services and resort to crime as a means to survive (Strydom and Schutte, 2005).

A further difficulty in assessing ethnic heterogeneity in a South African context relates to its actual definition applied in a local context. During the apartheid era, the South African government used the idea of ethnicity for political and racial purposes by establishing language areas for each 'ethnic or tribal' group as classified by the government. During the 1950s and 1960s, these groups were assigned separate residential areas according to perceived ethnic identity (Emmett, 2003). Apartheid policies also empowered the government to forcibly remove black Africans from cities and to preserve the 'ethnic character' of neighborhoods in the black African townships that were created, legally and illegally, around the cities (Byrnes, 1996). As a result of these oppressive racial policies, many black Africans minimized the importance of their ethnic heritage, or disavowed it entirely (Byrnes, 1996). The dawn of democracy in 1994 however saw a reversal of this thinking with South Africans appearing to reclaim their ethnic heritage and to acknowledge pride in their ancestry (Byrnes, 1996). The new political leaders recognized the practical advantage of encouraging people to identify both with the nation and with an ethnic group or tribe that had a past older than the nation. The consequence being the elevation of eleven official languages and even more 'official' ethnic and tribal groups, resulting

in South Africa having one of the most complex ethnic patterns in the world (Byrnes, 1996). The fact that the variable representing ethnic heterogeneity, percent foreign born, was non-significant may therefore indicate that it is weak measure of ethnic heterogeneity. Further studies in the South African context should attempt to differentiate between local and international ethnic groups on the basis of language or race in an attempt to better represent this measure of social disorganization.

Social/economic deprivation

Social disorganization theory suggests that suburbs characterized by high socio-economic status will have residents who are in a position to establish and maintain strong ties and more extensive social networks (Jacob, 2006). In this study the two measures of social/economic deprivation produced inconsistent results. The social/economic deprivation index on the one hand displayed no significance in any of the models despite exhibiting a low positive correlation with the overall offender index ($r = 0.364$). The coefficient for percent unemployed on the other hand showed significance in all the models with the noted exception of the sexual offender model. In international tests of social disorganization, the social/economic deprivation measure is generally the strongest predictor of criminal activity. Andresen (2006) found economic deprivation, in the form of unemployment, to be greatest predictor of crime rates in an empirical assessment of social disorganization theory in Vancouver, while Freisthler (2004) found impoverishment to be linked with high rates of crime in a test of social disorganization in California. Other studies however display inconsistent findings (see Sampson and Groves, 1989; Wright *et al.*, 1999).

In the present study, percent unemployed - as a proxy for social/economic deprivation - was shown to be by far the strongest predictor of delinquency rates and illustrates the importance of addressing this issue within Tshwane. The first main policy document to govern policing in post-apartheid South Africa, the National Crime Prevention Policy (NCPS, 1996, p.18) in 1996 already identified “historically shaped unemployment” as providing a ready recruitment ground for criminal activity and as contributing significantly to increased levels of crime in the country. Unemployment has also been identified as one of the main motivations behind farm attacks in the country (Haefele, 1998; Strydom and Schutte, 2005), while other local researchers charge levels of unemployment coupled with high levels of inequality with the high crime rate (Brown, 2001; Blackmore, 2003; Hodgskiss, 2004; Demombynes and Özler, 2005).

Locally, researchers obtain a strong positive association between levels of unemployment and violent and economic crime (Wedge *et al.*, 2000; Maree and Prinsloo, 2003; Masango, 2004). In terms of the violent offender, Schwabe (2000) notes the emergence of a subculture of violence among an unemployed black juvenile cohort in South Africa. This cohort perceives itself to be deprived in terms of education, employment and socio-economic wealth relative to other groups in the country. These groups tend to be guided by values that prescribe violence as a means of solving problems and expressing frustrations (Schurink and Schwabe, 2000) and have created a climate of learning crime, whereby the youth are frequently associated with past and present violent offenders. Children are coerced into this violent subculture as they grow up in an environment in which violence becomes internalised and part of everyday living (Maree, 2003). In terms of the economic offender,

unemployed individuals are envisaged as being driven by a need to support their families or dependents and in doing so resort to such economic crimes as burglary, robbery, shoplifting and/or theft. High rates of economic offenders were found in the former homeland townships in the northern periphery of the city (Figure 1), which tend to reinforce the historical-based context of delinquency and collaborates the economic motivations driving these offenders.

Whereas all the other models exhibited a significant relationship with some measure of social disorganization, no significant coefficients were found for the sexual delinquency rate. This result suggests that alternate individual-level motivations possibly exist for sexual offenders within Tshwane, as the ecological determinants compiled were not significant.

Family disruption

The use of the family disruption measure as an indicator of social disorganization has its historical antecedents in the work of Sampson and Groves (1989). The researchers extended the arguments of Shaw and McKay (1942) by identifying family disruption as an exogenous force contributing to social disorganization. A disrupted family would, according to Sampson (1995, p.197), “facilitate crime by decreasing networks of informal control.” The family disruption measure, in the form of percent female-headed household, was found to be conspicuously absent from all four models despite the fact that the measure exhibited a low positive correlation with the overall offender index ($r = 0.277$). Whereas the rejection of this measure in the present study contrasts with other empirical tests of social disorganization (see Andresen, 2006; Sun *et al.*, 2004) it is consistent with Cahill and Mulligan (2003) who in a test of social

disorganization theory in Tucson, Arizona, found little support for the family disruption measure. In explaining this discrepancy the authors concluded that either the variables selected were not a good measure of family disruption or that family disruption did not play an integral role in affecting crime rates. While the same conclusions may be drawn in this study, two more poignant explanations may apply. First, as a partial result of the migrant labour system in the apartheid-era, black African males have traditionally been coerced into working away from their household and as such, according to the South African census, the household would be classified as female-headed even though the male resides periodically at the household. Although this may have a disruptive influence on the members of the family, the disturbance would not be as greatly felt if for instance, the male had abandoned the family. The second explanation revolves around local contextual discrepancies between international and local definitions of household head. Internationally, residing in a female-headed household would imply the physical absence of a male in the form of a husband or partner in the household. Locally, however in a country as diverse as South Africa, some members of the population base their definition of household head on gender, some on age, some on income-earning ability, and some on a combination of these variables depending on their cultural context. Lastly, an alarming finding by Budlender (2003) found that despite being characteristically poverty-ridden in South Africa children in female-headed households might be 'better off' than residing in male-headed households or two-parent households. The researcher found that women tend to spend much longer than men on caring for their children and that women are more likely than men to live with their children and so be responsible for seeing to their own material needs as well as those of the children. In fact the study even found that women with no children of

their own tend to spend more time on childcare than men who have their own children living with them. Racial differences between male and female head of households again characterized their researchers findings.

Residential mobility

According to social disorganization theory residential mobility is hypothesized to impede the community's ability to informally control delinquency because residents in areas with high levels of instability undermine collective efficacy and social control processes (Nielsen *et al.*, 2005). While no South African studies have been conducted to measure the effect of residential mobility on crime and delinquency rates, a number of international studies illustrate its significance on the propensity to commit crime (see Freisthler, 2004; Andresen, 2006). The present study however found none of the variables representing residential mobility as being significant in any of the regression models. Incidentally, these variables also exhibited no correlation with the overall offender index (average $r = -0.266$). In fact, negative and significant coefficients were exhibited on one proxy of residential mobility, namely the percent of people that moved in the last 5 years, for both the overall and violent category of offenders. This finding is supported by Nielsen *et al.* (2005) who found that increased residential turnover might not necessarily lead to increased crime levels since the cultural and social values of the new immigrants may positively affect their ability to develop relationships with existing residents. In the present study an explanation for this result is based on *a priori* knowledge of the recent political history of Tshwane. As previously mentioned, Tshwane is an example of a highly mobile society with almost of third of all residents having moved within the past 5 years. The end of apartheid not only resulted in the end of restrictions on the movement of its residents but also

positive year-on-year economic growth for ten consecutive years (Hesselink-Louw *et al.*, 2003). These combined factors have resulted in a highly mobile society where a change in residence is associated with a move up the social and economic ladder. An interesting implication of this finding is the fact that it is predominantly long-standing members of the community that are committing criminal offences, particularly violent offences. These long-standing members of the community would probably be older segments of the population and may have ‘missed out’ in the economic upsurge that South Africa has recently experienced. Witnessing what researchers have described as the ‘emerging black middle class’ in South Africa (see Lalloo *et al.*, 2004; Macozoma, 2007) these predominantly low-income black African residents would be frustrated at their stagnating socio-economic status more than a decade after the end of apartheid. The low number of renters in Tshwane is compatible with the current property boom prevalent in South Africa and well as the fact that many residents in poorer regions of Tshwane were given low-cost houses as part of the Reconstruction and Development Programme (RDP) of the late-1990s.

Overall little support is found for the social disorganization theory in the city of Tshwane. The positive relationship of the percent unemployed with some of the regression models lends support for the social disorganization theory; however, the predominantly negative and non-significant coefficients for the ethnic heterogeneity, social/economic deprivation, family disruption and residential mobility measures are counter to the expectations of the theory. It is difficult to place the study explicitly within existing international literature since ecological studies of crime have traditionally focussed on overall offenders and have neglected to study the contextual factors correlated with different types of offenders. In addition, no local studies of

delinquency have been used to assess social disorganization or any other ecological theories of crime in the country, hindering comparisons. Whilst social disorganization theory, among others, has been used to explain and interpret the distribution of crime locations in South Africa (see Schwabe and Schurink, 2000), the theory hasn't been empirically employed in ecological studies of delinquency.

This study is however not without limitations. First, the data utilised in the study reflects only incarcerated offenders and the results of the study are therefore representative of the approximately 8% of offenders in the country that are actually apprehended and incarcerated (see McCafferty, 2003). Second, the cross-sectional nature of the study implies that the findings of the study are applicable only to the sample of offenders at the time of data collection. Despite this fact no noteworthy interventions such as changes in parole policy or mandatory 'burstings' were taken by the DCS at the time the sample of offenders was drawn to make the sample unrepresentative. Longitudinal studies examining the influence of social disorganization constructs of delinquency rates in Tshwane would ideally provide a better picture of this spatial relationship. This would also allow researchers to address the reciprocal relationships between delinquency rates and social disorganization theory and thus allow causal inferences between the two to be drawn. While these issues place certain restrictions on the generalizability of the findings, the results nevertheless provide important information regarding the spatial distribution of offenders within Tshwane as well as highlight the need to understand 'historical circumstance' and local context when comparing and extending ecological theories of crime in a local context.

CONCLUSION

The spatial distributions of violent, economic and sexual offenders were investigated using variables informed by the social disorganization theory and found little support for the theory. Similar to previous research on social disorganization (see Freisthler, 2004; Andresen, 2006), social/economic deprivation in the form of unemployment was found to be the greatest predictor of delinquency rates with no other measures proving significant. Despite South African society and cities historically experiencing social disorganization and community fragmentation, the effects of these constructs were shown to have little influence on the rates of offenders. To this end the author asserts that the ‘social disorganization of apartheid’ and its social and economic remnants contrasts with the social disorganization constructs of Shaw and McKay (1942). While it may be that social disorganization needs to be measured with different indicators than those used in the current study, the results do provide substantial support for the incorporation of local knowledge to account for any explanation of the distribution of offenders in Tshwane. For future research, it is recommended that an ecological analysis of offender origins using any number of socio-demographic variables be undertaken in Tshwane, or elsewhere in South Africa, in order to obtain more knowledge regarding the ecological causes of delinquency. Knowledge garnered from such a study would be invaluable as it would not only enable the development of a localized urban ecological theory of crime but also allow for the incorporation of additional ‘post-apartheid’ explanations in its make-up. Tests of other ecological theories of crime such as the routine activity theory at a neighbourhood level within a local context would also be of value.

ACKNOWLEDGEMENTS

The author would like to thank the South African Department of Correctional Services (DCS) for the provision of data.

ENDNOTES

¹ Data obtained from the MIS of the DCS was partially incomplete. The total number of incarcerated offenders residing within Tshwane is 1870 (this is the number indicated in subsequent chapters). The crime dockets for the remaining 866 offenders ($1870 - 1004 = 866$) did not include the crime for which the offender was incarcerated. Numerous attempts to obtain this information proved futile as a result of an extreme lack of co-operation from DCS officials and, limited on-the-job knowledge by DCS officials of how the MIS actually works.

REFERENCES

- Andresen, M.A. 2006. Crime measures and the spatial analysis of criminal activity. *British Journal of Criminology*, 46, 258-285.
- Blackmore, F.L.E. 2003. A panel data analysis of crime in South Africa. *South African Journal of Economic and Management Sciences*, 6, 439-458.
- Brown, K.V. 2001. The determinants of crime in South Africa. *The South Africa Journal of Economics*, 69, 269-299.
- Budlender, D. 2003. Women and poverty in South Africa. Document commissioned by the Women's Net Programme of South Africa. Available at <http://genderstats.org.za/poverty.shtml>, last accessed 4 September 2007.
- Bukenya, J. O. 2005. Crime trends and socio-economic interactions: a county-level analysis. *Criminal Justice Studies*, 18, 365-378.
- Bursik, R.J. and Grasmick, H.G. 1993. Economic deprivation and neighborhood crime rates. *Law and Society Review*, 27, 263-83.
- Byrnes, R.M. 1996. *South Africa: A Country Study*. GPO for the library of Congress: Washington.
- Cahill, M.E. and Mulligan, G.F. 2003. The determinants of crime in Tucson, Arizona. *Urban Geography*, 24, 582-610.

- Chaix, B., Leyland, A.H., Sabel, C.E. Chauvin, P., Råstam, L., Kristersson, H. and Merlo, J. 2006. Spatial clustering of mental disorders and associated characteristics of the neighbourhood context in Malmö, Sweden, in 2001. *Journal of Epidemiology & Community Health*, 60, 427-435.
- Chasan, A. 2002. Let them eat nothing. *World Press Review*, 49(10).
- Coulton, C.I., Korbin, J., Chow, I. and Su, M. 1995. Community level factors and child maltreatment rates. *Child Development*, 66, 1262-1276.
- Demombynes, G. and Özler, B. 2005. Crime and local inequality in South Africa. *Journal of Development Economics*, 76, 265-292.
- Du Plessis, A. and Louw, A. 2005. The tide is turning: The 2003/4 SAPS crime statistics. *SA Crime Quarterly*, 12, 1-8.
- Emmett, T. 2003. Social disorganization, social capital and violence prevention in South Africa. *African Safety Promotion Journal*, 1, 4-18.
- Ernst, J.S. 2001. Community-level factors and child maltreatment in a suburban county. *Social Work Research*, 25, 133-142.
- Fein, J.C. 2002. Does gender matter? Structural correlates of male and female youth crime in Canada. Unpublished MA thesis, University of Waterloo, Canada.
- Frank, C. 2006. Missed opportunities: the role education, health and social development in preventing crime. Institute for Security Studies (ISS) Monograph Series, No.126, October 2006.

- Freisthler, B. 2004. A spatial analysis of social disorganization, alcohol access, and rates of child maltreatment in neighborhoods. *Children and Youth Services Review*, 26, 803-819.
- Haefele, B. 1998. Violent attacks on farmers in South Africa: Is there a hidden agenda? *Acta Criminologica*, 11, 9-18.
- Hayslett-McCall, K.L. 2002. Neighborhoods, land-use and robbery-rates: A test of routine activity theory. Unpublished PhD thesis, Pennsylvania State University, Pennsylvania.
- Hesselink-Louw, A-N.E., Joubert, S. and Maree, A. 2003. Criminological assessment of offenders: an analysis with the aim of promoting rehabilitation. *Acta Criminologica*, 16, 91-98.
- Hodgskiss, B. 2004. Lessons from serial murder in South Africa. *Journal of Investigative Psychology and Offender Profiling*, 1, 67-94.
- Horn, A.C. 1998. Tshwane, Pretoria, Phelindaba: structure-agency interaction and the transformation of a South African region up to 1994, with prospects for the immediate future. Unpublished PhD Thesis, University of Pretoria, Pretoria.
- Hough, M. 2003. Crime in South Africa: Is it a threat to national security? M. Hough and A. du Plessis (Eds), *Combating Crime in South Africa: Contemporary Perspectives*. Institute for Strategic Studies (ISS) Press: Pretoria, 188-205.

- Jacob, J.C. 2006. Male and female youth crime in Canadian communities: assessing the applicability of social disorganization theory. *Canadian Journal of Criminology and Criminal Justice*, 48, 31-60.
- Kawachi, I., Kennedy, B.P. and Wilkinson, R.G. 1999. Crime: Social disorganisation and relative deprivation. *Social Science and Medicine*, 48, 719-731.
- Kriel, J. 2005. Emerging trends among the South African inmate population and persons subject to community corrections. *Acta Criminologica*, 18, 100-115.
- Krivo, L.J., Peterson, R.D. and Payne, D.C. 2006. Inequality in crime across space: exploring the role of segregation. Paper presented at the Annual Meeting of the Population Association of America, Los Angeles.
- Lalloo, R., Smith, M.J., Myburgh, N.G. and Solanki, G.C. 2004. Access to healthcare in South Africa – the influence of race and class. *South African Medical Journal*, 94, 639-642.
- Lalthapersad, P. 2003. Historical analysis of African women workers in South Africa during the period 1900-2000. *South African Journal of Economic and Management Sciences*, 6, 262-273.
- Lanier, C. and Huff-Corzine, L. 2006. American Indian homicide: a county-level analysis using social disorganisation theory. *Homicide Studies*, 10, 181-194.
- Lee, M.T. and Martinez Jr, R. 2002. Social disorganization revisited: mapping the recent immigration and black homicide relationship in Northern Miami. *Sociological Focus*, 35, 363-380.

- Lockwood, D. 2004. Mapping violent crime in Savannah's neighborhoods, 1993-1997: social disadvantage, land use, and violent crimes reported to the police. Paper presented at the 7th International Crime Mapping Research Conference, Boston.
- Mabin, A. 2005. Suburbanisation, segregation, and government of territorial transformations. *Transformation*, 56, 41-64.
- Macozoma, S. 2007. The black middle class: Where to from here? *Management Today*, February 2007, 16-17.
- Mahlalela-Thusi, B. and Heugh, K. 2002. Unraveling some of the historical threads of mother-tongue development and use during the first period of Bantu Education. *Perspectives in Education*, 20, 241-257.
- Manuel, T. 2006. Address to the UCT Engineering and Built Environment student council. University of Cape Town, 31 August.
- Marais, C.W. 2003. Metro policing: Too high a price? *Acta Criminologica*, 16, 138-150.
- Maree, A. 2003. Criminogenic risk factors for youth offending. In Bezuidenhout, C. and Joubert, S. (Eds), *Child and Youth Misbehaviour in South Africa: A Holistic View*. Van Schaiks: Pretoria, 51-79.
- Maree, A. and Prinsloo, J. 2003. An exploration of crime and crime risks with specific reference to South Africa. In Hough, M. and du Plessis, A. (Eds.), *Combating Crime in South Africa: Contemporary Perspectives*. Institute for Security Studies (ISS): Pretoria, 171-187.

- Masango, M.J. 2004. Aggression, anger and violence in South Africa. *HTS: Theological Studies*, 60, 993-1006.
- McCafferty, R. 2003. Murder in South Africa: A comparison of past and present. Working Paper, United Christian Action. Available at http://www.christianaction.org.za/uca/articles/murder_southafrica.doc, last accessed 30 November 2006.
- McCulloch, A. 2003. An examination of social capital and social disorganisation in neighbourhoods in the British Household Panel Survey. *Social Science & Medicine*, 56, 1425-1438.
- Morrow, S., Maaba, B. and Pulumani, L. 2004. *Education in Exile*. HSRC Press: Pretoria.
- Mustaine, E.E., Tewksbury, R. and Stengel, K.M. 2006. Social disorganization and residential locations of registered sex offenders: is this a collateral consequence? *Deviant Behavior*, 27, 329-350.
- NCPS (National Crime Prevention Strategy). 1996. Pretoria, South African Department of Safety and Security.
- Nielsen, A.L., Lee, M.T. and Martinez Jr, R. 2005. Integrating race, place and motive in social disorganization theory: lessons from a comparison of black and Latino homicide types in two immigrant destination cities. *Criminology*, 43, 837-872.
- Oh, J-H. 2005. Social disorganizations and crime rates in U.S. central cities: toward an explanation of urban economic change. *The Social Science Journal*, 42, 569-582.

- Ouimet, M. 2000. Aggregation bias in ecological research: how social disorganization and criminal opportunities shape the spatial distribution of juvenile delinquency in Montreal. *Canadian Journal of Criminology*, 42, 135-156.
- Pelser, A. and de Kock, C. 2000. Violence in South Africa: a note on some trends in the 1990s. *Acta Criminologica*, 13, 80-94.
- Pinnock, D. 1984. *The Brotherhoods: Street Gangs and State Control in Cape Town*. David Philip: Cape Town.
- Platzky, L. and Walker, C. 1985. *The Surplus People: Forced Removals in South Africa*. Ravan Press: Johannesburg.
- Putnam, R.D. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press: Princeton.
- Rice, K.J. and Smith, W.R. 2002. Socioecological models of automotive theft: integrating routine activity and social disorganization approaches. *Journal of Research in Crime and Delinquency*, 39, 304-336.
- Sampson, R.J. 1995. The community. In Wilson, J. Q. and Petersilia, J. (Eds), *Crime*. ICS: San Francisco, 193-216.
- Sampson, R.J., and Groves, W.B. 1989. Community structure and crime: testing social-disorganization theory. *American Journal of Sociology*, 94, 774–802.

- Sampson, R.J. and Wilson, W.J. 1995. Toward a theory of race, crime, and urban inequality. In Hagan, J. and Peterson, R. (Eds), *Crime and inequality*, Stanford University Press: Stanford, 37-54.
- Sampson, R.J., Raudenbush, S. W. and Earls, F. 1997. Neighborhoods and violent crime: a multilevel study of collective efficacy. *Science*, 277, 918-924.
- Schönteich, M. and Louw, A. 2001. *Crime in South Africa: A Country and Cities Profile*. Institute for Security Studies (ISS): Pretoria.
- Schurink, W.J. and Schwabe, C.A. 2000. Activity 5: Piloting of multivariate analysis to explain crime, Part 4: important social science dimensions in the multivariate analysis of crime phenomena. Research report, DACST Innovation Fund Project Number: 13102.
- Schussler, M. 2006. Employment still growing in South Africa. Mail and Guardian Online, 23 November 2006. Available at http://www.mg.co.za/articlePage.aspx?articleid=290919&area=/breaking_news/breaking_news__business/, last accessed December 2006.
- Schwabe, C.A. 2000. Towards the development of a spatial information system for crime analysis and prevention: Some conceptual requirements and empirical evidence from South Africa. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST).

- Schwabe, C.A. and Schurink, W.J. 2000b. Crime forecasting and multivariate analysis at a strategic level: towards a social science interpretation. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST), Pretoria.
- Shaw, C. and McKay, H.D. 1942. *Juvenile Delinquency and Urban Areas*. University of Chicago Press: Chicago.
- Simcha-Fagan, O. and Schwartz, J. 1986. Neighbourhood and delinquency: An assessment of contextual effects. *Criminology*, 24, 667-704.
- Strydom, H. and Schutte, S.C. 2005. A theoretical perspective on farm attacks in the South African farming community. *Acta Criminologica*, 18, 115-125.
- Sun, I.Y., Triplett, R. and Gainey, R.R. 2004. Neighborhood characteristics and crime: a test of Sampson and Groves' model of social disorganization. *Western Criminology Review*, 5, 1-16.
- Taylor, R., Gottfredson, S. and Brower, S. 1984. Block crime and fear: defensible space, local social ties and territorial functioning. *Journal of Research in Crime and Delinquency*, 21, 303-331.
- Thomas, T. 1987. Homelands psychosocial pathology: impressions of a community doctor. *South African Outlook*, 117, 113-116.
- Thylor, R.B. 1996. Neighborhood responses to disorder and local attachments: the systematic model of attachment, social disorganisation, and neighborhood use value. *Sociological Forum*, 11, 41-75.

Tshiwula, L. 1998. *Crime and Delinquency*. Kagiso: Pretoria.

United Association of South Africa (UASA) (2006). The 4th South African Employment Report. Available at: www.polity.org.za/pdf/EmploymentReport.pdf, last accessed 14 December 2006.

United Nations Development Programme (UNDP) (2003). Oxford University Press: Cape Town.

Wedge, P., Boswell, G. and Dissel, A. 2000. Violence in South Africa: key factors in the background of young serious offenders. *Acta Criminologica*, 13, 31-38.

Wright, B., Caspi, A., Moffitt, T., Miech, R. and Silva, P. 1999. Reconsidering the relationship between SES and delinquency. *Criminology*, 37, 175-194.

CHAPTER 5

**CROSSING THE RACIAL DIVIDE: A SPATIAL-ECOLOGICAL
PERSPECTIVE OF OFFENDERS IN THE CITY OF TSHWANE
METROPOLITAN MUNICIPALITY, SOUTH AFRICA**

Gregory Dennis Breetzke and Andre Carl Horn

Published: *GeoJournal*, 2006, 67(3), 181-194.

ABSTRACT

Post-apartheid South Africa has been plagued by an increase in crime and a concomitant increase in the number of incarcerated offenders. Researchers have postulated many proximate causes for the insidious increase in crime, including the vast socio-economic inequalities existing in the country, a remnant of apartheid-era policies and post-apartheid migrations. This article focuses on the neglected field of the environmental criminology of offenders. Following a spatial-ecological approach the relationship between various socio-economic variables and offender rates in the City of Tshwane Metropolitan Municipality in South Africa is modelled. The GIS-based methodological procedure includes a crime offender index (COI), correlational analysis (CA), and principal components analysis (PCA) and produced five factors: social status and income, family characteristics, unskilled earner, residential mobility and ageing population. These five factors, accounted for almost 75 percent of the variance in the offender index. The findings of our research reject race as a determinant of crime, and rather highlight existing and emerging socio-economic inequalities in the globally connected post-industrial city in regions of political instability and economic uncertainty and its relationship with crime and crime prevention.

INTRODUCTION

Crime is a complex and multi-faceted social and geographic phenomenon. The study of crime was initially dominated by research in the fields of criminology, sociology and law but in the past 70 years, professional geographers have developed spatial-ecological crime perspectives to supplement existing criminological research. The spatial-ecological perspectives of crime are noted by Lowman (1986) who provided a detailed 150-year-old history of these perspectives, highlighting an increased interest in environmental criminology since the 1970s. Spatial-ecological perspectives typically examine the social and economic conditions of neighbourhoods in combination with the spatial location of offences and/or offenders. The interdependent link between generators of criminal behaviour and geography is investigated to provide clearer insight into the development of criminality. The work of social ecologists Shaw and McKay (1942) is regarded as the quintessential piece of 'geographical' research involving crime in the first half of the 20th century. Their social disorganisation theory was developed at the Chicago School of urban sociology and involved the mapping of thousands of incidents of juvenile delinquency and subsequent analysis of the relationships between delinquency and various social conditions (Harries, 1999). Social disorganisation and resulting crime and delinquency rates depended on the environment's socio-economic status, residential mobility and ethnic heterogeneity. Traditionally, the ecological theories of crime looked for explanations of individual actions in general features of the social structure in which an individual is embedded (Anselin *et al.*, 2000).

Urban environmental-criminology takes into account both crime areas and the urban origins of offenders. Davies and Herbert (1994) identified three broad domains associated with the environmental variation in crime areas and offender origins: the area content domain, behaviour domain, and cognitive-affective domain. Based on excessive research following the ecological tradition in the context of the modern city, Racine (2002) asked for a shift in focus towards perceptual issues. However, we maintain that a comprehensive theory on environmental-criminology should incorporate both crime areas and offender origins, and cover all three domains of variation. Herbert (2002) acknowledged that environmental-criminology in the past mainly focussed on the places at which crime events occur and largely neglected the areas of residence of offenders. This is also true of research on crime in South Africa. We believe that there are two further motivations for a renewed interest in spatial-ecological research on crime, particularly with a focus on offender areas of origin. First, since the 1990s the availability of large-scale population datasets and the proliferation of open source desktop mapping systems together with Geographical Information Systems (GIS) provided for the first time an unrivalled spatial component in the analysis and visualisation of ecologically based crime components. The flexible spatial aggregation capabilities of GIS (Ainsworth, 2002) and the construction of contiguity matrices for representing neighbour relationships between areal units (Anselin *et al.*, 2000) are just two examples of the benefits provided by GIS to improve the original method of spatial factorial ecology. Second, traditional ecological research on crime was set in the context of the modern, industrial city. The post-modern, post-industrial city is a different setting with a different social morphology, structure and economic function, and we argue that the knowledge on the spatial ecology of crime obtained in the modern city may not necessarily be

applicable to the changing city of today. The equation between insider and excluded, rich and poor, foreign and minority populations in relation to scale and location in the post-modern city poses a new socio-spatial dynamic that must also affect crime areas and offenders. Likewise, the South African city is fast losing its original modernist-apartheid features whilst becoming globally and regionally connected and displaying more and more the social diversity reminiscent of the post-modern, post-industrial city albeit in the context of the apartheid legacy and in a region of political and economic uncertainty.

The high and rising crime levels across all crime categories are characteristic of South Africa since the inception of the African National Congress (ANC) government in 1994 (Pelser and de Kock, 2000; du Plessis and Louw, 2005). Marais (2003) compared South African crime trends with those of one hundred and thirteen Interpol member countries and highlights South Africa as being in the first position in terms of murder, rape, robbery and violent theft, and in fourth position in terms of violent assault. According to a recent African Peer Review Mechanism report (ARPM), the distinctive feature of crime in South Africa is not so much its volume, but its violence (*Sunday Times*, 2006). A significant amount of GIS-based criminological research has been undertaken in South Africa to investigate the scourge of crime. Although a relatively new technology in South Africa, GIS has been used to map crime incident data for the town of Paarl in order to illustrate the relationship between the crime patterns and the morphological characteristics of the town (Lochner and Zietsman, 1998); plot incidents of gang and organised crime activity in the Western Cape (Redpath, 2001); map child sexual abuse (CSA) incidents in Cape Town and develop social correlates of abuse (Parker and Dawes, 2003); map crime hot spots and high

priority areas for police intervention throughout South Africa (Weir-Smith, 2004); and illustrate how churches could be used as a strategic intervention tool in the fight against sexual and violent crimes in Cape Town (Erasmus and Mans, 2005). Other contributors include Cooper *et al.* (2001), Schmitz and Stylianides (2002) and Schmitz *et al.* (2002). However, studies such as these involve rudimentary crime pattern analysis and don't investigate the spatial origin of offenders and possible motivations behind their behaviour. In contrast, this article attempts to relate, for the first time in a South African context, spatial patterns of offender residence to socio-economic variables in an attempt to explain first, the spatial pattern of offenders within the City of Tshwane Metropolitan Municipality (CTMM) and second, the reasons that contribute, in part, to why an individual decides to offend. This study focuses on existing incarcerated offenders across all crime types in Tshwane municipality. It is readily acknowledged that different motivators exist for different types of crime and that crimes vary in terms of their seriousness and impact on the surrounding neighbourhood. We however visualise the results as providing a broad spatial perspective of offenders in the municipality together with identifying general socio-demographic crime generators within the community.

No single risk factor accounts for a high number of offenders emanating from a particular area and there are a variety of causal mechanisms that operate upon the individual that may lead him or her to a criminal lifestyle. Notwithstanding human irrationality in a decision-making context, the correlation and modelling of crime and/or offender rates with neighbourhood-level contextual factors can reveal interesting insights into the emerging post-modern, post-industrial city in general, and the post-apartheid South African city in particular. Increasing income inequality

linked to multi-ethnicity is a main characteristic of the emerging cities of the world and in a sense South Africa's cities represents an archetype in this regard. South Africa has had one of the highest rates of racially defined social and economic inequalities in the world (Whiteford and van Seventer, 1999). Since the end of apartheid political violence was replaced by growing levels of economic crime (Shaw, 1995; Dursuweit, 2002). At the same time, the traditional white-black income distribution pattern was altered by the emergence of a large ultra-poor class of immigrants from rural areas as well as neighbouring and other African states, the emergence of post-apartheid black middle- and black elite classes, and increasing poverty among white workers affected by de-industrialisation and affirmative action (Pillay *et al.*, 2006; Atkinson and Marais, 2006). Hence, in addition to the spatial-ecological aspect – we are also sensitive to the racial dimension of crime.

MATERIALS AND METHODS

The study was conducted in Tshwane, formerly Pretoria. The Tshwane municipality represents one of the six major metropolitan areas in South Africa, and has a diverse population composition and a heterogeneous social and economic structure. The municipality has a population of roughly 2 million inhabitants and was, until recently, a cross-boundary metropolis with 312 administrative units in Gauteng and 59 in North West provinces. The method and procedures utilised comprised four components: first, a crime offender index (COI) locating the area of residence of offenders was constructed at a suburb level of aggregation for Tshwane; second, 91 socio-economic census variables were correlated with the COI and the results tested for statistical significance; third, the census variables that exhibited a significant positive

correlation with the COI were introduced as input into Principal Components Analyses (PCA) in order to identify the main factors within the prediction. Last, the component scores produced from the PCA were inputted into a regression analysis in order to determine the effect of each of the component scores on the COI, which acted as the dependent variable. The discussions that follow refer to the suburb level of aggregation and not to infer to the level of the individual.

Spatial distribution of offenders

The primary data for the construction of the COI was the residential addresses of offenders at all five correctional centres within Tshwane. This data was obtained during March 2006 from the management information systems (MIS) of the Department of Correctional Services (DCS) at Pretoria Central Correctional Centre (consisting of Pretoria Medium and Pretoria Maximum), Pretoria Female Correctional Centre, Odi Correctional Centre and Atteridgeville Correctional Centre. The information systems of these five centres provided address data for 1870 offenders residing within Tshwane. These 1870 records include sentenced offenders and exclude awaiting trial detainees as well as parolees. The number of sentenced offenders must be viewed with caution however as Kriel (2005) notes that approximately 28% of the South African prison population are awaiting trial and 60% of this number are usually acquitted as a result of cases being withdrawn for a variety of reasons. The increase in crime is often blamed for the bungled judiciary system and the declining number of convictions (Gouws, 2004), which, for crimes such as hijackings, is less than 2% (Marais, 1999). Although a worldwide phenomenon, the underreporting of crime can also not be underestimated. Victims' surveys in South Africa consistently uncover between 60% and 70% more crime than reported by

official sources, with upwards of 50% of crime in many serious categories being unreported (McCafferty, 2003). Victims of crime in South Africa are often reluctant to report an incident of crime as a result of a general lack of trust in the criminal justice system as a whole, and in the South African Police Service (SAPS) in particular. According to Altbeker (2005) the problem of underreporting is exacerbated by the phenomenon of underrecording by police officers within the SAPS. While there may be more malevolent reasons for the underrecording of crime the truth is that it's near impossible to report and record all crime over a given period. The offender data obtained may therefore not be representative of the exact number of offenders residing within the municipality nevertheless it is the most reliable and complete dataset available for the researchers to examine.

Of the 1870 offender addresses obtained, 125 address locations could not be validated resulting in an aggregation 'hit-rate' of 93,3% (1745 offender addresses). Initially it was attempted to geocode the addresses to gain a point-based spatial perspective of the offender distribution. However, the problems of geocoding within a South African context are noted by Schwabe (2000) and Schmitz *et al.* (2000) and contributed to a hit-rate far below the 85% minimum reliable geocoding hit-rate for crime analysis specified by Ratcliffe (2004). The COI was subsequently aggregated to a suburb level and validated using street and cadastral datasets. The suburb represents the finest spatial level at which Census2001 information has been provided by Statistics South Africa (SSA, 2001) and consists of between 150 – 300 households. The COI result is mapped in Figure 1 and is expressed in rates per 1000 population at risk (ie. population older than 18). The offender rate is classified in terms of its standard deviation from the mean rate to allow high and low rate areas to be easily identified.

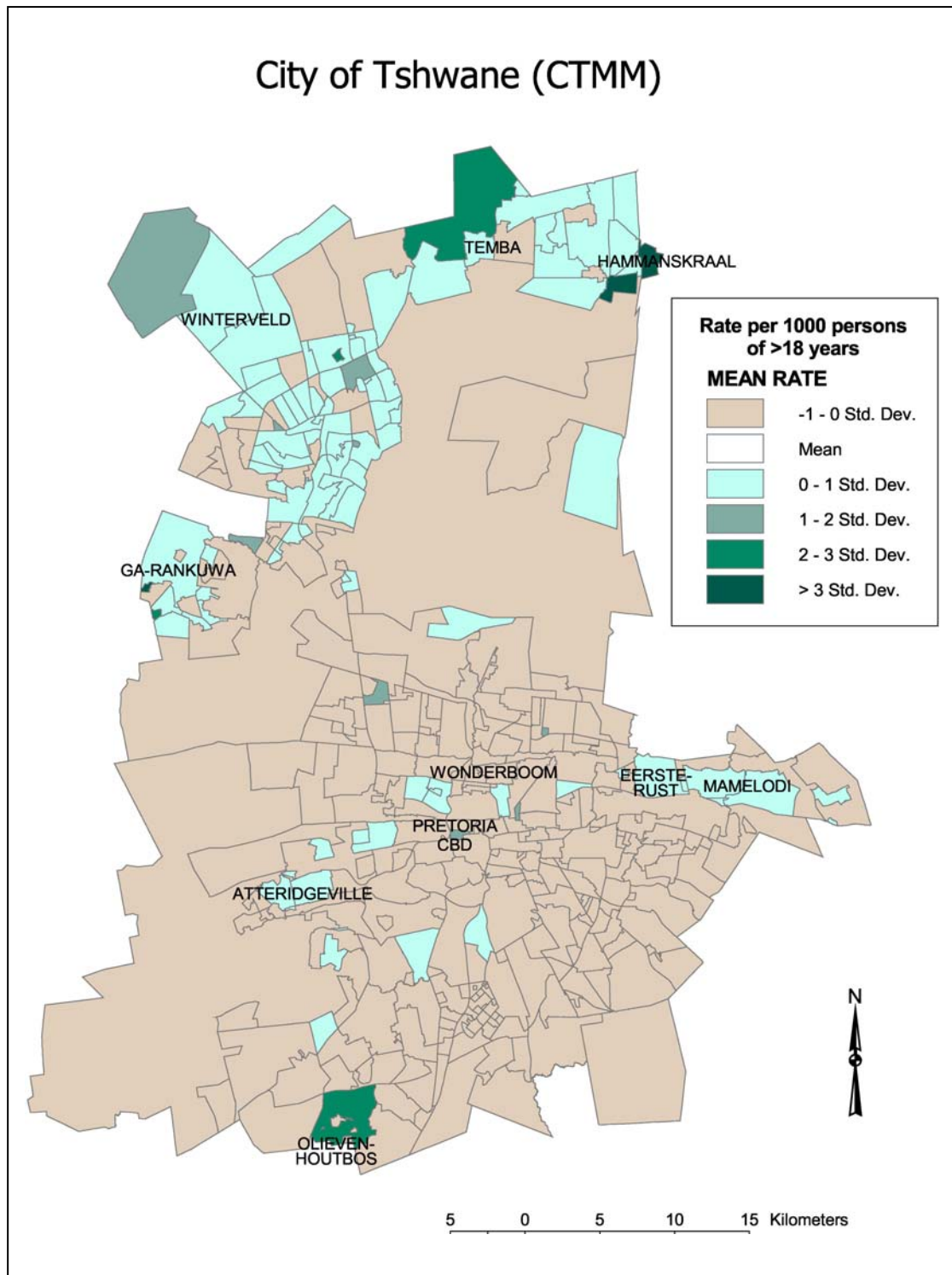


Figure 1: Mean offender rate per 1000 population older than 18

The prevalence of offenders among the 371 suburbs varied from 0 to 23.53 offenders per 1000 population over 18. Of the 371 suburbs, 70 had a number of offenders more than one-half standard deviation above the mean. These 70 suburbs (18.9% of the suburbs of Tshwane) account for 82.5% of the offenders within Tshwane. Also interesting to note is that 12 suburbs (3% of the suburbs of Tshwane) had an offender rate one and a half standard deviations above the mean. These 12 suburbs account for almost 41% of the number of offenders and are indicative of the highly skewed distribution of the COI within Tshwane. At first glance, the spatial pattern of the COI within Tshwane revealed a high tendency of offenders emanating from impoverished parts of the municipality. Four main offender concentrations can be identified:

- (1) A cluster of offenders from particularly the informal sections of the former African homeland border towns of Ga-Rankuwa, Winterveld and Hammanskraal
- (2) A concentration of offenders in post-apartheid immigrant settlements on the edge of the city core at, for example Olievenhoutbos and Mandela Village
- (3) A concentration of offenders in the former traditional black townships of Atteridgeville, Eersterust and Mamelodi, and
- (4) A concentration of offenders in impoverished white areas. The impoverished white areas with high offender rates show two distributive patterns (a) a small-holding cluster at Grootvlei-Onderstepoort in the peri-urban zone between the core city and the homeland border towns, and (b) a concentration at the suburban clusters of Danville-Elandspoort and Booysens-Claremont-Daspoort.

These preliminary findings provided a first empirical clue that crime in Tshwane is a poverty related and multi-racial phenomenon.

Correlational analysis

A correlational analysis was performed to explore the ecological relationships between the COI and 91 census variables. Data on all the variables were taken from South Africa 2001 census dataset. The 91 census variables selected were chosen to reflect a range of social and economic circumstances within Tshwane and to help group areas with similar risk profiles. Correlational analysis identified 31 census variables that were positively correlated with the COI at a level of statistical significance. In ecological research, correlation carries no assumption as to causality and a causal relationship cannot therefore be presumed between the COI and 31 census variables because of the influence of confounding variables. A correlation matrix was therefore employed to screen for associations between the dependent variable and the 31 independent variables as well as between the independent variables themselves. The results expectedly revealed a high degree of inter-correlation between the independent variables, a situation that could produce spurious results. Multicollinearity makes determining the importance of any given predictor difficult because the effects of the predictors are confounded due to possible correlations between them (Stevens, 2002). To deal with the problem of multicollinearity the variables were used as input into a principal components analysis (PCA).

Principal Component Analysis (PCA)

Principal axis factor analysis with varimax rotation was employed to derive uncorrelated linear combinations of the 31 selected variables. A set of principal components were computed for the variables in order to empirically determine the number of underlying constructs which account for most of the variance of the COI. The graphical method specified by Cattell (1966) was used to determine the number of components to retain in the analysis. Table 1 indicates the PCA results of the 31 selected census variables and their factor loadings. Only factor loadings greater than .40 or less than -.40 were ascribed practical statistical significance since it was desired that a variable should at least share 15% of its variance with the construct it was going to help label.

Table 1: Varimax rotated components and loadings for 31 selected variables^a

	Components				
	1	2	3	4	5
% Households with no electricity for cooking	.898				
% Informal dwellings/shacks	.688				
% Households with no electricity for heating	.899				
% Annual household income: R1-9600	.661				
% Annual household income: R9601-38400			.598		
% Households with no electricity for lighting	.881				
% 1-3 rooms in the household	.620		.400		-.432
% Refuse not removed by authorities	.795				
% 5pers+ living in the household		.694			
% No telephone or cellphone	.764		.411		
% Households with no flush toilets	.791				
% Households with water supply outside their dwelling	.845				
% Aged: 0-14		.790			
% People born in South Africa				.849	
% No schooling	.625				
% Primary school	.705		.517		
% Unemployed	.591	.639			
% Not economically active					.774
% Monthly income: R1-1600	.761		.490		
% Informal area	.767				
% Moved in the area in the last 5 years		.765			
% Never married		.515	.467		
% Living together like married partners	.527				-.605
% Employed persons in construction, plants or elementary occupations	.695		.543		
% People did not live and work in the same place		.705			
% Born outside Gauteng	.516			.403	
% People moved from outside Gauteng into the CTMM				.411	
% People utilise public transport		.809			
% People travel by foot			.812		
% People did not move into CTMM in the past 5 years					
% Paid employee				.832	

^a All loadings less than .400 have been set as null to aid interpretation

The PCA identified five components explaining 73.4% of the variance. All the factors have loadings which reflect some general degree of impoverishment and paint a portrait of crime generators within suburbs in Tshwane (see Table 2).

Table 2: Description of factors

Factor Number	Descriptive label	% of variance	Predominant characteristics
1	Social status and income	45.95%	No electricity, little or no education, lack basic services, unemployed, living in informal areas
2	Family characteristics	12.40%	Young children, large household, unmarried, recently moved into the area
3	Unskilled earner	6.70%	Low income earner in basic occupation, small house, lack of telecommunication
4	Residential mobility	4.83%	Born and previously resided inside South Africa but outside Gauteng, paid employee
5	Ageing population	3.52%	High rate of co-inhabitation, small houses, not economically active

Factor 1, which accounted for 45.95% of the variation, was loaded with 18 variables that are commonly regarded as important indicators of socio-economic status. The factor indicates relatively high offender rates in suburbs with low social standing, as it appears as if the percentage of households without electricity for cooking, heating and lighting are driving this interaction. Factor 2, family characteristics, includes the variables percent households with greater than 5 persons, percent never married and percent persons between the ages of 0-14. These variables reflect a young and unstable family structure where single, unemployed individuals are under pressure to provide for a growing number of dependants and/or an extended family. Factor 3, unskilled earner, represents individuals who are manual labourers who earn enough money to survive but with little education and lack of basic amenities. Four variables – born in South Africa, born outside Gauteng, moved into the area from outside Gauteng and paid employee – loaded onto factor 4, residential mobility. Gauteng, the economic hub of South Africa, is a well-established destination for individuals arriving into the country, or from outside the province. The lure of employment and wealth are often unfulfilled and individuals are exposed to criminal behaviour and crime-inducing circumstances. The fifth factor is highly dominated by the ‘Not

Economically Active' variable (loading= .774) although the negative loadings for 'percent living together like married partners' and '1-3 rooms in the household' are fairly substantial. The strong negative loadings on these two variables would tend to suggest this factor represents an older segment of the population and explained only 3.5% of the variance in the set of variables. A simple correlation of the variables used to define each factor was undertaken to investigate the communality among them. In all variables used to define each factor, moderate to strong correlations were found. Figure 2 shows the geographic distribution of factor 1 (social status and income), which accounted for almost 50% of the variation in the COI. Similar, to the offender distribution (Figure 1) the highest values on this factor occur on the periphery of the municipality. These predominantly black African areas are generally known to be impoverished and have insufficient social service delivery. A sporadic number of suburbs located close to the city centre also exhibited high values on this factor and are additionally known as impoverished areas consisting of largely white households. The areas to the southeast of the city centre are characterised by low scores and include the more affluent suburbs of Tshwane. Lastly, the strong geographical association between the offender rate distribution and the socio-economic factor scores would tend to reinforce commonly held criminological theory relating social disorganisation to levels of offending within a community.

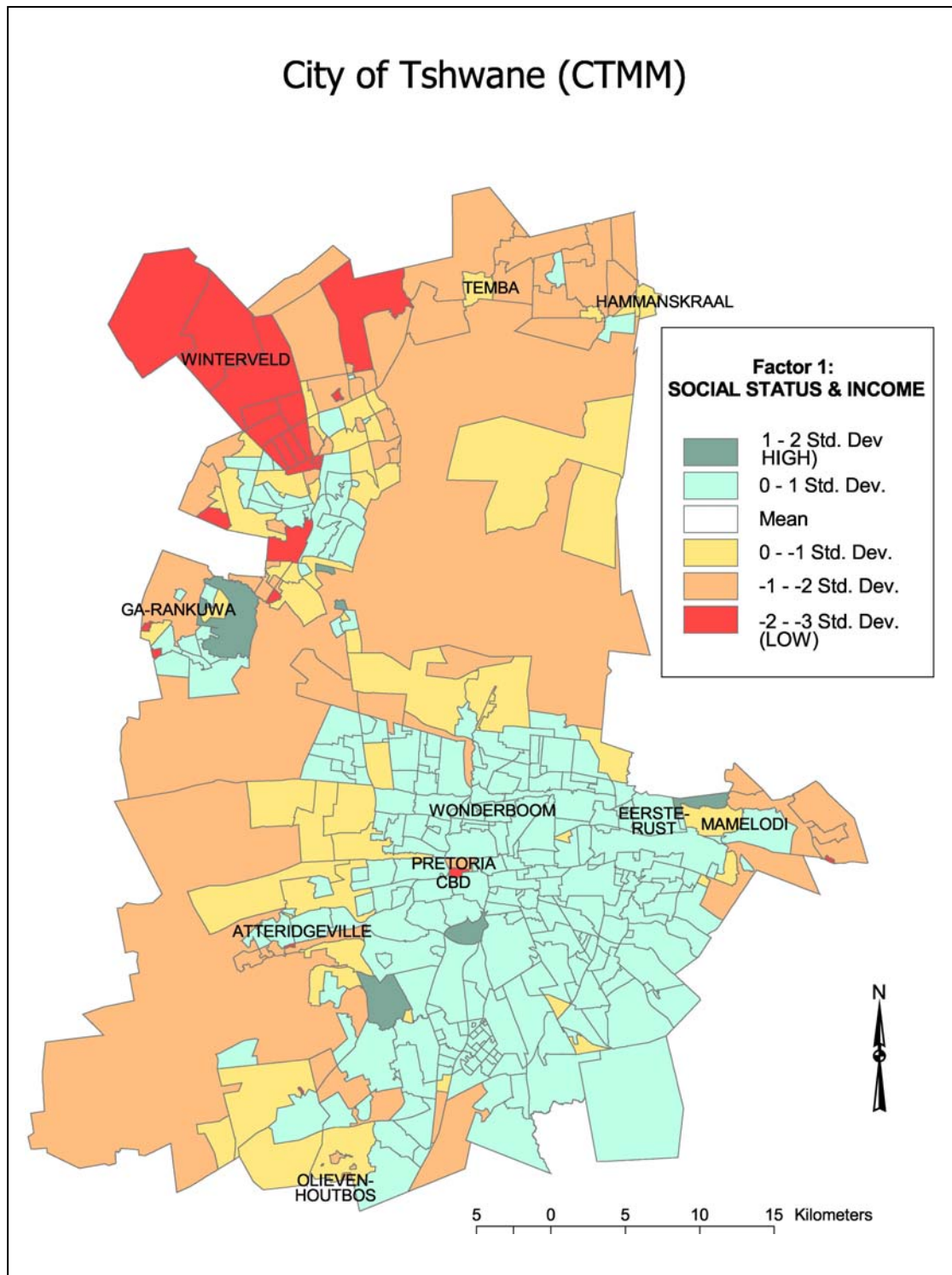


Figure 2: Factor 1: Social status and income

Regression Analysis

Regression analysis was used to determine which factor scores had the greatest impact or influence on the COI. The factor scores were used as input into an Ordinary Least Squares (OLS) regression model with the log-transformed COI as the dependent variable. Suburbs in Tshwane with no offender index rate were ascribed a null value and were excluded from analysis. The regression model explained 32.2 percent of the variance in the offender rate index (adjusted $R^2 = 0.300$; $F(5,186) = 14.660$, $p < 0.0001$), therefore producing encouraging results. Table 3 indicates the statistically significant standardised coefficients to the regression model. The social status and income factor had a positive and statistically significant coefficient with the COI and has the strongest explanatory power on the model. This reflects areas with a high level of poverty and lack of basic services and illustrates that social status and income is the best predictor of the COI. Family characteristics, residential mobility and unskilled earner all had positive and statistically significant coefficients. Factor 5, ageing population, was not found to be significant. This implies that the effect of this factor contributes little to the model.

Table 3: Unstandardised and standardised regression coefficients for factors and COI^a

Variable	<i>b</i>	<i>SE</i>	Beta	<i>p</i>
Constant	-.076	.085		.370
Social status and income (Factor 1)	.341	.055	.395	<.0001
Family characteristics (Factor 2)	.212	.081	.178	<.01
Unskilled earner (Factor 3)	.463	.080	.383	<.0001
Residential mobility (Factor 4)	.604	.197	.221	<.01
Ageing population (Factor 5)	.056	.066	.053	NS

^a Adjusted $R^2 = 0.300$; Std. Error of the estimate: 0.860; NS = not significant

RESULTS AND DISCUSSION

The location of offenders within Tshwane appears to be associated with the spatial incidence of four broad factors – low social status and income, a large and young family, unskilled earners and high residential mobility. To refer to these factors as criminogenic risk factors would be presumptuous and it is perhaps wiser to suggest that these factors create a more favourable *environment* for offending, or increase probabilities associated with risk factors (DiCristina, 1995). While this research has indicated that these four factors may account for the high number of offenders emanating from a particular area, it is acknowledged that there are numerous other individual and community-level dynamics that operate upon the individual that may lead him or her into a criminal lifestyle. International and local researchers attribute offending to among others, community disorganisation (Brown, 2001; Maree, 2003), availability of alcohol and drugs (McBride and McCoy, 1993; Rauh, 2002), the type and extent of social networks (Maree, 2003), conditions in schooling (Maree, 2003; Shaw and Tshiwula, 2002), prior victimisation and abuse (Wedge *et al.*, 2000; Peled and Davis, 1995), the availability of police (Schmidt and Witte, 1984; Siegel, 2001) as well as the presence of gangs (Braga, 2003; Maree, 2003). All these motivators while relevant to this study are specialised concepts which are difficult, if not impossible, to represent using the South African census-based variables in an aggregated form across a geographical area. Although this places certain limitations on the study a number of current findings warrant attention.

Offender rate vs social status and income

A low socio-economic status has been noted by a number of South African researchers as a potential cause of the high crime rate in the country (Glanz, 1994; NCPS, 1996; Ehlers and Pimstone, 1998; Schönteich and Louw, 2001). According to Berg and Schärf (2004) these societal problems may be related to apartheid and post-apartheid developments that resulted in a 'culture of violence', unemployment and inequalities. Even after apartheid South Africa has one of the highest levels of inequalities in the world in terms of socio-economic status (McIntyre *et al.*, 2000).

The findings of this study indicate a geographic correlation between the incidence of offenders within Tshwane and low socio-economic conditions. The majority of informal settlements within Tshwane are inhabited by black Africans that recently settled in the area and tend to be lacking in basic amenities such as piped water, proper sanitation systems, and in some instances, electricity. Masuku (2002) reports the results of such low social standing and uncertainty can result in ongoing tensions between individuals and families and lead to offending. The Household Infrastructure Index and the Household Circumstances Index, which are both multidimensional poverty indices, developed by SSA rank the high offender index areas identified in Figure 1 as being among the highest ranked areas in terms of poverty in the Gauteng province. The high-risk areas identified in Figure 2 occur within the upper most quintile of deprivation in the General Index of Deprivation of McIntyre *et al.* (2000), and are amongst the lowest ranked in the United Nations Development Programme's Human Development Index (UNDP, 2003). In a number of poverty indices developed by Erasmus (2004) and Cross *et al.* (2005) for Tshwane, the northern areas on the periphery of the municipality associated with high offender rates are identified as the

most poverty-stricken and under-serviced areas. Moreover, the study clearly identified a growing tendency of white poverty in various clusters in Tshwane associated with high incidences of offenders.

While socio-economic conditions have been linked to the high and rising crime rate in South Africa (Brown, 2001; Blackmore, 2003), the question remains whether it is these socio-economic conditions that contribute to offending or whether it is the socio-economic inequalities that exist within the municipality? South African society holds a unique position in terms of its social and economic wealth distribution. Whereas in the past prevailing social and economic conditions were predominantly racially defined (Whiteford and van Seventer, 1999), the twelve years of democracy have seen a surge of a black elite class and increasing social and economic inequalities within races as well. These high levels of inequality have also been linked to the high crime rate in the country (Hodgskiss, 2004; Demombynes and Özler, 2005) and fuels further frustration especially in the majority low-income black African population whose socio-economic position has not increased more than a decade after the end of apartheid. The inequalities in the Tshwane municipality that in the past were a result of, and dictated by, apartheid era policies, need to be supplanted by governmental policies aimed at alleviating such socio-economic discrepancies. A low socio-economic status alone is not sufficient to induce criminal behaviour however, and only when their interaction with other interdependent social and cultural variables is considered, can one explain this association.

Offender rate vs family characteristics

Maree (2003) provides a summary of criminogenic risk factors based on South African research findings and lists home factors as the predominant factors followed by those in the community. A study by Mistry and Dhlamini (2001) found that perpetrators of farm attacks in South Africa typically came from an unstable family background while Minnaar (2000) found ‘cop-killers’ in South Africa are most likely to be unmarried as well as growing up in a dysfunctional household with a shortage of money. According to Barkan (1997) two main familial categories exist in relation to the causation of crime: the role of family structure and family functioning. The former refers to the physical composition of the family and the latter to the inter-actional behavioural patterns and relationships within a family (Schoeman, 2002). In this study, three variables directly associated with these categories were significantly loaded onto the family characteristics factor. The first ‘% 5pers+ living in the household’ may be indicative of a large family or a household with a large number of residents. The second ‘% Aged 0-14’ indicates a young dependent population and the third ‘% Never married’ refers to the marital status of the individuals. It can be inferred from the third variable that there is an absence of a parent in these families. Parental absence and criminality are common bedfellows in international research (see Barkan, 1997; Bartollas, 1997; Siegal and Senna, 2000) while Maree and Prinsloo (2003) highlight family background as a potential criminogenic risk factor within South Africa. Naude (2005) additionally notes that South Africa is experiencing a high level of marital instability, particularly in the reproductive age groups (15-34). Our study confirms that this factor can account for the disruption in family compositions and can act as a crime generator within a community.

Offender rate vs unskilled earner

Brown (2001, p.296) presented a general framework for understanding the possible causes for the high crime rate in South Africa and concluded that “there is no one category of variables (sic) which explains crime in South Africa.” Blackmore (2003) reiterated those sentiments but highlighted low income per capita and unemployment as among the most significant explanatory variables. The unskilled earner factor is loaded by low-income variables (ie. monthly and annually) as well as percent employed in unskilled occupations. This factor portrays individuals restricted in job prospects through among others, a lack of education, and earning minimum wage in a menial job. The lack of proper education has resulted in these individuals being unprepared for the competitive labour market in the new South Africa and finding themselves in an unskilled occupation. The low income earned by such individuals can place them under increasing economic strain should the number of independents increase or if there is a death in the family. Such strain could result in these individuals resorting to other means to improve their financial situation, while the additional frustration at the lack of service delivery and the perceived socio-economic inequalities in the municipality may induce other types of crime.

Offender rate vs residential mobility

Residential mobility has shown in this study to have a significant link to criminal behaviour in Tshwane. The rapid growth in the South African economy and concomitant job creation has resulted in international and interregional migration, and in the past 10 years Tshwane has been characterised by a highly mobile population and a great increase in urbanisation. Cross *et al.* (2005) reports Tshwane receives a relatively large proportion of non-Gauteng migrants (27%) compared to its share of

the total provincial population (17%). Migration impedes the development of community ties among residents (Ouimet, 2000) and is believed to negatively affect social integration, which decreases the effectiveness of community informal control mechanisms (Crutchfield *et al.*, 1982). Moreover, this migration increases the problem of urban unemployment (Blackmore, 2003) as the promise of jobs is very often unfulfilled and migrants then become squatters in impoverished areas of the city. In a correlation study of poverty and migration in South Africa, Cross *et al.* (2005) found a significant spatial pattern between areas of high migration and areas of high poverty in Tshwane. The areas exhibiting the highest migration rates occurred within the northern suburbs of the municipality, a finding that correlates with the highest offender index values shown in Figure 1. Other characteristics of urbanisation, such as overcrowding, unemployment and increased consumer demands and expectations are themselves often believed to be associated with high crime rates (Schönteich and Louw, 2001). In truth, a reciprocal effect may be experienced between residential mobility and crime, as an increase in crime within an area may lead many residents to leave an area, while many residents who move into an area can lead to competition for limited resources, greater stress and subsequent crime.

Offender rate vs race

According to Schwabe (2000) a subculture of crime has emerged among a black juvenile cohort in South Africa. This cohort perceives itself to be deprived relative to other groups in the country in terms of social and economic wealth. The slow pace of development and the lack of job creation have fuelled feelings of boredom and frustration by this cohort and the direct or indirect result of this is often ostentatiously displayed through crime and violence.

Measures of deprivation were investigated in this study and showed that suburbs with the highest levels of social or economic deprivation were also shown to be the suburbs where the majority of offenders emanate. These suburbs typically consist of black Africans but the study also found associations between high offender rates and ‘poor white’ areas. A racial breakdown of the prison population and the municipality in Tshwane is provided in Table 4 supplemented with the correlation coefficients initially between race and the COI and then between race and the four factors in the OLS model.

Table 4: Correlation coefficients between race variables and COI and factor scores

Racial variable	Prison pop.	CTMM pop.	COI	Factor 1	Factor 2	Factor 3	Factor 4
% Black African	89.3%	52.9%	.308**	.466**	.587**	.529**	.139**
% White	6.3%	42.7%	-.276**	-.446**	-.503**	-.508**	.135**
% Coloured	3.7%	1.4%	.017	-.123*	.023	.022	.061
% Indian/Asian	0.6%	1.5%	-.024	-.069	-.013	-.100	.016

* $P < 0.05$, ** $P < 0.01$

Table 4 clearly illustrates the overrepresentation of the black African population under correctional control in the Tshwane municipality and the underrepresentation of the white population. The only positive and statistically significant correlation between the COI and any racial group is found between the COI and the percentage of black Africans. A possible explanation for this finding is revealed in the adjacent columns where the black African suburbs consistently exhibit significant positive correlations across all four factors. More importantly however, the table reveals the corresponding vast racial inequalities that exist in Tshwane in terms of all of the factors derived in the PCA and reflected in Table 1. The white population is on average much more affluent than the black African population, however the results of the study has indicated that pockets of low income whites also experience high

offender rates, relating offending to issues other than simply race. A racial stigma is often attached to crime in South Africa (Allen, 2002), but a suburb with a high percentage of people already involved in crime, with poor socio-economic conditions, a disrupted family environment and a high level of mobility will increase the likelihood of an individual resorting to crime regardless of personal characteristics. On this we are clear: crime in South Africa is a problem of deprivation, migration and frustration, not race. The first main policy document to govern policing in South Africa, the National Crime Prevention Strategy (NCPS, 1996, p.18) in 1996 already alluded to the link between deprivation and crime:

“It is clear that disparities in wealth, development and access to resources, as well as the relative deprivation, which this implies for those on the lower rungs of the economic ladder, do operate as an incentive for criminal activity and contribute as a justification for crime.”

While the link between deprivation, migration and crime exists throughout most of the world, the political history of South Africa could partly be used to explain not only the positive relationship identified in this study but also the development of this post-modern, post-industrial city. The establishment of various apartheid laws such as the Group Areas Act of 1950 and the Bantu Education Act of 1953 greatly contributed to the spatial and social segmentation of South African society. In both instances, the majority black population were forcibly removed from existing urban areas to regions or ‘homelands’ often in rural under-serviced areas or to regions on the periphery of existing white urban centres (Emmett, 2001; Mabin, 2005). This study has shown that not only do these areas currently exhibit high offender rates but they also continue to be under serviced and are among the most socially and economically deprived in the

municipality. While small clusters of white suburbs also exhibit high offender rates and exist well within the former white areas, these suburbs were shown to be socially and economically less prosperous than the vast majority of the traditional white areas.

CONCLUSION

Human behaviour is a major guideline in the development of policies and strategies aimed at alleviating pressing societal problems and uplifting quality of life (Schwabe *et al.*, 2000). Although at times capricious, this behaviour may be driven by causal mechanisms existing within the individuals' community. This spatial-ecological study has shown that socio-economic factors play an important role in shaping criminal behaviour and identifies for the first time in South Africa a definitive link between the geographical distribution of offenders and social and economic deprivation in an urban context. Suburbs with high levels of social and economic deprivation predictably exhibited high levels of offending whereas the more affluent suburbs in the municipality exhibited low levels of offending. Table 4 provided more evidence of the link between deprivation and levels of offending and inequality whereby the vast inequalities in the municipality (illustrated between races in Table 4) were presented as possible explanations for the vast discrepancies between levels of offending throughout the region.

Knowing what causes crime is not necessarily the same as reducing or addressing the situation (Maree and Prinsloo, 2003). The best approach to reduce crime in South Africa is arguably a holistic approach, with a focus on the many interdependent components that interact to generate criminal behaviour. This study has found strong

correlations not only between low measures of tangible wealth (ie. income) and levels of offending but also between a lack of service provision and the poor supply of basic amenities (ie. electricity) and offending. These findings have important implications for the local practice and policy of the SAPS. In terms of local practice such knowledge should facilitate the initiation of local practice strategies at various levels:

- Operational level: By ranking neighbourhoods into high and low risk, police detectives can initiate proactive micro-level crime-targeting strategies aimed at specific areas in Tshwane
- Middle-management level: Police station commanders can prioritise neighbourhoods and assign officers to high priority areas
- Strategic level: At the strategic level, senior managers or national/provincial commissioners can initiate urban renewal or upgrading policies aimed at addressing the social, economic, or physical ‘ills’ (eg. lack of resources, lack of basic services) that characterise certain neighbourhoods within Tshwane. This would not only improve the social well being of existing residents but also theoretically result in a reduction of offenders emanating from such areas.

According to Longley (2005) there has been a revival of interest in applications of GIS driven by support by governments for the pursuit of evidence-based policies and a desire to develop a rational basis to set performance targets for public service delivery at the local level. The findings of this study provide tangible evidence from which to guide future policing and crime prevention policies whether it be through the adoption of Crime Prevention through Environmental Design (CPTED) or through other means.

Globalisation and post-modern social fragmentation are changing the appearance of many world cities. New clusters of deprivation often associated with ethnic migration are superimposed over modernist divides between have and have less, and industrial shifts are threatening previously stable populations. These international trends also have an impact on South African society, despite its unique history. Certainly, the geography of crime in this country can no longer be solely explained in terms of the apartheid meta-narrative. An anti-crime strategy in South Africa should take these conditions into account.

ACKNOWLEDGEMENTS

The authors would like to thank the Department of Correctional Services (DCS) in South Africa for the provision of data of offenders. Comments from three referees significantly improved the original manuscript.

REFERENCES

- Ainsworth, P.B. 2002. *Offender Profiling and Crime Analysis*. Willan Publishing: Devon.
- Allen, D.B. 2002. Race, crime and social exclusion: a qualitative study of white women's fear of crime in Johannesburg. *Urban Forum*, 13, 53-80.
- Altbeker, A. 2005. Positive trends: the 2004/5 crime statistics. *SA Crime Quarterly*, 14, 1-11.
- Anselin, L., Cohen, J., Cook, D., Gorr, W. and Tita, G. 2000. Spatial analyses of crime. In Duffee, D. (Ed.), *Criminal Justice 2000: Volume 4. Measurement and Analysis of Crime and Justice*. National Institute of Justice (NIJ): Washington, 213-262.
- Atkinson, D. and Marais, L. 2006. Urbanisation and the future urban agenda in South Africa. In Pillay U., Tomlinson R. and Du Toit J. (Eds), *Democracy and Delivery: Urban Policy in South Africa*. HSRC Press: Cape Town, 22-49.
- Barkan, S.E. 1997. *Criminology: A Sociological Understanding*. Prentice Hall: New Jersey.
- Bartollas, C. 1997. *Juvenile Delinquency, 4th Edition*. Allyn & Bacon: Boston.
- Berg, J. and Schärf, W. 2004. Crime statistics in South Africa 1994-2003. *South African Journal of Criminal Justice*, 17, 57-78.
- Blackmore, F.L.E. 2003. A panel data analysis of crime in South Africa. *South African Journal of Economic and Management Sciences*, 6, 439-458.

- Braga, A.A. 2003. Serious youth gun offenders and the epidemic of youth violence in Boston. *Journal of Quantitative Criminology*, 19, 33-54.
- Brown, K.V. 2001. The determinants of crime in South Africa. *The South Africa Journal of Economics*, 69, 269-299.
- Cattell, R.B. 1966. The scree test for the number of factors. *Multivariate Behavioural Research*, 1, 245-276.
- Cooper, A. K., Byleveld, P. and Schmitz, P.M.U. 2001. Using GIS to reconcile crime scenes. Paper presented at the 5th Annual International Crime Mapping Research Conference, Dallas.
- Cross, C., Kok, P., Wentzel, M., Tlabela, K., Weir-Smith, G. and Mafukidze, J. 2005. *Poverty Pockets in Gauteng: How Migration Impacts Poverty*. HSRC Press: Pretoria.
- Crutchfield, R.D., Geerken, M.R. and Gove, W.R. 1982. Crime rate and social integration: the impact of metropolitan mobility. *Criminology*, 20, 467-478.
- Davies, W.K.D. and Herbert, D.T. 1994. *Communities in Cities: Perspectives in Social Geography*. Bellhaven Press: London.
- Demombynes, G. and Özler, B. 2005. Crime and local inequality in South Africa. *Journal of Development Economics*, 76, 265-292.
- DiCristina, B. 1995. *Method in Criminology*. Harrow & Heston: New York.

Du Plessis, A. and Louw, A. 2005. The tide is turning: the 2003/4 SAPS crime statistics. *SA Crime Quarterly*, 12, 1-8.

Dursuweit, T. 2002. Johannesburg: fearful city? *Urban Forum*, 13, 3-19

Ehlers, D. and Pimstone, G. 1998. Predicting crime: a statistical glimpse of the future?
Institute Security Studies (ISS) Crime Index, No.2, June 1998.

Emmett, T. 2001. Social disorganisation, social capital and violence prevention in South Africa. Paper presented at the 2nd Regional African Safe Communities Conference, Midrand, South Africa.

Erasmus, J.C. 2004. *A Development Index for the City of Tshwane*. HSRC Press: Pretoria.

Erasmus, J.C. and Mans, G.G. 2005. Churches as service providers for victims of sexual and/or violent crimes: a case study from the Paarl community. *Acta Criminologica*, 18, 140-163.

Glanz, L. 1994. *Crime in South Africa: Perceptions, Fear and Victimisation*. HSRC Press: Pretoria.

Gouws, A. 2004. The impact of crime on the legitimacy of the South African political system. *Acta Criminologica*, 17, 78-89.

Harries, K. 1999. *Mapping Crime: Principle and Practice*. National Institute of Justice (NIJ): Washington.

- Herbert, D. 2002. Crime and its control in urban environments. In Davis, W.K.D. and Townshend, I. (Eds), *Monitoring Cities: International Perspectives*. IGU Urban Commission: Berlin and Calgary, 541-556.
- Hodgskiss, B. 2004. Lessons from serial murder in South Africa. *Journal of Investigative Psychology and Offender Profiling*, 1, 67-94.
- Kriel, J. 2005. Emerging trends among the South African inmate population and persons subject to community corrections. *Acta Criminologica*, 18, 100-115.
- Lochner, F.C. and Zietsman, H.L. 1998. Using geographical information systems (GIS) for policing in South Africa: a case study in Paarl. *South African Geographical Journal*, 80, 60-72.
- Longley, P. 2005. Geographical Information Systems: a renaissance of geodemographics for public service delivery. *Progress in Human Geography*, 29, 57-63.
- Lowman, J. 1986. Conceptual issues in the geography of crime: towards a geography of social control. *Annals of the Association of American Geographers*, 76, 81-94.
- Mabin, A. 2005. Suburbanisation, segregation and government of territorial transformations. *Transformation*, 56, 41-64.
- Marais, H. 1999. Hijacking – road to a fast buck. *Siyaya*, 5, 26-33.
- Marais, C.W. 2003. Metro policing: too high a price? *Acta Criminologica*, 16, 138-150.

- Maree, A. 2003. Criminogenic risk factors for youth offending. In Bezuidenhout, C. and Joubert, S. (Eds), *Child and Youth Misbehaviour in South Africa: A Holistic View*. Van Schaiks: Pretoria, 51-79.
- Maree, A. and Prinsloo, J. 2003. An exploration of crime and crime risks with specific reference to South Africa. In Hough, M. and du Plessis, A. (Eds.), *Combating Crime in South Africa: Contemporary Perspectives*. Institute for Security Studies (ISS): Pretoria, 171-187.
- Masuku, S. 2002. Prevention is better than cure: addressing violent crime in South Africa. *SA Crime Quarterly*, 2, 5-12.
- McBride, D.C. and McCoy, C.B. 1993. The drugs-crime relationship: an analytical framework. *The Prison Journal*, 43, 257-278.
- McCafferty, R. 2003. Murder in South Africa: A comparison of past and present. Unpublished report. Available at: http://www.frontline.org.za/articles/murder_southafrica.doc, last accessed on 28 November 2006.
- McIntyre, D., Muirhead, D., Gilson, L., Govender, V., Mbatsha, S., Goudge, J., Wadee, H. and Ntutela, P. 2000. Geographic patterns of deprivation and health inequities in South Africa: informing public resource allocation strategies. Health Economics Unit and Centre for Health Policy, Cape Town.
- Minnaar, A. 2000. Profiling 'cop killers' in South Africa. *Crime research in South Africa*, 1,1.

- Mistry, D. and Dhlamini, J. 2001. Perpetrators of farm attacks: an offender profile. Unpublished report for the Institute for Human Rights and Criminal Justice Studies, South Africa.
- Naudé, W. 2005. Poor, young and unmarried: men and crime in South Africa. *Acta Criminologica*, 18, 126-139.
- NCPS (National Crime Prevention Strategy). 1996. Pretoria, South African Department of Safety and Security.
- Ouimet, M. 2000. Aggregation bias in ecological research: how social disorganization and criminal opportunities shape the spatial distribution of juvenile delinquency in Montreal. *Canadian Journal of Criminology*, 42, 135-156.
- Parker, Z. and Dawes, A. 2003. Child sexual abuse in Atlantis. Research report, Children's Institute, University of Cape Town, South Africa.
- Peled, E. and Davis, D. 1995. *Group Work with Children of Battered Women: A Practitioner's Guide*. Sage: London.
- Pelser, A. and de Kock, C. 2000. Violence in South Africa: a note on some trends in the 1990s. *Acta Criminologica*, 13, 80-94.
- Pillay, U., Tomlinson, R. and Du Toit, J. 2006. Introduction. In Pillay, U., Tomlinson, R. and Du Toit, J. (Eds), *Democracy and Delivery: Urban Policy in South Africa*. HSRC Press: Cape Town, 1-19.

- Racine, J.B. 2002. Explaining, regulating or monitoring violence in the cities of tomorrow. In Davis W.K.D. and Townshend I. (Eds), *Monitoring Cities: International Perspectives*. IGU Urban Commission: Berlin and Calgary, 557-598.
- Ratcliffe, J.H. 2004. Geocoding crime and a first estimate of a minimum acceptable hit rate. *International Journal of Geographical Information Science*, 18, 61-72.
- Rauh, J. 2002. Crime and crime prevention: the views of police station commissioners. Available at: <http://www.wits.ac.za/csvr/papers/papcrjrl.htm>, last accessed on 25 May 2006.
- Redpath, J. 2001. The bigger picture: the gang landscape in the Western Cape. *Indicator South Africa*, 18, 34-40.
- Schmidt, P. and Witte, A.D. 1984. *An Economic Analysis of Crime and Justice: Theory, Methods, and Applications*. Academic Press, Inc.: Toronto.
- Schmitz, P.M.U., Potgieter, M., Du Plessis, P., Cooper, A.K. and Schwabe, C.A. 2000. Activity A7: Packaging and rollout, Part 1: Theoretical aspects of GIS and geocoding. Research report, DACST Innovation Fund Project Number: 13102.
- Schmitz, P.M.U. and Stylianides, T. 2002. Mapping crime levels and court efficiency per magisterial district in South Africa. Paper presented at the 6th Annual International Crime Mapping Research Conference, Denver.
- Schmitz, P.M.U., Cooper, A.K. and Quick, G. 2002. Using satellite imagery for crime mapping in South Africa. Paper presented at the 6th Annual Crime Mapping Research Conference, Denver.

- Schoeman, M. 2002. A classification system and an inter-disciplinary action plan for the prevention and management of recidivism. Unpublished PhD Thesis, University of Pretoria, South Africa.
- Schönteich, M. and Louw, A. 2001. *Crime in South Africa: A Country and Cities Profile*. Institute for Security Studies (ISS): Pretoria.
- Schwabe, C.A. 2000. Towards the development of a spatial information system for crime analysis and prevention: some conceptual requirements and empirical evidence from South Africa. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST).
- Schwabe, C.A., Schurink, W.J. and Makakase, M. 2000. Activity A2: Investigation into the most useful crime forecasting methodologies, Part 3: information required for strategic and operational crime forecasting. Research report, DACST Innovation Fund Project Number: 13102.
- Shaw, M. 1995. Towards safer cities? Crime, political transition and changing forms of policing control in South Africa. *African Security Review*, 4, 4-11.
- Shaw, C.R. and McKay, H.D. 1942. *Juvenile Delinquency and Urban Areas*. University of Chicago Press: Chicago.
- Shaw, M. and Tshiwula, L. 2002. Developing citizenship amongst urban youth in conflict with the law in Africa. Paper presented at the International Conference on Youth in Conflict with the Law, Port Elizabeth, South Africa.

Siegel, L.J. 2001. *Criminology: Theories, Patterns and Typologies*, 7th Edition. Wadsworth: USA.

Siegel, L.J. and Senna, J.J. 2000. *Juvenile Delinquency: Theory, Practice and Law*, 7th Edition. Wadsworth: USA.

SSA (Statistics South Africa). 2001. *Census2001*. Pretoria, Statistics South Africa.

Stevens, J. 2002. *Applied Multivariate Statistics for the Social Sciences*. Lawrence Erlbaum Associates: New Jersey.

Sunday Times. 2006. 'Fight crime, Africa tells SA. Peer review panel lists threats to stable democracy – and lawlessness is No 1', 3 December, p.1.

UNDP (United Nations Development Programme). 2003. South Africa Human Development Report, Oxford University Press: Cape Town.

Wedge, P., Boswell, G. and Dissel, A. 2000. Violence in South Africa: key factors in the background of young serious offenders. *Acta Criminologica*, 13, 31-38.

Weir-Smith, G. 2004. Crime mobility: spatial modelling of routine activities of arrestees and substance abusers in South Africa. *GeoJournal*, 59, 209-215.

Whiteford, A. and Van Seventer, D.E. 1999. *Winners and Losers: South Africa's Changing Income Distribution in the 1990s*. WEFA: Pretoria

CHAPTER 6

A GEODEMOGRAPHIC PROFILER FOR HIGH OFFENDER PROPENSITY AREAS IN THE CITY OF TSHWANE, SOUTH AFRICA

Gregory Dennis Breetzke and Andre Carl Horn

In press: *Environment and Planning A*

ABSTRACT

Post-apartheid South Africa has been plagued by an increase in crime across all categories. While a significant amount of criminological research has been undertaken in the country, the spatial analysis of crime and offenders, a basic prerequisite for a functional crime management strategy, has not been adequately addressed at a sufficiently fine scale of aggregation. This paper reports on the geodemographic development of offender risk profiles for neighbourhoods in the City of Tshwane Metropolitan Municipality (CTMM) in South Africa. Geodemographics is a relatively new geo-analytical technique that is being increasingly used in policing applications to complement law enforcement techniques and provide further insight into offenders and their offences. Findings of the study indicate that neighbourhoods at a high risk for offender development are amongst the most socially and economically deprived in the municipality and are disproportionately occupied by black Africans. The results highlight a need to re-assess the current law enforcement approach to crime reduction in the country and return to the crime prevention initiatives that were part of the National Crime Prevention Strategy (NCPS) of the 1990s.

INTRODUCTION

Crime is a complex and multi-faceted spatial phenomenon. Two major theories suggest the importance of space for understanding crime: the social disorganisation theory (Shaw and McKay, 1942) and the routine activities theory (Cohen and Felson, 1979). According to the social disorganisation theory, crime and delinquency depend on a neighbourhood's level of social and economic deprivation, residential mobility and ethnic heterogeneity (Cahill and Mulligan, 2003), while the routine activities theory proposes that crime will take place within a criminal's area of social interaction (Weir-Smith, 2004). Other theories attribute the spatial patterning of crime to social disadvantage (Simcha-Fagan and Schwartz, 1986; Smith and Jarjoura, 1988), segregation effects (Logan and Messner, 1987; Shihadeh and Flynn, 1996; Krivo *et al.*, 2006), levels of economic and social deprivation (Kawachi *et al.*, 1999; Peterson *et al.*, 2000), and to the intersection of criminal opportunities with offenders' motivation, mobility and perceptions of target areas (Brantingham and Brantingham, 1991).

The latter researchers are synonymous with the concept of 'environmental criminology' wherein great emphasis is placed on the spatial dimension of criminal behaviour. Traditionally, the two central concerns of environmental criminology have been explaining the spatial distribution of offences and explaining the spatial distribution of offenders (Bottoms and Wiles, 2002). In recent times investigations into the geographic distribution of offences has dominated environmental criminological research (Herbert, 2002) not least because of the pursuit of situational crime prevention strategies which have had a good record in the short-term reduction

of crime (Clarke, 1995). Investigations into the residential origins of offenders on the other hand involve an examination into the root causes of crime resulting from, and associated with, the residential environment of offenders and are seen as a more long-term solution to crime reduction and therefore currently receives less attention, especially in South Africa (Leggett, 2004a). The residential environment of the offender remains however a vital part of the crime equation, relating both to measurable qualities, such as the distance to crime, and to wider issues of the social and economic conditions that produce criminality. Any crime reduction strategy needs to take both into account and in the context of the fast-changing post-modern, post-industrial city the time may be appropriate to redress this imbalance.

While a substantial amount of criminological research has been undertaken in South Africa, a number of researchers note an absence of aggregate level empirical research focussing on crime causation and appropriate crime reduction strategy (see Glanz, 1996; Brown, 2001). With the recent exception of Breetzke and Horn (2006), data of offenders has rarely been analysed at any spatial scale in South Africa, while the demographic risk factors of persons engaging in crime in the country are largely unknown (Schönteich, 2005). In a country whose population is highly racially stratified and where crime levels are also among the highest in the world (Gouws, 2004; Marais, 2003; Pelser and de Kock, 2000; du Plessis and Louw, 2005), the need to identify ecological determinants of crime and profile at-risk neighbourhoods is vital not least because of the implication for future policing and public policy formation.

This study aims to build offender risk profiles for neighbourhoods in the City of Tshwane Metropolitan Municipality (CTMM) in South Africa using geodemographic techniques. The Tshwane municipality is located in the Gauteng province of South Africa and is one of six major metropolitan areas in the country. The municipality, established in 2000, consists of formerly white neighbourhoods around a central business district (CBD); the former apartheid townships of Atteridgeville (black African) and Laudium (Indian) on the western edge; the townships of Eersterus (Coloured) and Mamelodi (black African) on the eastern edge; and an arc of late-apartheid black African townships on the border of the former Tswana homeland in the northern periphery of the municipality. These outlying townships include Ga-Rankuwa, Mabopane, Soshanguve, Winterveld and Temba. The pre-1994 urban structure has been largely retained except for the almost complete replacement of whites by black Africans in large parts of the inner city; the expansion of black African townships with informal housing; and the establishment of a few informal settlements such as Olievenhoutbos amidst previously white suburbs. The municipality has a population of roughly 2 million inhabitants and has a diverse population composition and a heterogeneous social and economic structure.

The proposed geodemographic classification system is based on the inductive assumption that current offenders are similar to 'potential' offenders or are at least influenced by similar neighbourhood-level factors and have the same general motivations. Variables selected for the creation of the geodemographic system are shown to correlate geographically with the number of offenders within a neighbourhood. The benefit of such a system lies not only in its ability to profile potential criminals and improve crime detection rates but more importantly to provide

a spatial dimension within which to assess current crime reduction policy initiatives in the country. Different social structural conditions of at-risk neighborhoods across racial and ethnic divides can additionally be investigated. A brief history of the two overarching policy documents that have governed policing in South Africa since the inception of the African National Congress (ANC) government in 1994 is outlined below.

A BRIEF HISTORY OF CRIME PREVENTION INITIATIVES IN SOUTH AFRICA: POST-1994

The National Crime Prevention Strategy (NCPS) (1996-1999) was the first official policy document on crime management of the new democracy. It advocated a macro-strategy towards crime and aimed at shifting the emphasis from reactive ‘crime control’ towards proactive ‘crime prevention’ (South Africa, 1996). The NCPS was rooted in the Reconstruction and Development Plan (RDP), an integrated, interdepartmental and holistic approach towards post-apartheid change and development that guided the entire Nelson Mandela administration. The NCPS was based on a four pillar approach to crime prevention that included the reforming of the criminal justice system; changing the public’s values and attitudes to crime; reducing crime through environmental design and development; and combating transnational crime. Sweeping as the strategic framework of the NCPS may have been, researchers (see Simpson and Rauch, 1999; Naudé, 2000) were soon critical of the lack of infrastructure and information sources with regard to the implementation of the strategy’s crime prevention programmes and who should ultimately take responsibility for them.

The succession of Nelson Mandela by Thabo Mbeki in 1999 and the replacement of the RDP by a Growth, Employment and Reconstruction (GEAR) strategy effectively meant a change from idealism to pragmatism. A major consequence was the almost immediate administrative fragmentation of the state. In response to mounting pressure over increasing crime levels, a new approach to crime reduction was quickly ushered in (du Plessis and Louw, 2005). In contrast to the NCPS's crime prevention approach, the National Crime Combating Strategy (NCCS) (2000-present) is effectively a law enforcement approach in which areas affected by high crime rates, particularly violent crime, are clustered into crime-combating zones, which are then targeted for aggressive high density street level policing (Mokonyane, 2000). Moreover, while the NCPS was theoretically an interdepartmental policy aimed at impacting on the supposed causes of crime (Pelser and Louw, 2002), the NCCS is explicitly a security cluster matter that was created without consultation from other government departments such as health, education and social development in particular (du Plessis and Louw, 2005) and has been likened to the authoritarian police practices of the apartheid era (Leggett, 2004a). It is difficult to evaluate the mandate of the NCCS to stabilise crime in high priority areas, and hence compare the trade-off in crime reduction policy approaches, given the fact that police station-level crime statistics are denied to the public (Leggett, 2004a). The increase in crime levels pre- and post-1999 (Marais, 2003; Berg and Schärf, 2004; Altbeker, 2005) and the heightened fear of crime among residents of the country (Mistry, 2004) suggest that the NCCS has not fared particularly well. It is anticipated that the creation of geodemographic offender risk profiles for the Tshwane municipality will not only be the first attempt to provide insight into the offender ecology of the post-apartheid South African city but will also enable policy makers to assess both past (NCPS) and present (NCCS) crime reduction

policy initiatives and in doing so assist in the development of effective strategic systems to guide future interventions.

GEODEMOGRAPHICS AND CRIME

Geodemographics is the “analysis of people by where they live” (Sleight, 1997, p.16) and is posited on the complementary assumptions that the areal unit of measurement such as a census area, encloses a broadly homogenous social and economic environment and that individuals in the same neighbourhood share habits, preferences and to some extent behaviour (Curry, 1993; Harris *et al.*, 2005). Neighbourhoods are clustered into groups based on similarities in terms of various demographic and social variables, with the classification being both mutually exclusive and collectively exhaustive (Harris *et al.*, 2005; Schwabe, 2000). In terms of their criminological applications, geodemographic systems have been used to better deploy police resources at a variety of spatial scales throughout England and Wales (Ashby and Longley, 2005); analyse the geographic variations in crime and policing performance (Ashby, 2004); identify high crime risk neighbourhoods in Britain (Mayhew *et al.*, 1993); predict levels of social disorganisation, social capital and collective efficacy (Williamson *et al.*, 2006) and lastly, to indicate how levels and patterns of youth offending vary between neighbourhood types (Williamson *et al.*, 2005). In the majority of these instances geodemographic solutions are used to complement existing policing techniques, provide support for planning by policing authorities, or to provide further insight into offenders or criminal offences. In the United Kingdom (UK), commercial neighbourhood typologies such as MOSAICTM and ACORNTM have been recently supplemented by the development of an academically scrutinised

National Area Classification of 2001 Census Output Areas (OAs) developed by Vickers (2006). The system is one of the first social classifications covering the entire UK to be freely available and fully documented. Geodemographic systems such as that of Vickers (2006) as well as the many commercial classification systems are valuable research tools that can be utilised to gain a better socio-geographic understanding of the make-up of society. Sadly, the growth of such systems in South Africa has yet to reach these levels but some applications of the technology have been forthcoming particularly in the private sector.

CLASSIFICATION METHODOLOGY

The first major decision in the construction of a geodemographic classification system is to determine which variables to select as input into the clustering algorithm. In the creation of previous crime-related classifications Harper *et al.* (2002) and Sheldon *et al.* (2002) selected eighteen variables to reflect differing policing problems based on the Police Funding Formula in the UK as well as variables suggested in literature as having “an association with crime and disorder, or were important characteristics in distinguishing different types of policing problems” (Harper *et al.*, 2002, p.8). In this study however a data driven methodology is adopted governed predominantly by the lack of aggregate level research available in the country by which to inform variable selection as well as the uncertainty regarding the applicability of international criminological theories which has been noted by local researchers to be limited when applied in a South African context (see Labuschagne, 2003; Ovens, 2003). As a result of these considerations a number of variables were therefore selected that are shown to correlate geographically with the number of offenders within a neighbourhood. In a

similar study Leigh *et al.* (2000) used statistical correlations with crime rates to assist in the identification of variables to use when grouping similar policing and crime reduction areas in the UK. In order to determine which socio-economic and demographic variables positively correlate with the number of offenders within a neighbourhood an offender index was compiled for the Tshwane municipality.

Index of offenders

An offender index was created using residential address data obtained during March 2006 from the Management Information Systems (MIS) at all five correctional centres located within the Tshwane municipality. These correctional centres include Pretoria Central (consisting of Pretoria Medium and Pretoria Maximum), Pretoria Female, Odi and Atteridgeville. A total of 1745 verifiable offender addresses were obtained. These 1745 records include sentenced offenders and exclude awaiting trial detainees as well as parolees. The offender addresses were aggregated to a suburb level and are shown in Figure 1. The suburb represents the finest spatial level of aggregation at which Census2001 data has been provided by Statistics South Africa (SSA) and consists of between 150 – 300 households. While it is readily acknowledged that census areas do not correspond to socially defined neighbourhoods, Sampson (1992) notes that they do possess ‘ecological integrity’ and have also been successfully used in various social ecological approaches to the study of crime (ie. Coulton *et al.*, 1995; Lockwood, 2004; Ernst, 2001). The index is expressed as a rate per 1000 population above the age of 18 with the offender rate being classified in terms of its standard deviation from the mean rate.

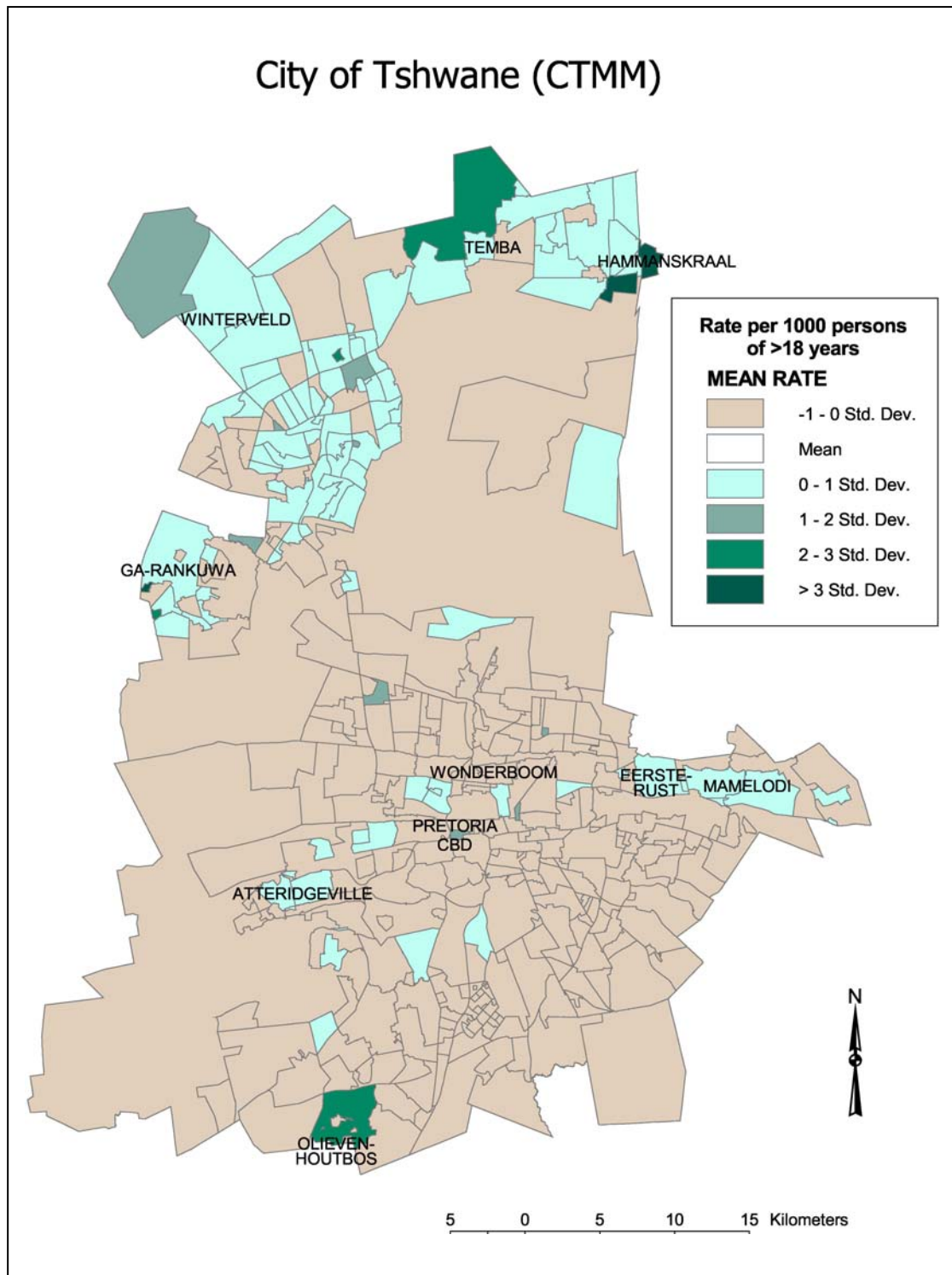


Figure 1: Mean offender rate per 1000 population older than 18

The small population counts in some suburbs within the municipality made the offender index vulnerable to outliers. In an adjustment similar to Bukenya (2005), all observations which deviated by more than five standard deviations from the mean were replaced with the mean values calculated over only the positive observations. The frequency of offenders ranged from 0 to 23.53 offenders per 1000 population over 18 years of age. Most high offender values are concentrated in the northern and eastern regions of the municipality. These areas are typical of the impoverished former black African homeland border townships occurring on the periphery of the municipality. In order to identify the variables that have an association with the levels of offending in a suburb, a correlation analysis was performed between the offender index and a range of socio-economic and demographic census variables.

Correlation analysis

An initial set of 250 census variables were identified to correlate with the offender index. The variables are taken from the Census2001 dataset and were grouped together according to their socio-economic and demographic similarities to form 91 composite variables. A correlation analysis using Spearman's non-parametric measure was run between these 91 variables and the offender index and highlighted 31 variables that were positively correlated at a level of statistical significance ($p < 0.01$). The rank-ordered 31 significant variables are displayed in Table 1.

The strength of the 31 correlations ranged from 0.615 for the percentage of households with more than 5 residents to 0.173 for the percentage of residents born outside the Gauteng province of South Africa. All of the variables reflect some generalised degree of impoverishment and deprivation within the municipality with a

number of variables such as employment status, education, income levels and mobility being common ecological determinants of criminality in international studies (Crutchfield *et al.*, 1982; Grant and Martinez, 1997; Carmichael and Ward, 2000; Fajnzylber *et al.*, 2002; Cahill and Mulligan, 2003; Andresen, 2006; Evans, 1980; Oh, 2005). As a caveat to this analysis, it should be noted that these variables are often proxies for multifaceted processes that are the key to understanding offender propensity. Residing in a house with more than five residents does not make you a criminal *per se*, rather it is the overriding social and economic conditions that create a more favourable environment for offending or increase probabilities associated with risk factors.

Table 1: Ranked positive correlations between offender index and 91 census variables

Variable	Variable description ^a	Spearman's ρ
1	Households with more than 5 residents	.615**
2	Unemployed	.581**
3	Residents utilise public transport	.545**
4	Aged: 0-14	.530**
5	Residents did not move into the CTMM ^b in the past 5 years	.514**
6	Never married	.508**
7	Residents with no telephone or cellphone	.485**
8	Residents born in South Africa	.477**
9	Annual household income: R9601-38400	.473**
10	Residents who moved in the area in the last 5 years	.448**
11	Residents who do not live and work in the same place	.434**
12	Annual household income: R1-9600	.413**
13	Residents moved from outside Gauteng province into the CTMM	.405**
14	Households with no electricity for cooking	.396**
15	Monthly income: R1-1600	.394**
16	Unskilled occupations	.390**
17	Residents with no schooling	.377**
18	Residents with a primary school education	.376**
19	Households with no electricity for lighting	.361**
20	Living in an informal area	.350**
21	Not economically active	.347**
22	Households with no flush toilets	.331**
23	Households with no electricity for heating	.313**
24	Residents travel by foot	.313**
25	Living together like married partners	.312**
26	Informal dwellings/shacks	.304**
27	Refuse not removed by authorities	.289**
28	1-3 rooms in the household	.271**
29	Households with water supply outside their dwelling	.239**
30	Paid employee	.238**
31	Born outside the Gauteng province	.173**

** $p < 0.01$ ^a All are percentages^b CTMM – City of Tshwane Metropolitan Municipality

Reducing the number of variables

A correlation matrix was calculated for the 31 cluster formative variables across the 371 suburbs within the municipality. The correlation matrix expectedly revealed a high degree of intercorrelation between the selected variables introducing the threat of data redundancy. In conventional classification methodology a number of methods exist to reduce the number of highly correlated input variables. These include creating further composite variables, applying factor analysis or simply excluding a correlated

variable to ensure that no dimension or category is over-represented. In the latter, the decision of which variable to exclude is usually made in consultation with classification experts or after other ancillary evidence has been considered such as a variable's distribution or geographic consistency (see Harper *et al.*, 2002; Vickers *et al.*, 2005). In this study, however, in order to compartmentalise the offender concept and simultaneously deal with the problem of multicollinearity a number of factors were constructed using Principal Components Analysis (PCA). A varimax-rotated analysis yielded five factors explaining just under 75% of the variation in the dataset. Table 2 provides a description of each factor together with the amount of variance that each explains.

Table 2: Description of PCA factors

Factor Number	Descriptive label	% of variance	Predominant characteristics
1	Social-economic status	45.95%	No electricity, little or no education, lack basic services, unemployed, living in informal areas
2	Family characteristics	12.40%	Young children, large household, unmarried, recently moved into the area
3	Unskilled earner	6.70%	Low income earner in unskilled occupation, small house, lack of telecommunication
4	Residential mobility	4.83%	Born and previously resided inside South Africa but outside Gauteng, paid employee
5	Ageing population	3.52%	High rate of co-inhabitation, small houses, not economically active

While factor analysis techniques in geodemographics have been criticised by researchers for among others, blurring distinctions between cluster types (Harris *et al.*, 2005) and causing harm to data (Openshaw, 1995), the technique has been successfully used to build the PiN and SuperProfiles geodemographic classifications in the UK (Brown and Batey, 1994; Sleight, 2004) as well as to build rural typologies in Europe (Copus, 1996; Ballas *et al.*, 2003). Another option that was considered in

the classification methodology was the use of weights for individual variables. While a number of weighting algorithms and strategies undoubtedly exist in geodemographics it was ultimately decided to apply equal weightings to all variables (they were all set to 1). Equal weights were applied in the study for a number of reasons. First, variables were selected for the classification system that were positively correlated with the offender index (ie. number of offenders within a suburb) therefore these variables are similar in terms of their relationship to offender rates. By weighting a variable higher than another, this could make the classification more suitable for one interpretation of offending than for another. Second, there is already high cocorrelation between the 31 variables that was difficult to quantify. The addition of weights to all or some variables would make it difficult to predict what the effect may be. Consistent with the data-driven methodology of the study all available census variables were therefore included and a filtering process *viz a viz* correlation analysis employed as a means of highlighting those variables that appear to be related to levels of offenders within a suburb.

K-mean cluster analysis

An iterative relocation-clustering algorithm known as *k*-means was used to cluster the 371 suburbs of the city of Tshwane into similar profiles based on the five factors outlined above. The *k*-means clustering proposed in Fisher (1958) is an algorithm that classifies objects based on variables into *k* number of groups, where *k* is a positive integer. This grouping is done by minimising the sum of squares of distances between the data and the corresponding cluster centroids. Although the algorithm has shown to be sensitive to the choice of initial seed sites (Harris *et al.*, 2005), it is computationally fast, sensitive to outliers and has been used by a number of

researchers within a variety of classifications (see Debenham *et al.*, 2003; Harper *et al.*, 2002; Ballas *et al.*, 2003; Vickers *et al.*, 2005). Two important issues need to be addressed in *k*-means clustering: the first is the number of clusters to produce and second, the number of cases within each cluster. The number of clusters to produce through *k*-means is determined *a priori* and is driven more along usefulness and local knowledge than on scientific theory (Vickers, 2006). A number of seed sites were tried as well as a number of cluster solutions (four to ten) run on the data to determine the optimum solution. All initial cluster solutions contained clusters with very small membership values. After an examination of these preliminary results and according to a solution proposed by Debenham *et al.* (2001), all suburbs with a low population total, in this instance less than 50 residents, were removed and the remaining suburbs reclassified. A total of 17 suburbs were excluded from further classification with a combined population loss of 251 (ie. an average of 14.67 people per suburb). Although compromising the collectively exhaustive ideals of geodemographics the reality is that such low population suburbs are susceptible to extreme values that can warp the clustering solution. This left a total of 354 suburbs to be clustered. Ultimately, the seven-cluster solution produced the clearest distinguishable clusters, with no evidence of extreme outliers to distort the findings. An examination of the clusters indicated optimal homogeneity among suburbs within each cluster. Figure 2 shows the spatial pattern for the cluster solution while Table 3 indicates the cluster means for each respective factor, ranked in discriminative power according to ANOVA F-values.

ANOVAS for all factors showed high statistical significance ($p < 0.001$, $F > 3.843$) indicating that the clusters differed notably from one another on the basis of the five factors. The best discriminator based on ranked ANOVA F-values, was socio-economic status ($F = 178$), which was closely followed by family characteristics ($F = 176$) and then unskilled earner ($F = 116$). The mean offender rate across the municipality was 1.24 offenders per 1000 population over 18 years of age. In order to generate a risk profile for the municipality, all geodemographic groups that exhibited offender rates more than one standard deviation above this mean offender rate were categorised as high-risk, while those clusters that exhibited offender rates more than one standard deviation below the mean offender rate were categorised as low-risk. Figure 3 shows the spatial pattern for the cluster solution categorised by risk.

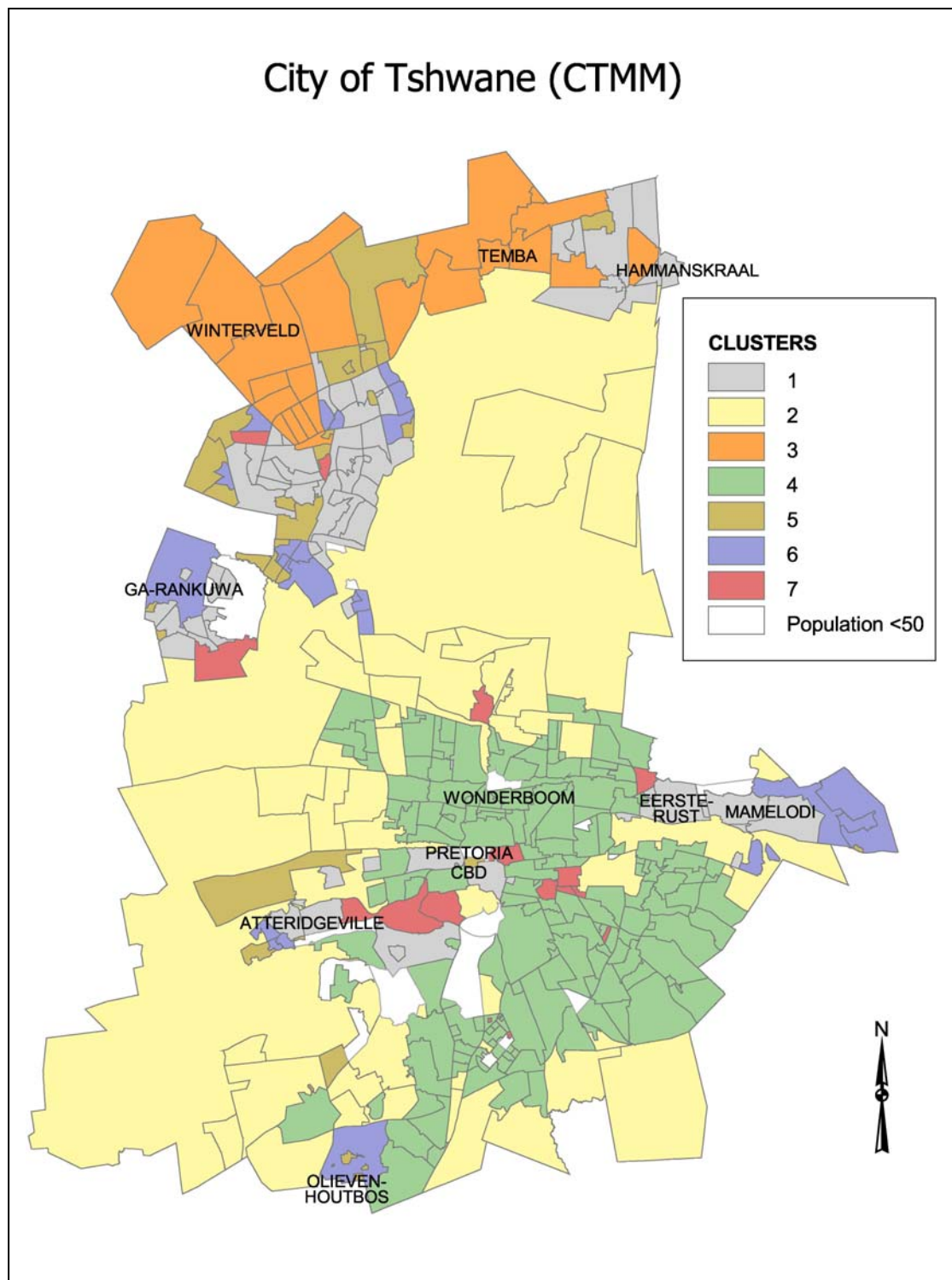


Figure 2: Spatial distribution of the seven clusters within the Tshwane municipality

Table 3: Characteristics of the offender index and factors across the 7 clusters

	Cluster							
	1	2	3	4	5	6	7	
All suburbs $n = 354$	64	43	22	159	27	24	15	
Factors	Mean	Mean	Mean	Mean	Mean	Mean	Mean	F^a d.f. = [6,347]
Socio-economic status	-0.57	0.45	2.12	-0.51	1.73	0.36	-0.58	178
Family characteristics	1.13	-1.03	0.48	-0.31	0.70	1.49	-1.28	176
Unskilled earner	0.69	1.10	-0.37	-0.70	-0.46	0.66	1.31	116
Ageing population	0.47	-0.91	1.86	-0.05	-0.53	-1.26	1.69	96
Residential mobility	0.12	0.42	-0.05	0.12	0.07	-0.12	-0.01	8
Offender Index ^b	1.64	0.31	2.26	0.33	2.03	1.42	0.70	

^a ANOVA variance ratio, for $P = 0.001$, $F_{[6,347]} = 3.843$

^b Index expressed as rate per 1000 population over 18 years of age

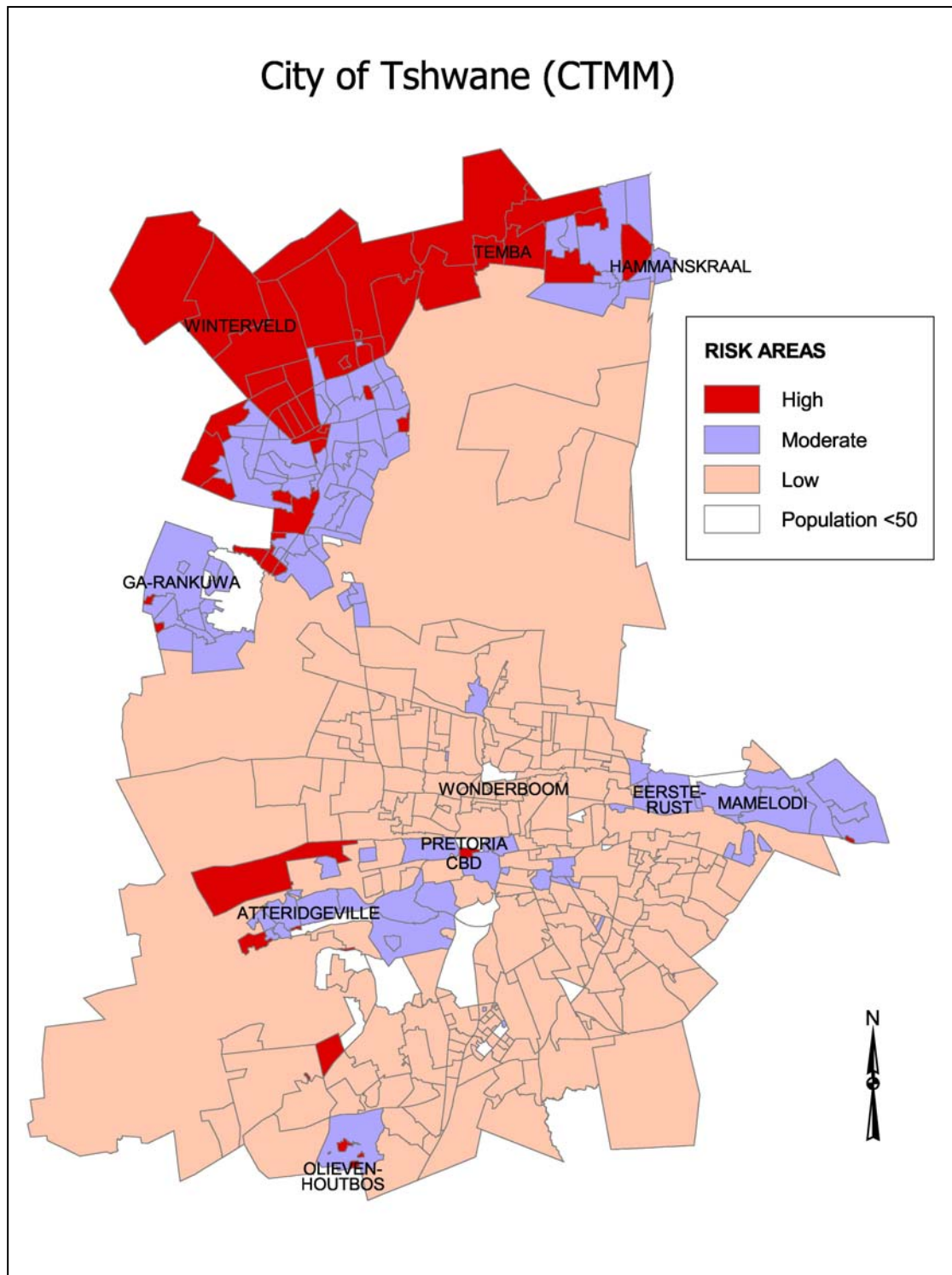


Figure 3: Offender risk profiles for the Tshwane municipality

In the study, clusters 3 and 5 exhibited offender rates more than one standard deviation above the mean offender rate and are categorised as high-risk. Cluster 3 exhibited the highest mean offender rate and is primarily located in the common black African townships of Marokolong, Sekampaneng and Winterveld in the far northern regions of the municipality near the border with the North West province. The suburbs in this cluster are among the poorest and most deprived in the municipality with residents being predominantly unemployed and with numerous young dependents. Cluster 5 exhibited the second highest mean offender rate. The cluster again occurs predominantly in the far northern region of the municipality with only a few exceptions. These exceptions include the CBD, the informal extension of Atteridgeville, the Olifantsfontein informal node in the south, and a large but low-density cluster of impoverished whites just north of Atteridgeville. Residents in the northern region of this cluster are typically unemployed with low income and lack of basic amenities such as electricity and refuse removal.

Clusters 2 and 4 exhibited offender rates less than one standard deviation below the mean rate and are characterised as low-risk. Cluster 2 exhibited the lowest mean offender rate and is almost entirely located in outlying low-density areas and in the low-density area between the core city and the former homeland border townships. These suburbs are typically commercial properties used for the large-scale manufacturing and production of machinery and goods. Residents in these suburbs tend to be employed by these plants and factories and earn minimum wages. Suburbs in cluster 4 largely represent formerly white residential areas to the north, east and south of the inner city. Residents are typically employed with middle to high socio-economic status.

The remaining clusters 1, 6 and 7 were categorised as moderate risk. The suburbs in cluster 1 include the black African townships of Mamelodi, Atteridgeville and Tembisa-Hammanskraal. The population is characterised by employed residents in an unskilled occupation but with a modest provision of basic services. Cluster 6 displays a dispersed pattern with suburbs in varying regions of the municipality. The population is characterised by economically active residents but with disrupted families. Most households are formal dwelling units with a decent provision of basic services and relatively low mobility. And lastly, cluster 7 is mainly situated in and around the CBD of the Tshwane municipality with typically younger residents being employed but with moderate socio-economic status.

DISCUSSION

The categorisation of suburbs in South Africa is a minefield for the unwary. In a country whose recent political history is steeped in social segregation, discrimination and community fragmentation (Emmett, 2003), the identification of 'riskier' suburbs will necessarily come under immense scrutiny. While the susceptibility map shown in Figure 3 is to some extent based on subjective assessments, the difference in risk factors between geodemographic classes, outlined in Table 3, provides evidence that certain categories of suburbs are in fact different and that perhaps these differences affect offender propensity. The results of the study are investigated in terms of first, the racial structure of South African society and second, in terms of its assessment of past and present crime reduction policy initiatives.

A racial interpretation of the profiling system

A racial breakdown of the offender risk profiles for suburbs within the Tshwane municipality is provided in Table 4 supplemented with the racial breakdown of the municipality as a whole.

Table 4: Racial distribution within the profiling system

<i>n</i> = No of suburbs	Total <i>354</i>	High Risk <i>49</i>	Moderate Risk <i>103</i>	Low Risk <i>202</i>
% Black African	52.89	98.61	85.39	26.48
% White	42.63	0.34	11.73	70.17
% Coloured	1.37	0.31	2.05	1.28
% Indian or Asian	1.50	0.74	0.83	2.07

A total of 49 suburbs within the Tshwane municipality are categorised as being at a high risk for offender development. These 49 suburbs (13.8% of the suburbs of Tshwane) occur predominantly on the northern border of the municipality and account for almost half of the offenders within Tshwane. The geodemographic groups classified as high-risk are mainly characteristic of the former black African homeland towns originating from forced removal policies instigated by the former apartheid government (Emmett, 2003). Distinct socio-demographic factors are associated with these high-risk groups including low socio-economic status, low income and a disrupted family. Also interesting to note in Table 4 is the overrepresentation of the black African population group among the high-risk suburbs. According to the classification system, almost 99% of the residents living in suburbs at a high-risk for offender development are black African. This contrasts sharply with the racial distribution of residents living in low-risk suburbs, where 70% of the residents are white and only 26% are black African. The racial stigma that is often attached to

crime in South Africa (see Allen, 2002) needs to be re-evaluated in light of these findings which highlight the fact that patterns of racial and spatial inequality linked to levels of offending are strongly interconnected. Compared to predominantly white areas, black African suburbs have higher levels of socio-economic disadvantage, residential instability and disrupted families. The Coloured and Indian populations are also over-represented in the moderate and low risk areas, respectively, despite their low population numbers, a finding that warrants future attention. Krivo *et al.* (2006) has found that racial segregation isolates less well-off communities and can leave them vulnerable to neglect, discrimination, and other ill social forces. When the racial segregation is first, steeped within the historical and ethnical context that is South Africa, and second, to the extreme detriment of certain races, then the result can ostentatiously display itself through crime.

Crime planning and policy implications

The results of the study are supportive of a hybrid approach to crime reduction strategy in which the crime prevention approach of the former NCPS is combined with the law enforcement approach of the current NCCS. Clusters exhibiting high-risk for offender development were shown to be amongst the most socially and economically deprived in the Tshwane municipality. The current policy initiative that is tasked with reducing crime in the country, the NCCS, is not addressing these social conditions of offender risk however but rather focuses on enforcing the law (Leggett, 2004a). The findings of the study support du Plessis and Louw (2005) who contend that the biggest gap in South Africa's crime reduction effort is the area of social development. Whereas in the past local crime prevention initiatives concerned with the offender were dealt with by law enforcement and judicial system sectors

(Liebermann, 2002), this study suggests that other public sectors such as social development and education have an important role to play as well. Future crime reduction strategies should therefore include aspects of the current law enforcement approach to reduce the short-term crime levels, while also incorporating various crime prevention measures aimed to address the long-term social conditions in key regions of the city. While Leggett (2004b) focuses more on social intervention through by-law regulations, the authors explicitly propose an increase in the provision of basic amenities, improved public service delivery as well as the construction of various social infrastructures such as schools and hospitals. Such a strategy will ideally require a holistic perspective and inter-departmental cooperation.

CONCLUSION

Geodemographic classifications are key decision-making tools for the advancement and planning of local service delivery strategies including crime reduction. This study has shown how geodemographic analysis can not only highlight suburbs 'at-risk' for offender development but can also provide an additional spatially based platform from which to address derelict conditions within the Tshwane municipality. This could occur through the targeting not only of suburbs with known high offender rates but also of suburbs in the same geodemographic group, for whom offender risk is low. Whereas in the past the South African association between criminality and prevailing social conditions was either inferred from international research or loosely based on aspatial studies (see Brown, 2001; Mistry and Dhlamini, 2001; Demombynes and Özler 2005; Hodgskiss, 2004), this study provides, for the first time in a local context, a definitive geographic link between the location of offenders and the presence of

social and economic deprivation. The implications are significant. First, the research provides undisputable spatial evidence for the critical re-assessment of the current police-based crime reduction strategy and its replacement by a more balanced hybrid approach. The present narrow focus of the NCCS with its focus on law enforcement is inappropriate in South Africa given the fact that neighbourhoods with poor social conditions are shown in this study to be such significant determinants of offender development. Second, the disproportionate representation of the black African population in the identified high-risk suburbs also highlights not only the racial divisions that still characterises South African society and the failure of the present administration to address these, but more importantly the need to concentrate general social crime prevention initiatives in predominantly black African areas in the city. Offender-based geodemographic research in South Africa should be extended and in future also refine the differentiation between major crime types as well as involve more in-depth investigations into the rates of offending related specifically to individual racial and ethnic groups in the country. Furthermore, ecological theories of crime such as the social disorganisation theory should be applied at a neighbourhood level within a local context in order to evaluate its effectiveness in a society as segregated and racially diverse as South Africa.

ACKNOWLEDGEMENTS

The authors would like to thank the South African Department of Correctional Services (DCS) for the provision of data of offenders as well as three anonymous reviewers whose comments, suggestions and insights greatly improved the manuscript.

REFERENCES

- Allen, D.B. 2002. Race, crime and social exclusion: a qualitative study of white women's fear of crime in Johannesburg. *Urban Forum*, 13, 53-80.
- Altbeker, A. 2005. Positive trends: the 2004/5 crime statistics. *SA Crime Quarterly*, 14, 1-11.
- Andresen, M.A. 2006. Crime measures and the spatial analysis of criminal activity. *British Journal of Criminology*, 46, 258-285.
- Ashby, D.I. 2004. Geodemographics for policing: A new approach to the analysis of geographic variations in crime and policing performance. Paper presented at the 7th International Crime Mapping Research conference, Boston.
- Ashby, D.I. and Longley, P.A. 2005. Geocomputation, geodemographics and resource allocation for local policing. *Transactions in GIS*, 9, 53-72.
- Ballas, D., Kalogeresis, T. and Labrianidis, L. 2003. A comparative study of typologies for rural areas in Europe. Paper presented at the 43rd European Congress of the Regional Science Association, Jyväskylä, Finland.
- Berg, J. and Schärf, W. 2004. Crime statistics in South Africa 1994-2003. *South African Journal of Criminal Justice*, 17, 57-78.
- Bottoms, A. and Wiles, P. 2002. Environmental criminology and crime. In Maguire, M., Morgan, R. and Reiner, R. (Eds), *The Oxford Handbook of Criminology*, 3rd Edition. Oxford University Press: Oxford, 620-657.

- Brantingham, P.J. and Brantingham, P.L. 1991. *Environmental Criminology*. Prospect Heights: Waveland.
- Breetzke, G.D. and Horn, A.C. 2006. Crossing the racial divide: a spatial-ecological perspective of offenders in the City of Tshwane Metropolitan Municipality, South Africa. *GeoJournal*, 67, 181-194.
- Brown, K.V. 2001. The determinants of crime in South Africa. *The South Africa Journal of Economics*, 69, 269-299.
- Brown, P. and Batey, P. 1994. Design and construction of a geodemographic targeting system: Super Profiles 1994 WP-40, Urban Research and Policy Evaluation Regional Research Laboratory, Department of Civic Design, University of Liverpool, Liverpool.
- Bukenya, J.O. 2005. Crime trends and socio-economic interactions: a county-level analysis. *Criminal Justice Studies*, 18, 365-378.
- Cahill, M.E. and Mulligan, G.F. 2003. The determinants of crime in Tucson, Arizona. *Urban Geography*, 24, 582-610.
- Carmichael, F. and Ward, R. 2000. Youth unemployment and crime in the English regions and Wales. *Applied Economics*, 32, 559-571.
- Clarke, R.V. 1995. Situational crime prevention. In Tonry, M. and Farrington, D.P. (Eds), *Building a Safer Society: Strategic Approaches to Crime Prevention*. University of Chicago Press: Chicago, 91-150.

- Cohen, L. and Felson, M. 1979. Social change and crime rate trends: a routine activity approach. *American Sociological Review*, 44, 588-08.
- Copus, A. 1996. A rural development typology of European NUTS III regions, Working Paper 14, Agricultural and Rural Economics Department, Scottish Agricultural College, Aberdeen.
- Coulton, C.I., Korbin, J., Chow, I. and Su, M. 1995. Community level factors and child maltreatment rates, *Child Development*, 66, 1262-1276.
- Crutchfield, R.D., Geerken, M.R. and Gove, W.R. 1982. Crime rate and social integration: the impact of metropolitan mobility. *Criminology*, 20, 467-478.
- Curry, D. 1993. *The New Marketing Research Systems: How to use Strategic Database Information for Better Marketing Decisions*. John Wiley & Sons: New York.
- Debenham, J., Clarke, G. and Stillwell, J. 2001. Deriving supply-side variables to extend geodemographic classification. Working paper, School of Geography, University of Leeds, Leeds.
- Debenham, J., Clarke, G. and Stillwell, J. 2003. Extending geodemographic classification: a new regional prototype. *Environment and Planning A*, 35, 1025–1050.
- Demombynes, G. and Özler, B. 2005. Crime and local inequality in South Africa. *Journal of Development Economics*, 76, 265-292.
- Du Plessis, A. and Louw, A. 2005. Crime and crime prevention in South Africa: 10 years after. Paper presented at the 14th World Conference on Criminology, Philadelphia.

- Emmett, T. 2003. Social disorganisation, social capital and violence prevention in South Africa. *African Safety Promotion Journal*, 1, 4-18.
- Ernst, J.S. 2001. Community-level factors and child maltreatment in a suburban county. *Social Work Research*, 25, 133-142.
- Evans, D.J. 1980. *Geographical Perspectives on Juvenile Delinquency*. Gower: UK.
- Fajnzylber, P., Lederman, D. and Loayza, N. 2002. What causes violent crime? *European Economic Review*, 46, 1323–1356.
- Fisher, W. 1958. On grouping for maximum homogeneity. *Journal of the American Statistical Association*, 53, 789-798.
- Glanz, L. 1996. The causes of crime in South Africa. Paper presented at the CRIMSA International Conference on Crime and Justice in the Nineties, Pretoria.
- Gouws, A. 2004. The impact of crime on the legitimacy of the South African political system. *Acta Criminologica*, 17, 78-89.
- Grant, D.S. and Martinez, R. Jr. 1997. Crime and the restructuring of the U.S. economy: a reconsideration of the class linkages. *Social Forces*, 75, 769–799.
- Harper, G., Williamson, I., Clarke, G. and See, L. 2002. *Family Origins: Developing Groups of Crime and Disorder Reduction Partnerships and Police Basic Command Units for Comparative Purposes*. Home Office: London.

- Harris, R., Sleight, P. and Webber, R. 2005. *Geodemographics, GIS and Neighbourhood Targeting*. John Wiley & Sons: Chichester.
- Herbert, D. 2002. Crime and its control in urban environments. In Davis, W.K.D. and Townshend, I. (Eds), *Monitoring Cities: International Perspectives*. IGU Urban Commission: Berlin and Calgary, 541-556.
- Hodgskiss, B. 2004. Lessons from serial murder in South Africa. *Journal of Investigative Psychology and Offender Profiling*, 1, 67-94.
- Kawachi, I., Kennedy, B.P. and Wilkinson, R.G. 1999. Crime: social disorganisation and relative deprivation. *Social Science and Medicine*, 48, 719-731.
- Krivo, L.J., Peterson, R.D. and Payne, D.C. 2006. Inequality in crime across place: exploring the role of segregation. Paper presented at the Annual Meeting of the Population Association of America, Los Angeles.
- Labuschagne, G. 2003. Offender profiling in South Africa: It's definition and context. *Acta Criminologica*, 16, 67-74.
- Leggett, T. 2004a. The state of crime and policing. In Daniel, J., Southall, R. and Lutchman, J. (Eds), *State of the Nation: South Africa 2004-05*. HSRC Press: Pretoria, 144-176.
- Leggett, T. 2004b. By-laws and regulations for high impact crime prevention: why wait? *SA Crime Quarterly*, 8, 11-16.
- Leigh, A., Arnott, J., Clarke, G.P. and See, L. 2000. *Family Values: Similar Policing and Crime Reduction Areas for Comparative Purposes*. Home Office: London.

- Liebermann, S. 2002. Rethinking the role of planning: crime, the place and collaborative governance. Paper presented at the Planning Africa 2002 Conference, Durban.
- Lockwood, D. 2004. Mapping violent crime in Savannah's neighborhoods, 1993-1997: social disadvantage, land use, and violent crimes reported to the police. Paper presented at the 8th International Crime Mapping Research Conference, Boston.
- Logan, J.R. and Messner, S.F. 1987. Racial residential segregation and suburban violent crime. *Social Science Quarterly*, 68, 510-527.
- Marais, C.W. 2003. Metro policing: too high a price? *Acta Criminologica*, 16, 138-150.
- Mayhew, P., Maung, N.A. and Mirlees-Black, C. 1993. *The British Crime Survey*. Home Office: London.
- Mistry, D. 2004. National victims of crime survey: falling crime, rising fear *SA Crime Quarterly*, 8, 17-24.
- Mistry, D. and Dhlamini, J. 2001. Perpetrators of farm attacks: an offender profile. Unpublished report for the Institute for Human Rights and Criminal Justice Studies, South Africa.
- Mokonyane, N.P. 2000. ANC daily news briefing by the Gauteng provincial Minister for Safety and Security. Available at:
<http://www.anc.org.za/anc/newsbrief/2000/news1019.txt>, last accessed on 25 June 2007.

- Naudé, B. 2000. The South African National Crime Prevention Strategy: a critique. *Acta Criminologica*, 13, 1-11.
- Oh, J-H. 2005. Social disorganizations and crime rates in U.S. central cities: toward an explanation of urban economic change. *The Social Science Journal*, 42, 569-582.
- Openshaw, S. 1995. *The Census Users' Handbook*. GeoInformation International: Cambridge.
- Ovens, M. 2003. A criminological approach to crime in South Africa. *Acta Criminologica* 16, 67-80.
- Pelser, A. and de Kock, C. 2000. Violence in South Africa: a note on some trends in the 1990s. *Acta Criminologica*, 13, 80-94.
- Pelser, E. and Louw, A. 2002. Where did we go wrong? A critical assessment of crime prevention. *SA Crime Quarterly*, 2, 1-4.
- Peterson, R.D., Krivo, L.J. and Harris, M.A. 2000. Disadvantage and neighborhood violent crime: do local institutions matter? *Journal of Research in Crime and Delinquency*, 37, 31-63.
- Sampson, R. J. 1992. Family management and child development: Insights from social disorganization theory. In McCord, J. (Ed.), *Facts, Frameworks and Forecasts: Advances in Criminological Theory*. Transaction Publishers: New Brunswick, 63-93.
- Schönteich, M. 2005. Murder in South Africa: What we know and don't know. Paper presented at the New Decade of Criminal Justice in South Africa: Consolidating Transformation Conference, Gordon's Bay.

- Schwabe, C.A. 2000. Towards the development of a spatial information system for crime analysis and prevention: some conceptual requirements and empirical evidence from South Africa. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST).
- Shaw, C.R. and McKay, H.D. 1942. *Juvenile Delinquency and Urban Areas*. University of Chicago Press: Chicago.
- Sheldon, G., Hall, R., Brunsdon, C., Charlton, M., Albanides, S. and Mostratos, N. 2002. Maintaining basic command unit and crime and disorder partnership families for comparative purposes. Available at:
<http://www.homeoffice.gov.uk/rds/pdfs2/basiccommand.pdf>, last accessed 25 June 2007.
- Shihadeh, E.S. and Flynn, N. 1996. Segregation and crime: the effect of black social isolation on the rates of black urban violence. *Social Forces*, 74, 1325-52.
- Simcha-Fagan, O. and Schwartz, J. 1986. Neighbourhood and delinquency: An assessment of contextual effects. *Criminology*, 24, 667-704.
- Simpson, G. and Rauch, J. 1999. Reflections on the National Crime Prevention Strategy. In Maharaj, G. (Ed.), *Between Unity and Diversity*. David Philip Publishers: Cape Town, 295-314.
- Sleight, P. 1997. *Targeting Customers: How to use Geodemographics and Lifestyle Data in your Business*. NTC Publications Limited: Henley-on-Thames.

- Sleight, P. 2004. An introductory review of geodemographic information systems. *Journal of Targeting, Measurement and Analysis for Marketing*, 12, 379-388.
- Smith, D.R. and Jarjoura, C.R. 1988. Social structure and criminal victimization. *Journal of Research in Crime and Delinquency*, 25, 27-52.
- South Africa. 1996. National Crime Prevention Strategy. Pretoria, South African Department of Safety and Security.
- Vickers, D.W., Rees, P. and Birkin, M. 2005. Creating the National Classification of census output areas: data, methods and results. Working paper 05/2, School of Geography, University of Leeds, Leeds.
- Vickers, D.W. 2006. Multi-level integrated classifications based on the 2001 Census. Unpublished PhD Thesis, School of Geography, University of Leeds, Leeds.
- Weir-Smith, G. 2004. Crime mobility: spatial modelling of routine activities of arrestees and substance abusers in South Africa. *GeoJournal*, 59, 209-215.
- Williamson, T., Ashby, D.I. and Webber, R. 2005. Young offenders, schools and the neighbourhood: a new approach to data-analysis for community policing. *Journal of Community and Applied Social Psychology*, 15, 203-28.
- Williamson, T., Ashby, D.I. and Webber, R. 2006. Classifying neighbourhoods for reassurance policing. *Policing and Society*, 16, 189-218.

CHAPTER 7

**HERE BE DRAGONS! SPATIAL SYMBOLS OF CRIME IN POST-
APARTHEID SOUTH AFRICA**

Gregory Dennis Breetzke

Submitted: *Antipode*

ABSTRACT

This article aims to contribute towards an ecological theory of crime in South Africa by reviewing crime and its spatial distribution under both the apartheid and post-apartheid eras. From an ecological perspective, apartheid was predicated upon the spatial segregation of the country's diverse population according to certain state-defined racial groups. These racialised spaces created by the apartheid state did not automatically dissolve after democratisation but have become even further entrenched by rightist, neo-liberal economic and developmental policies. Moreover, a number of these spaces have become spatial symbols of crime whose ecological conditions, to some extent, pre-determine criminal behaviour in residents. In this context, a chain reaction was set in place under apartheid, which has seen a self-reinforcing cycle in which levels of crime within certain regions of the country have created a context that favours their perpetuation. Policy implications of an ecological perspective on crime are discussed and strategic recommendations are made for the future.

INTRODUCTION

Over the past 14 years South Africa has been held up as an example to the rest of the world as a model of how a deeply divided country on the verge of civil war made a peaceful transition to democracy and nation-building. Following the successful general election in April 1994 the country underwent a rapid transformation from being a ‘white’, autocratic and largely repressive state to one that became more inclusive and democratic. The most significant achievement in the early stages of the democracy was the reconciliatory stance adopted between the leaders of the formerly oppressive state and the previously banned African National Congress (ANC). It was a step that defused the fear that armed confrontation between the two previously conflicting parties might occur. Since the transition, the fledgling country has experienced a number of challenges. Amongst the most important and demanding are the restructuring of the economy, adjusting to globalisation, dealing with rising poverty and high unemployment, grappling with the HIV/Aids pandemic, and last but not least attempting to contain and combat the surge in criminal activity. Indeed of all these challenges facing the country crime remains the single biggest threat to the *one nation, many cultures* approach adopted by the ANC as part of its reconciliation agenda.

South Africa is crippled by crime. The country currently experiences approximately 43 murders a day, comparable with the United States (US) and China, but with the latter countries having populations six and thirty times greater than ours. Approximately 220 000 people have been murdered in the past decade: a figure that is four times larger than the total number of deaths of Americans for a ten-year period

during the Vietnam War (Altbeker, 2007). Since the US invasion of Iraq in March 2003, there have been 3913 fatalities of the American military (end-2007) (GlobalSecurity, 2007), and in the same period of time over 88 000 people have been murdered in South Africa. Little wonder that South Africa has been labelled as a “country at war with itself” (Altbeker, 2007, p.38).

It has been claimed that the crime pandemic in South Africa is a ‘natural’ occurrence in transitional societies. The quoted example is that of the collapse of the socialist system in central and eastern Europe where a dramatic increase in the amount of crime followed and was affected by the social change (Lévay, 2000). Similar claims have been made for the increase in crime levels in transitional societies throughout Latin America and the former Soviet Union (see Shaw, 2002; Pridemore, 2007). Some, however, argue that countries undergoing similar socio-political changes to South Africa currently experience far lower levels of crime, particularly with respect to violent crime (see Kynoch, 2005; Altbeker, 2007). For example Mozambique and El Salvador, despite both having experienced protracted civil wars, do not have levels of crime and violent conflict that approach those of South Africa.

Explanations for the current high crime levels in the country are typically divided into those either associated with the legacy of apartheid or those related to the transition to democracy. Typical explanations include the post-apartheid influx of African migrants (Berg and Schärf, 2004), and the ‘culture of violence’ born out of the nature of apartheid and the anti-apartheid struggle (Elder, 2003). Other explanations cite a faulty and ill-equipped criminal justice system (Smith, 1997), rising inequality (Altbeker, 2007), and the ready availability of drugs and firearms (Maree, 2003; Berg

and Schärf, 2004). For all the apartheid-era rhetoric theorising crime in the country, few empirical efforts have been made to test their validity. Dixon (2001, p.215) provides a scathing attack on local crime researchers for their lack of any serious empirical attempts to account for the country's high levels of crime. Dixon comments on the "alarmingly amateurish, and crudely positivist research" being conducted as well as the proliferation of technical quick-solutions to what remain deep-seated social problems. Moreover, the spatial component inherent in crime analysis has also been largely neglected. Indeed ecological explanations for 'where crime occurs' and 'where offenders live' in post-apartheid South Africa are only now beginning to emerge from local literature (see Brown, 2001; Blackmore, 2003; Breetzke and Horn, 2006; Breetzke and Horn, in press). This is astonishing for a country steeped in socio-spatial segregation and where social, economic and, more specifically, spatial contexts shape the urban landscape. Indeed the apartheid system was predicated upon the segregation of South African society into specific geographical areas yet the social ecology of apartheid and its link with crime in contemporary South Africa is one of the least researched.

In an attempt to address this shortcoming I outline a theoretical context to explain the ecological patterns of crime in post-apartheid South Africa. The basic thesis is that macro-social patterns of racial and spatial inequalities, born out of repressively enforced apartheid-era segregationist policies, has given rise to ecologically marginalised and stereotyped communities whose means of improving their socio-economic status is restricted by historical circumstance. Crime and developmental policy implications are reviewed and discussed, in light of the theoretical context outlined, and strategic recommendations are made for the future.

A HISTORY OF CRIME IN SOUTH AFRICA

Post-apartheid South Africa has been plagued with high and rising levels of crime, but what comparisons can be drawn with the former apartheid-era? This section outlines three interrelated dimensions of crime in apartheid and post-apartheid South Africa: First, the magnitude of crime; second, the location of crime; and third, the location of offenders.

Apartheid (1951 – 1994)

- The magnitude of crime

It is difficult to estimate the magnitude of crime in South Africa for the years preceding transition. The reasons for that are three-fold. First is the blurred distinction during the apartheid-era between political violence and criminal or opportunistic violence. Political and criminal violence were two sides of the same coin with the state itself often being a significant source of criminal activity. Indeed, the state was not only engaging in criminal predation itself but openly fomenting and sponsoring criminals in campaigns against its political rivals, particularly the ANC (Kynoch, 2005). The former South African Police (SAP) typically acted as agents of the state against 'apartheid offences' with only one in ten members of the SAP actively engaged in criminal detection and investigation during this period (Dipenaar, 1988). Second is the under-reporting of crime by the black African, Coloured and Indian populations prior to political independence. Despite the under-reporting of crime being a worldwide phenomenon, this was undoubtedly exacerbated under the apartheid government during which the SAP was more a counterinsurgency force constrained to fighting political enemies than a bastion of law and order (Samara,

2003; Leggett, 2004). Under apartheid the SAP “protected whites and oppressed blacks” (Adepoju, 2003, p.17) and the deep animosity between the black population and the police undoubtedly affected crime reporting and recording. Last, the limited crime data that are available for the apartheid-era exclude crime occurring in the bantustans¹ or so-called ‘independent black homelands’. The result is that crime statistics up until democratisation still present analysts with prodigious ‘black holes’ where data is completely absent for these areas (Louw, 1997). While the actual extent of crime during the apartheid period is difficult to ascertain, researchers suggest that ‘ordinary’ crime levels preceding the outbreak of politicised hostilities in the mid-1980s were extraordinarily high (see Louw, 1997; Shaw, 2002; Kynoch, 2005). Examining the admittedly fallible crime data that is available, it is evident that crime was on the rise since the mid-1980s, with statistics indicating that even at the height of politicised violence in the early 1990s the number of deaths attributed to political conflicts made up only a small fraction of total deaths (Louw and Schönteich, 2001; Kynoch, 2005). Between 1990 and 1994 the overall reported crime rate rose more than 18%, and the rate of violent crime by 35% (Simpson, 1998). Moreover, the well-publicised Truth and Reconciliation Commission (TRC) came to the stark conclusion that criminal activities may well have been responsible for the largest part of the violence in the early 1990s (Bonner and Nieftagodien, 2002).

- The location of crime

Few studies were conducted during apartheid investigating the location of crime. Notwithstanding the problems with recorded crime data during this period, briefly referred to above, the region-specific and demographically representative monitoring of crime began only after the ANC came to power in 1994 (Blackmore, 2003). Up

until that point crime statistics were only available for minority white areas, whereas crimes committed to the majority of the population were left unreported, badly documented or “generally ignored by the government of the day” (Blackmore, 2003, p.447). Relying exclusively on anecdotal evidence researchers highlight the impoverished black settlements as being the primary location of criminal incidents in apartheid South Africa (see Elder, 2003; Kynoch, 2003a; Kynoch, 2005; Altbeker, 2007). These black settlements, or so-called *townships*² were primarily located on the white urban periphery and were a consequence of segregationist legislation introduced by the apartheid government during the 1950s. Originally envisaged as dormitory towns for mainly black male migrant workers from the homelands, townships soon mushroomed into densely-populated and ethnically diverse spaces synonymous with vigilantism (Harris, 2001), extreme poverty and socio-economic deprivation (Kynoch, 2005), inadequate and corrupt policing (Kynoch, 2003b), politically motivated hostilities between the former armed wing of the ANC, *Umkhonto we Sizwe* (MK), and the state security forces as well as parochial power struggles between rival black African political groups such as the ANC and the IsiZulu-based Inkatha Freedom Party (IFP). Commenting on the violence during the early 1990s Duncan (2003, p.11) refers to a “low intensity war” occurring in the townships with daily reports of bomb blasts, internecine battles and the assassination of influential political figures.

According to Kynoch (2005) legislation was introduced to eradicate criminal activity during apartheid but this was only applied to bring white society under control whereas the townships were ignored (unless perpetrators infringed on whites). This tendency continued throughout apartheid where policing was initially confined to making sure the white spaces were safe but largely neglected the murder, rape and

gangsterism that was flourishing in the townships (Brewer, 2000). The Soweto Uprising of 1976, however, resulted in more urgency on the part of the apartheid government in general, and the SAP in particular, to ‘govern’ townships. Not only did the Soweto Uprising further undermine police-community relations but it also provided a message that blacks were mobilising and prepared to engage in civil conflict against the apartheid regime (Kynoch, 2005). But while the SAP began to re-focus their attention towards the townships their intentions were once again aimed primarily at rooting out political offenders while continuing to neglect the criminals in these areas. An unfortunate offshoot of these developments was the formation of a number of vigilante movements, often politically aligned, which sprung up to address the scourge of crime afflicting local township residents. Township vigilante groups such as *Makgotla* were established “to protect residents against their own children who were professional criminals and murderers” (Kynoch, 2005, p.499). Despite their violent methods, these vigilante groups continued into the 1980s until they were eclipsed by street committees and self-defence units (SDUs) established by ANC supporters to maintain law and order (Kynoch, 2005). Indeed, Leggett (2004) attributes much of the organised ‘black on black’ violence during the transition period to clashes between SDUs and the self-protection units (SPUs), which were the IFP equivalent.

Two other types of law enforcement were later introduced to stem the tide of violence in the townships: the *kitskonstabels* and the municipal police. The *kitskonstabels* were what Leggett (2004, p.157-158) describes as “instant constables, trained in six weeks, granted full police powers (but not full police membership), and cut loose on the townships”, while the municipal police were “slightly better trained and placed

directly at the command of the puppet black authorities.” Negating their mandate of maintaining law and order in these areas both law enforcement bodies were notorious for drunkenness, corruption, and a brutality beyond that of the white security forces (CIIR, 1988). In summary, Kynoch (2005, p.496) notes that townships were places where social and economic deprivation, combined with repressive policing, criminal predation and a corresponding reliance on vigilantism, produced urban environments in which violence frequently became a normative means of “pursuing material interests, resolving conflicts and seeking ‘justice’”

- Location of offenders

Whereas the majority of crime was arguably located within the townships, the most common criminological interpretation is that the majority of offenders were located in the townships as well. While few empirical investigations were forthcoming during this period, a number of face-value observations inform this assumption. First, ubiquitous influx-control laws and various regional development plans prohibited the free movement and association of black residents outside designated spaces such as the townships. The so-called pass laws were deliberate attempts to curb black urbanisation and to stop black migration to the white urban core (Emmett, 2003) and unwittingly ‘trapped’ criminals and their victims within the same spatial sphere. Second, researchers have noted that criminal gangs and local strongmen, often operating under the guise of vigilante groups, openly resided and operated in the townships prior to the advent of politicised hostilities (see Louw, 1997; Kynoch, 2005). Third, with few informal control mechanisms such as police patrols in the area, criminals in the townships effectively had free reign and were unlikely to travel long distances in the pursuit of illegal gains. In any event, individuals who resisted the pass

laws effectively resisted apartheid (Elder, 2003) and perpetrators would be unlikely to risk arrest for an ‘apartheid offence’ when they were committing opportunistic and/or criminal atrocities within their own community.

In summary, while a number of factors preclude any definitive statements to be made regarding apartheid crime levels, it is generally acknowledged that crime was high and rising long before democratic rule. Anecdotal evidence suggests that the majority of crime occurred in the townships on the fringes of the white urban core, with offenders typically residing in the townships as well. The dawn of democracy and the concomitant promise of a new life for all raised popular expectations among the majority of South Africans that crime levels would subside but the reality has been the antithesis.

The Rainbow Nation (1994 – present)

- Magnitude of crime

The euphoria of political transformation in 1994 brought with it an initial spike in crime levels in South Africa as a result of the inclusion of the ten bantustans in the crime count for the country (Leggett, 2004). In the same year Interpol ranked South Africa as the second most dangerous country in the world to live in and second in the world with respect to sex-related crimes. Following the peak in crime levels, the country experienced what Berg and Schärf (2004, p.61) refer to as the “honeymoon period” from 1994-1996 during which crime levels dropped and momentarily stabilised. Since 1997 however, levels of crime in the country have continued to rise steadily, with a levelling off in 2000/01, a dip in 2001/02, and then a gradual rise again reaching a new peak in 2003/04 (Altbeker, 2007). Notwithstanding the

limitations inherent in officially recorded crime data, the basic trend over the past fourteen years of democracy has been a dramatic escalation of crime from 1997 to 2003/04 followed by a gradual decrease to 2006/07.

Anecdotal explanations for the rise or ‘continuing rise’ of crime in post-apartheid South Africa are myriad. Kynoch (2005) reports that ANC- and Inkatha-affiliated ‘warlords’ represented under the guise of the now defunct SDUs and SPUs became unrestrained by centralised command structures after apartheid, and with little fear of being penalised by the group they claimed to represent, turned to crime as a means to survive. As Kynoch (2005, p.496) states: “such elements were unlikely to put down their guns and relinquish power merely because politicians declared the fighting to be over.” Altbeker (2007, p.146) believes the post-1994 crime wave has been driven by its own “runaway internal energies” rather than underlying social and economic conditions. Altbeker believes that crime in the country has become so pervasive that it has dragged others with a higher resilience against the temptations of criminality into crime. A more nuanced conceptualisation of crime in South Africa is outlined by Shaw (2002), who attributes the growth in crime in the country to the breakdown of community and related principles of social organisation, including crime control arrangements and reduced risks of punishment. Shaw argues that the growth in the country’s crime levels is also a factor of two critical and inter-related issues: the availability of firearms and the increased organisation of some aspects of criminal activity. In terms of the former issue, Shaw (2002, p.6) states:

“In transitions where a high level of violence has been a dominant feature of the society in the pre-transitional period, and where the nature of the peace settlement in the society is effectively a stalemate,

people on both sides of the divide either retain their arms because they do not trust the opposition, or buy new ones because they fear the future.”

Other researchers attribute growing crime levels in post-apartheid South Africa to the ‘culture of violence’ that was nurtured and inculcated into South African society under apartheid (see Schwabe, 2000; Maree, 2003; Leggett, 2004; Berg and Schärf, 2004). Accordingly the violent nature of the political struggle has resulted in violence becoming ‘normalised’ in certain segments of South African society.

- Location of crime

All crime in post-apartheid South Africa is captured in the newly formed Case Administration System (CAS) of the current South African Police Services (SAPS). The CAS is used to collate crime information that are subsequently released to the public annually in the form of crime statistics. These crime statistics are released in an aggregated form as a crime count per police precinct. A historical review of crime statistics since democratisation illustrates the escalation of crime in police stations located in the townships of South Africa. According to the latest crime statistics for 2006/07, the majority of violent crimes occur in townships near South Africa’s six major metropolitan areas. Of the 124 police stations with the highest crime levels in the country, which account for nearly 40% of the total violent crimes (ie. murder, attempted murder, rape and assault with attempt to cause grievous bodily harm (GBH)), 64% are located in the townships. Among the 10% of police stations with the highest levels of violent crime in the country, none were located in former ‘whites-only’ police stations. Furthermore, of the police stations that account for over 40% of the country’s general aggravated robbery, car hijackings, house robbery and business

robbery crimes: 46%, 21%, 38%, 10% are located in township police stations respectively. In a socio-crime classification of 1100 police stations in South Africa, Schwabe and Schurink (2000) note that police stations located in the townships had exceptionally high total crime numbers with all crimes committed being above the national average except for shoplifting and the contravention of the Explosives Act.

Two additional crime trends are pertinent in post-apartheid South Africa. The first is the overall increase in crime in police stations located in the former ‘whites-only’ neighbourhoods. The latest crime statistics indicate that Sandton, an affluent former ‘whites-only’ neighbourhood located in Johannesburg, was named the country’s most dangerous neighbourhood for armed house robbery with 343 families attacked at gunpoint in the 2006/07 financial year. Sandton was also named as one of the highest risk areas for three other categories of crime – hijacking, business robbery and general aggravated robbery. Other police stations located in affluent former ‘whites-only’ neighbourhoods also rank among the country’s most dangerous and include Garsfontein, and Brooklyn (in Tshwane) and Honeydew, and Randburg (in Johannesburg). A second notable trend is the rapid growth of crime in police stations located in the Central Business Districts (CBDs) of all major metropolitan areas. Police stations located in the CBDs of Johannesburg, Durban, Pietermaritzburg, Tshwane and Cape Town consistently exhibit high levels of crime, particularly economic crimes.

- Location of offenders

Despite extensive ecological studies of delinquency internationally (see Schuerman and Kobrin, 1982; Bursik, 1984; Bursik and Grasmick, 1992), until more recently, not a single local study had been conducted investigating the location of offenders in post-apartheid South Africa. This shortcoming was addressed by Breetzke and Horn (2006) who investigated the spatial relationship between a population of offenders and a range of socio-demographic variables in the city of Tshwane. The researchers found that 3% of the neighbourhoods in Tshwane accounted for almost 41% of incarcerated offenders, with all major concentrations of offenders emanating from the townships in the northern periphery of the municipality. The location of offenders was also found to be associated with low social status and income, a large and young family, unskilled earners and high residential mobility. In a follow up study Breetzke and Horn (in press) created an offender profiling system for Tshwane. Using a data driven methodology, the 371 neighbourhoods of Tshwane were classified from high to low risk for offender development on the basis of a number of ecological risk factors. According to the authors the geodemographic groups classified as high-risk for offender development were mainly characteristic of the townships. Even neighbourhoods with current low offender rates but still categorised as high risk for offender development were primarily located in the townships. Distinct socio-demographic factors were associated with these high-risk clusters including a low socio-economic status, low income, and a disrupted family. Almost 99% of the residents living in neighbourhoods at a high-risk for offender development were black, while 70% of white people lived in neighbourhoods classified as low-risk.

It is difficult to say for certain whether crime is increasing or decreasing in post-apartheid South Africa. The questionable accuracy and authenticity of the limited apartheid-era crime data that is available for the country makes direct comparisons between crime levels over the two periods problematic if not impossible. Empirical evidence suggests that the location of crime in post-apartheid South Africa appears to have been marginally displaced from the townships to the former 'whites-only' neighbourhoods. Whilst both regions currently experience high levels of crime, the repressive apartheid-era policing policies previously shielded the minority white population from the scourge of crime affecting the spatially isolated townships. In contrast, the vast majority of offenders continue to emanate from the impoverished townships although perhaps driven less now by political than by criminal motives. Based on this brief discourse it is evident that a thorough understanding of the spatial ecology that continues to characterise townships in post-apartheid South Africa is key to any current theorising of crime and its causes in the country.

SPATIAL SYMBOLS OF CRIME IN POST-APARTHEID SOUTH AFRICA

The democratic transition in South Africa saw sweeping political, economic, and ideological changes in the country. Arguably the biggest change from an ecological perspective was the abolition of statutory urban segregation and the elimination of the pass laws that had previously hindered the free movement of black residents. It was the enactment of the Group Areas Act of 1950 (Act 41) that initially heralded the ideology of segregation or the separate socio-spatial development of the many diverse races of the country. The Act was premised upon the spatial fracturing of South African society by comprehensively segregating its residents according to certain

state-defined racial groups. Millions of blacks were, in some instances, evicted from their homes and forcibly removed from white areas to specific urban spaces, separated by buffer zones of open land (Spinks, 2001). The socio-spatial redesign saw the formation of a number of black urban periphery townships in areas distant and distinct from the white urban core. Being spatially secluded from white commercial and economic centres, township residents naturally felt economically and socially marginalised as apartheid's explicit white socio-spatial supremacy began to take hold. According to Simpson (1998, p.67) young black South Africans initially proved resilient in the face of such marginalisation and forged sub-cultures within political organisations during the 1970s and 1980s. Simultaneously however, Chikane (1986) observes that being a township resident in apartheid South Africa meant residing in squalid, crime-infested ghettos characterised by widespread malnutrition, poor or non-existent health systems, poor education in ill-equipped and overcrowded schools, inadequate or non-existent social security, high levels of unemployment, and quotidian experiences of racist prejudice and abuse.

In this article I argue that townships have become spatial symbols of crime whose ecological character and conditions, to some extent, pre-determine criminal behaviour and reinforce criminogenic stigmas and attitudes in residents. The notion that a geographical area can be *the* determining influence of crime and delinquency has its roots in the ecological tradition in criminology. Ecological theories of crime attempt to locate the causes of crime and delinquency within some form of social structure that exists external to the individual. Common research in the ecological tradition has been dominated by social disorganisation theory (Shaw and McKay, 1942) yet more integrated theoretical frameworks have been proposed to account for the differential

distribution of crime and delinquency in cities (see Cohen and Felson, 1979). In following the ecological tradition, the current discourse motivates that the presence of 'past' socio-economic deprivation coupled with historically high levels of crime and offenders within township communities has predisposed many residents to criminal behaviour. Subsequently, these geographic areas, spatially delineated by the apartheid government, have developed their own criminogenic identities as a result of a period of long and sustained social and economic neglect coupled with a constant exposure to crime. Insofar as the ecological perspective assumes that what is happening to or with a resident is dependent on the neighbourhood in which he or she is living (Elffers, 2003) it would appear, based on this discussion, that if a resident should move away from the townships their chances of resorting to crime would alter significantly.

Of course it is true that the spatial stratification of communities by concentrated disadvantage has emerged historically at multiple levels of geography. And it is also true that some researchers have previously suggested that neighbourhoods could be criminogenic in and of themselves (see Sampson and Raudenbush, 1999; Sherman *et al.*, 1989). But what makes the South African experience ecologically unique is that these 'criminogenic' areas not only emerged as a direct result of a repressively enforced racist spatial planning policy but there were also few legitimate means for residents of these areas to escape. Notwithstanding the inherent financial constraints involved in moving residence, black inhabitants under apartheid were legally and oppressively bound to their place of residence. In this context the racial segregation of South African society isolated and marginalised these communities and left them vulnerable to neglect, discrimination, and a plethora of ecological risk factors for

delinquency. Of course, these conditions do not affect everyone the same and there are certainly neighbourhoods within the townships where these ecological risk factors are less prevalent but the effect of these risk factors on those township residents that are more prone to criminal behaviour - perhaps by circumstance - is crime.

The changing urban structure of post-modern South African cities albeit in the context of the apartheid legacy, continues to provide an ecological context for examining how crime permeates throughout the country. Whilst township communities continue to be historically and economically bound to the city, the years since democratisation has seen a metonymic shift in the previous 'black-white' urban divide. The emerging black middle-class has migrated from the townships and into the more affluent former 'whites-only' neighbourhoods, while those blacks not advancing socio-economically are left behind. As Mabin (2005, p.52) however states, "the paths out of the townships are little trodden by outsiders moving in" as blacks increasingly occupy former 'whites-only' neighbourhoods but with the townships remaining much less penetrable to whites. Moreover, residential desegregation has resulted in a greater crossover between black and white middle-class forged through a forced 'common enemy' in the form of crime. The result for the townships is that 'new' money and wealth generated from the emerging black middle-class is not being ploughed back into the townships but is redistributed in the former 'whites-only' neighbourhoods. As a consequence, the much anticipated urban growth and development in the townships has failed to materialise and townships continue to be ravished with poverty, crime, and a limited access to a range of urban services, and employment opportunities. Former 'whites-only', neighbourhoods, on the other hand, are becoming desegregated as more and more black residents move in.

This new racial *status quo* in South African society has however been met with resistance among whites that are often framed in terms of what Durrheim (2005, p.444) refers to as “spatial metaphors.” Whites experience desegregation in terms of their displacement and, driven by spatio-temporal practices, either emigrate or move into even more exclusive fortified enclaves (Durrheim, 2005). Alternatively the now-desegregated former ‘whites-only’ neighbourhoods become ‘gated communities’ cordoned off from the rest of society complete with walled perimeters and guardhouses. These newest forms of neighbourhood development are what Mabin (2005, p.51) describes as:

“the new compounds of urban South Africa, representing tightly defended social segregation.... [and] are a response to the failure of the state to maintain the quiet conditions of white suburban life of the not-too-distant past.”

In all instances, far from desegregating South African society, repealing the Group Areas Act in 1991 has only served to deepen existing socio-spatial segregation, albeit less in terms of race but more in terms of class and a fear of crime.

In this section I have argued that the segregation and subsequent marginalisation of the majority black population under apartheid can help to explain the nature and magnitude of crime in transitional South Africa. In this context, socio-economic impoverishment, and a ‘desensitivity’ to violence, has colluded to create ecologically isolated and stereotyped communities in townships throughout the country. But what are the policy implications for such a heuristic argument? In order to evaluate these it is imperative to review the range of crime and developmental policy initiatives that have been forthcoming since democracy.

CRIME AND DEVELOPMENTAL POLICY IN POST-APARTHEID SOUTH AFRICA

From early on in the transition process, the newly elected ANC government recognised the proclivity of crime and violence and pledged to take a social developmentalist approach to their crime reduction policy (Samara, 2003). The government understood crime to be a symptom of historical injustices and felt instinctively that a focus purely on punishing criminals would be “to add carceral insult to socio-economic injury” (Altbeker, 2007, p.137). As a result the South African cabinet adopted a crime prevention orientated policy aimed at governing policing in post-apartheid South Africa: the National Crime Prevention Strategy (NCPS) of 1996. The NCPS advocated a macro-strategy towards crime and aimed at shifting the approach to crime in South Africa from crime control to crime prevention (NCPS, 1996). Partnerships were promoted as a mechanism for preventing crime, along with shared responsibility among a range of government departments, rather than just the police and the courts (Bruce, 2006). A proper and adequate analysis of the root causes of crime was recommended that would then inform a suitable crime prevention approach.

In order to identify the supposed root causes of crime, and simultaneously address the historical imbalances in South African society, the NCPS was enveloped in the Reconstruction and Development Programme (RDP). The RDP was an integrated, inter-departmental and holistic approach towards post-apartheid change that aimed to meet the basic needs of all South Africans and provide the assurance that each citizen would have a decent standard of living and economic security (RDP, 1994). Implicit

in the RDP was the notion that the socio-spatial distortions of the apartheid-era would be addressed through restructuring of the state (Maharaj and Ramutsindela, 2002). The RDP document aimed to integrate economic growth with development and reconstruction despite the common view that the two processes are contradictory (Peet, 2002). For all the ambition of its authors the RDP was essentially an electioneering tool used by the ANC to raise popular expectations about life in democracy (Tsheola, 2002), and rather predictably failed to address the immediate developmental needs of the poor (Ntsime, 2003; Adepoju, 2003). The failure of the RDP to promote economic growth coincided with the collapse of the NCPS and a move away from a socialist and crime prevention orientated approach to crime reduction. An assessment of the NCPS after its first year found that virtually no action has been taken on the two ‘social pillars’ of the strategy: *crime prevention through environmental design* and *community values and education* (Simpson and Rauch, 1999), while an assessment of the strategy after five years found that with the possible exception of victim support, most of the social programmes envisaged by the NCPS never came to fruition (Leggett, 2004). Mounting political pressure over the high crime levels and a growing fear of crime among the public began to make the apparent wisdom of the government’s conviction that crime had its roots in social problems that must be tackled first, sound like a refusal to take responsibility (Altbeker, 2007). A new Minister of Safety and Security, Mr Steve Tshwete³, and a new National Commissioner of Police, Jackie Selebi, were quickly ushered in under the Thabo Mbeki administration in 1999 and a more authoritarian crime reduction policy shortly followed.

The National Crime Combating Strategy (NCCS) (2000-present) was launched in April 2000 to guide operations and resources at a police station level. The NCCS adopted a more intelligence driven approach to policing that aimed to reduce crime in selected crime hot spots throughout the country that accounted for nearly 50% of all crime incidences (Nqakula, 2003). The NCCS is conceptually broken down into two phases: the stabilisation phase (2000–03) and the normalisation phase (2004–09). In the first phase the intended aim is to ‘stabilise’ crime in roughly 140 police stations (about 10% of police stations) identified by the SAPS that accounted for more than 50% of serious crime in the country (Leggett, 2004). The stabilisation of crime was to be accomplished through saturation policing by both the SAPS and the military (Leggett, 2004).

In 2004 the NCCS theoretically entered into its second phase of operation: normalisation. During this phase the SAPS intended to initiate social crime prevention initiatives in the now-stabilised hot-spot areas, and planned to keep crime levels low in these areas through sector policing⁴. It is difficult to evaluate the first phase of the NCCS in stabilising crime levels in priority areas of the country since no public document has ever been issued describing the NCCS in any detail (Leggett *et al.*, 2003). More depressingly Samara (2003) reports that no social crime prevention programmes were outlined for the 140 priority police stations after the so-called ‘stabilisation’ of crime levels. So whilst a number of arrests were no doubt made during the stabilisation phase of the NCCS, no medium to long-term strategies have been adopted to address the ecological risk factors that gave rise to the crime in the first place.

The change in crime reduction policy from the NCPS to the NCCS also saw a change in the ANC government's economic and development policy from the RDP to the Growth, Employment and Redistribution strategy (GEAR). According to Maharaj and Ramutsindela (2002), GEAR is a market-driven strategy that:

- emphasises that socio-economic development will be lead by the private sector
- there will be privatisation of state-owned enterprises
- government expenditure on social services will be reduced
- exchange control regulations will be relaxed, and
- there will be a more flexible labour market.

Whereas GEAR reiterated the RDP's link between economic growth and the redistribution of incomes, it argued that much higher economic growth rates were necessary to achieve social objectives (Peet, 2002). GEAR was seen to favour big business over the working class and its implementation in city councils and municipalities has resulted in the collapse of basic services in regions that need them most, notably the townships (see Narsiah, 2000; Tsheola, 2002; Peet, 2002). According to Bond (2000), the strategy has little appeal beyond the increasingly multi-racial elite and entrepreneurial classes and is envisaged as a strategy that will perpetuate poverty in the country, with Tsheola (2002, p.26) strongly arguing that, "far from producing 'a better life for all', GEAR is producing a zero-sum outcome". So whereas the predominantly affluent white and emerging black elite have either had their post-apartheid fears allayed, in terms of the former, or their post-apartheid economic aspirations met, in terms of the latter; the vast majority of the inhabitants of the country continue to be socially and economically deprived.

Indeed, the heightened aspirations of these - predominantly township - residents have been coupled with economic reforms such as GEAR that have not yet been associated with job creation and increasing incomes (O'Donovan, 1998). On the contrary, socio-economic reforms and infrastructure development have largely ignored township residents and tended to favour the affluent white and growing black elite. One pertinent example is provided in the form of the Gautrain – a high-speed rail link being developed between Johannesburg, Tshwane and the Oliver (OR) Tambo International Airport. The project, which is currently the biggest rail project under construction in the world, is due for completion in March 2011 and will cost the state approximately R21.9 billion (\$3.2 billion). Despite coming under heavy criticism from opposition parties and labour federations for neglecting the poor and not servicing the transport needs of township residents (IRIN, 2006), the ANC government maintains that the Gautrain is not transport for the elite but for the public at large. The proposed route of the Gautrain however bypasses all townships located within the Gauteng province and rather services the former 'white' urban hubs of Sandton and Rosebank (in Johannesburg) and Centurion and Hatfield (in Tshwane). Meanwhile up to 300 000 daily commuters, most of them residents of the impoverished townships on the outskirts of Tshwane and Johannesburg will have to continue to use the Metrorail, a dilapidated state-run surface network plagued by old infrastructure and machinery (IRIN, 2006). While private sector interests continue to play a determining role in effecting spatial change in the country (Mabin, 2005), an increasing juxtaposition of prosperity and poverty transpires among the country's population that is still defined predominantly by race and reinforces a sense many township residents have of their own deprivation and entrapment.

CONCLUSION

The question of apartheid and crime remains as salient as ever but the ecological playing field has significantly altered over the past 60 years. Apartheid South Africa was plagued with high and rising crime levels in a fractured and segregated society. Crime was confined to the apartheid-engineered townships on the periphery of the white urban core with offenders primarily located there as well. Affluent ‘whites-only’ spaces typically exhibited ‘not in my backyard’ (NIMBY) exclusionist and escapist mentalities whilst segregated black spaces were typically characterised by political and/or criminal violence and crime. The liberation from apartheid has resulted in a continued increase in crime levels across the country. Whilst crime has spatially diffused somewhat to former ‘whites-only’ neighbourhoods, the vast majority of crime and offenders continue to emanate from the townships.

This paper has argued that certain geographical areas of the country, such as the townships, have become spatial symbols of crime that predispose residents to criminality. In this context, a chain reaction was set in place under apartheid, which has seen a self-reinforcing cycle in which levels of crime and delinquency within certain regions of the country have created a context that favours their perpetuation. A form of spatio-criminal determinism has emerged among a number of current residents of the townships that is embedded in, and dictated by, apartheid-era segregationist policies that have yet to be alleviated in the post-apartheid-era. Moreover the ecological context of townships has instilled ‘criminogenic’ norms, values and behaviours in individuals and has triggered a cycle of criminality in these communities. Indeed, in a test of social disorganisation theory in South Africa

Breetzke (in press) found that 87% of a population of offenders incarcerated in correctional centres in Tshwane were residing in the townships at the time of their apprehension.

The notion of apartheid's socio-spatial divides pre-determining criminal behaviour is contentious; but it does have implications for crime reduction and associated developmental policy. Currently post-apartheid crime and development planning policies instigated by the ANC have largely neglected the spatio-historical context in which crime is occurring. In terms of crime reduction policy, the change from the crime prevention paradigm of the NCPS to the law enforcement approach of the NCCS has effectively resulted in the ecological forces causing criminal events, many of which have a skewed spatial distribution, being ignored. Instead a repressive law enforcement approach is now followed which is predicated upon 'capturing criminals' (Leggett, 2004). In terms of developmental policy, the abandonment of the neo-populist, basic-needs-orientated RDP in favour of global, neo-liberal GEAR has effectively meant that the state has fallen prey to globalisation and reneged on their promise to address structural issues, and redress social inequity at a national level. Meanwhile empirical evidence in the country suggests that crime and socio-economic deprivation are strongly linked (see Brown, 2001; Blackmore, 2003; Breetzke and Horn, 2006) which according to Samara (2003) belie attempts to approach crime and security separately from socio-economic developmental issues. While it may be dangerous to conflate crime prevention with economic and developmental policy, the failure to understand crime and its causes in ecological terms in the country will result in future policy discussions taking place in an analytical and empirical vacuum.

This paper has outlined a theoretical context for understanding crime and delinquency in South Africa. But what solutions can such knowledge provide? From a purely crime reduction perspective an integrated inter-departmental national strategy is required that is predicated upon a rapid and rigorous social and economic upliftment of certain criminogenic regions of the country, most notably the townships. The strategy should ideally be aimed at utilising all available government resources to first improve basic infrastructures, in particular roads, stormwater drainage, piped water, sewerage and street lighting, among others, in these regions of the country. Second, ‘enjoyment infrastructures’ should be built that focus on youth activities such as shopping malls, libraries, swimming pools, and sportsgrounds. In this way the current spatial symbols of crime can become spatial symbols of the ‘Rainbow Nation’. The allocation of these developmental tasks should be coupled with clearly identifiable and measurable goals and more importantly, particularly in a developing world context, accountability on behalf of the national and provincial government departments and other key role players. But whilst the upgrading of these spatial symbols of crime should ideally have some effect on the crime rate, a substantially more difficult challenge is to transform the criminogenic mindset that besets the occupants of these spaces. Failure to address this pervasive mindset, in addition to the targeted socio-economic upliftment of such areas, will result in a continued crime pandemic in the country that no amount of deterrence policing or state spending will be able to counter.

ENDNOTES

¹ The ‘Bantustans’ were black homelands artificially created by the apartheid government. In total ten homelands were created throughout South Africa from the 1950s to 1994 in order to separate different races from each other and allow each area to develop autonomously.

² ‘Township’ refers to built-up residential areas (neighbourhoods) that are still dominantly (+95,0%) inhabited by black people. Under the apartheid policy focusing on separate development, these areas were originally reserved for black people only. When they were established during the 1950s and 1960s they were never intended to grow into fully developed and independent communities with a complete infrastructure (eg. shops, community and recreational facilities, work places, etc). They were seen as dormitory towns for mainly male migrant workers from the then homelands. Today most of them still include a more stable; higher socio-economic (chiefly lower middle class) area inhabited by people who have lived there for a long time or whose parents/relatives had lived there since the establishment of the township. These older and more established areas may have developed features such as taverns, clubs, recreational facilities and churches, which have turned such areas into fully fledged communities. However, around or next to such areas more informal settlements and ‘matchbox’ developments sprang up over the past two decades (eg. Vosman next to Kwaguqa which served as the original township of Witbank). Although not intended, these differ little from the original dormitory towns. In the fifties, sixties and seventies separate townships were also built for the Coloured and Indian population groups. These townships (like Phoenix and Chatsworth for Indians and Hanoverpark, Mitchells Plain and Eldoradopark for Coloured people) were

mainly populated by people removed from so-called white areas (eg. people removed from District Six and Sophiatown). From the beginning they differed from the black townships in the sense that they did not experience the mass influx from rural South Africa and later from even further afield. Since the abolition of influx control in 1986 many black people started to squat next to these Indian and Coloured areas, while particularly since 1994 (or even before that date) many Indians and Coloured people moved into previously 'white' areas (or the areas where they had lived prior to the 50's). More and more black squatters subsequently moved into these former Indian and Coloured 'group areas' (Extract from SAPS, 2007)

³ Mr Steve Tshwete passed away in 2002 and was replaced by Mr Charles Nqakula.

⁴ Sector policing is an approach to policing whereby police stations are divided into smaller sectors, each with a police member or team of members assigned to it. These members are expected to consult with the communities they serve to identify crime problems and their solutions.

ACKNOWLEDGEMENTS

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the NRF.

REFERENCES

- Adepoju, A. 2003. Continuing and changing configurations of migration to and from the Republic of South Africa. *International Migration*, 41, 3-28.
- Altbeker, A. 2007. *A Country at War with Itself: South Africa's Crisis of Crime*. Jonathan Ball: Johannesburg.
- Berg, J. and Schärf, W. 2004. Crime statistics in South Africa 1994-2003. *South African Journal of Criminal Justice*, 17, 57-78
- Blackmore, F.L.E. 2003. A panel data analysis of crime in South Africa. *South African Journal of Economic and Management Sciences*, 6, 439-458.
- Bond, P. 2000. *Elite Transition*. University of Natal Press: Pietermaritzburg.
- Bonner, P. and Nieftagodien, N. 2002. The Truth and Reconciliation Commission and the pursuit of "social truth": The case of Kathorus. In Posel, D. and Simpson, G. (Eds), *Commissioning the Past: Understanding South Africa's Truth and Reconciliation Commission*. Witwatersrand University Press: Johannesburg, 173-203.
- Breetzke, G.D. in press. Modeling of violent, economic and sexual offenders: a test of social disorganisation in the city of Tshwane, South Africa. *Criminal Justice Studies*.
- Breetzke, G.D. and Horn, A.C. 2006. Crossing the racial divide: a spatial-ecological perspective of offenders in the City of Tshwane Metropolitan Municipality, South Africa. *GeoJournal*, 67, 181-194.

- Breetzke, G.D. and Horn, A. C. in press. A geodemographic profiler for high offender propensity areas in the city of Tshwane, South Africa. *Environment and Planning A*.
- Brewer, J. 2000. *Black and Blue: Policing in South Africa*. Clarendon Press: Oxford.
- Brown, K.V. 2001. The determinants of crime in South Africa. *The South Africa Journal of Economics*, 69, 269-299.
- Bruce, D. 2006. Racism, self-esteem and violence in South Africa: gaps in the NCPS' explanation? *SA Crime Quarterly*, 17, 31-36.
- Bursik Jr, R.J. 1984. Urban dynamics and ecological studies of delinquency. *Social Forces*, 63, 393-413.
- Bursik Jr, R.J. and Grasmick, H.G. 1992. Longitudinal neighborhood profiles in delinquency: The decomposition of change. *Journal of Quantitative Criminology*, 8, 247-263.
- Catholic Institute for International Relations (CIIR). 1988. *Now Everyone is Afraid: The Changing Face of Policing in South Africa*. CIIR: London.
- Chikane, F. 1986. Children in turmoil: the effects of unrest on township children. In Burman, S. and Reynolds, P. (Eds), *Growing up in a Divided Society*. Ravan Press: Johannesburg, 333-344.
- Cohen, L. and Felson, M. 1979. Social change and crime rate trends: a routine activity approach. *American Sociological Review*, 44, 588-08.
- Dipenaar, M. 1988. *The History of the SAPS*. Promedia: Silverton.

- Dixon, B. 2001. Exclusive societies: towards a critical criminology of post-apartheid South Africa. *Societies in Transition*, 32, 205-227.
- Duncan, N. 2003. Understanding collective violence in apartheid and post-apartheid South Africa. Paper presented at the Indo-South African dialogue on Truth, Reconciliation and Human Rights, Delhi, India.
- Durrheim, K. 2005. Socio-spatial practice and racial representations in a changing South Africa. *South African Journal of Psychology*, 35, 444-459.
- Elder, G.S. 2003. Malevolent traditions: hostel violence and the procreational geography of apartheid. *Journal of Southern African Studies*, 29, 921-935.
- Elffers, H. 2003. Analysing neighbourhood influence in criminology. *Statistica Neerlandica*, 57, 347-367.
- Emmett, T. 2003. Social disorganization, social capital and violence prevention in South Africa. *African Safety Promotion Journal*, 1, 4-18.
- GlobalSecurity. 2007. *Iraq: US Casualties*. Available at:
http://www.globalsecurity.org/military/ops/iraq_casualties.htm, last accessed 31 December 2007.
- Harris, B. 2001. As for violent crime that's our daily bread: vigilante violence during South Africa's period of transition. Report for the Centre for the Study of Violence and Reconciliation (CSVr). Available at <http://www.csvr.org.za/papers/papvtp1.htm>, last accessed 28 November 2007.

- IRIN. 2006. Hi-tech rail slammed by unions for ignoring the poor. Available at <http://www.irinnews.org/Report.aspx?ReportId=58600>, last accessed 29 January 2008.
- Kynoch, G. 2003a. Friend or foe? A worldview of community-police relations in Gauteng townships. *Canadian Journal of African Studies*, 37, 298-327.
- Kynoch, G. 2003b. Apartheid nostalgia: personal security concerns in South African townships. *SA Crime Quarterly*, 5, 7-10.
- Kynoch, G. 2005. Crime, conflict and politics in transition-era South Africa. *African Affairs* 104, 493-514.
- Leggett, T., Louw, A., Schönteich, M. and Sekhonyane, M. 2003. *Criminal Justice in Review 2001/2002*. Institute for Security Studies (ISS): Pretoria.
- Leggett, T. 2004. The state of crime and policing. In Daniel, J., Southall, R. and Lutchman, J. (Eds), *State of the Nation: South Africa 2004-05*. HSRC Press: Pretoria, 144-176.
- Lévay, M. 2000. Social changes and rising crime rates: the case of central and eastern Europe. *European Journal of Crime, Criminal Law and Criminal Justice*, 8, 35-50.
- Louw, A. 1997. Surviving the transition: trends and perceptions of crime in South Africa. *Social Indicators Research*, 41, 137-168.
- Louw, A. and Schönteich, M. 2001. Playing the numbers game: promises, policing and crime statistics. In Steinberg, J. (Ed.), *Crime Wave: The South African Underworld and its Foes*. Witwatersrand University Press: Johannesburg, 41-49.

- Mabin, A. 2005. Suburbanisation, segregation and government of territorial transformations. *Transformation*, 56, 41-64.
- Maharaj, B. and Ramutsindela, M. 2002. Introduction: Post-apartheid political dispensation – New or old geographies? *GeoJournal* 57, 1-2.
- Maree, A. 2003. Criminogenic risk factors for youth offending. In Bezuidenhout, C. and Joubert, S. (Eds), *Child and Youth Misbehaviour in South Africa: A Holistic View*. Van Schaiks: Pretoria, 51-79.
- Narsiah, S. 2000. Neoliberalism and privatization in South Africa. *GeoJournal*, 57, 3-13.
- NCPS (National Crime Prevention Strategy). 1996. Pretoria, South African Department of Safety and Security.
- Nqakula, C. 2003. Department of Safety and Security media briefing by the Minister of Safety and Security. Available at <http://www.info.gov.za/speeches/2003/03090812461003.htm>, last accessed 16 January 2006.
- Ntsime, P. 2003. A critical analysis of South Africa's transition to democratic local government: prospects for sustainable development. *Africanus*, 33, 35-5.
- O'Donovan, M. 1998. Looking forward: using socio-economic data to determine crime trends. Institute for Security Studies (ISS), Monograph No.3, May-June 1998.
- Peet, R. 2002. Ideology, discourse, and the geography of hegemony: from socialist to neoliberal development in post-apartheid South Africa. *Antipode*, 34, 54-84.

- Pridemore, W.A. 2007. Change and stability in the characteristics of homicide victims, offenders and incidents during rapid social change. *British Journal of Criminology*, 47, 331-345
- Reconstruction and Development Programme (RDP). 1994. *The Reconstruction and Development Programme: A Policy Framework*. African National Congress.
- Samara, T.R. 2003. State security in transition: the war on crime in post-apartheid South Africa. *Social Identities*, 9, 277-312.
- Sampson, R.J. and Raudenbush, S.W. 1999. Systematic social observation of public spaces: a new look at disorder in urban neighborhoods. *American Journal of Sociology*, 105, 603-651.
- SAPS (South African Police Services). 2007. 2006/07 Crime Statistics. Available at http://www.saps.gov.za/statistics/reports/crimestats/2007/crime_stats.htm, last accessed 28 November 2007.
- Schuerman, L.A. and Kobrin, S. 1982. Ecological processes in the creation of delinquency areas: an update. Paper presented at the Annual Meeting of the American Sociological Association, Toronto, Canada.
- Schwabe, C.A. 2000. Towards the development of a spatial information system for crime analysis and prevention: some conceptual requirements and empirical evidence from South Africa. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST).

- Schwabe, C.A. and Schurink, W.J. 2000. A classification of police stations in South Africa: Towards a better understanding of crime. Unpublished research report for the South African Department of Arts, Culture, Science and Technology (DACST), Pretoria.
- Shaw, M. 2002. Crime, police and public in transitional societies. *Transformation*, 49, 1-24.
- Shaw, C.R. and McKay, H.D. 1942. *Juvenile Delinquency and Urban Areas*. University of Chicago Press: Chicago.
- Sherman, L. W., Gartin, P.R. and Buerger, M.E. 1989. Hot spots of predatory crime: routine activities and the criminology of place. *Criminology*, 27, 27-55.
- Simpson, G. 1998. Urban crime and violence in South Africa. In Petty, C. and Brown, M. (Eds), *Justice for Children: Challenges for Policy and Practice in Sub-Saharan Africa*. Save the Children: London, 66-71.
- Simpson, G. and Rauch, J. 1999. Reflections on the first year of the National Crime Prevention Strategy. In Maharaj, G. (Ed.), *Between Unity and Diversity: Essays on Nation-Building in Post-apartheid South Africa*. David Philip: Cape Town, 295-314.
- Smith, N. 1997. A state of emergency won't end crime. Electronic Mail and Guardian. Available at <http://www.mg.co.za/mg/news/97may2/21>, last accessed 28 November 2007.
- Spinks, C. 2001. A new Apartheid? Urban spatiality, (fear of) crime, and segregation in Cape Town, South Africa. Development Studies Institute, Working Paper Series No. 01-20. London School of Economics, University of London, London.
- Tsheola, J. 2002. South Africa in GEAR: 'A better life for all' or a zero-sum game of globalization? *GeoJournal*, 57, 15-28.

CHAPTER 8

CONCLUSION

This thesis has illustrated how a better theoretical understanding of the ecological aspects pertaining to offending in South Africa is possible if a geo-analytical system is employed which is capable of synthesising the demographic contexts of space. A geodemographical classification system was developed because it offered such an integrative framework, and I have illustrated how the elements of this approach can illuminate current work within the ecological analyses of crime. Chapter 2 began the thesis by identifying five key requirements in the pursuit of an urban ecological theory of crime in South Africa. These requirements were based on an extensive literature review of existing criminological and geo-analytic research on crime in South Africa. Chapter 3 provided an overview of GIS within a crime and policing perspective in South Africa. Among the geo-analytical techniques identified for future use were geodemographic classification systems. Chapter 4 began the practical process towards an ecological understanding of offending in South Africa by gauging the relevancy of the social disorganisation theory in a local context. Chapter 5 identified a number of ecological risk factors that shape criminal behaviour in Tshwane. Chapter 6 represents the practical apotheosis of the thesis wherein a geodemographic offender profiling system was developed for Tshwane using the geo-analytic technique identified in Chapter 3, the motivation espoused in Chapter 4, and the ecological factors identified in Chapter 5. In Chapter 7 the findings of the thesis was placed into theoretical context by chronicling the ‘spatial’ history of crime in the country.

Based on the requirements identified in Chapter 2, several major findings of the thesis are outlined:

1: Assess the present status of GIS within crime science in the country

- The integration of GIS within policing has been slow and prone to error. While the NCPS and the NCCS were legislatively charged with integrating GIS within policing structures in the country, the actual introduction of the technology within the SAPS has been problematic. There is also an alarming lack of documentation from the SAPS regarding the implementation and detailed operations of the GISes at priority police stations countrywide.
- Geodemographic classification systems can play a key role in understanding the causes of crime and offending in South Africa. The ability of a geodemographic classification system to cluster neighbourhoods based on social similarity means that different ecological contexts can be clustered together and investigated in terms of their relationship to crime and offending.

2: Gauge the applicability of international ecological theories of crime in a local context

- Little support is found for the social disorganisation theory in Tshwane. Of all the offender categories, the sexual offender category provided the best result with 19.1% of its variation being explained by the variables representing social disorganisation.

- The percentage unemployed – used as a proxy for social/economic deprivation – was the only variable that exhibited a significant positive relationship. Other variables were not significant with residential mobility exhibiting a significant negative relationship in the overall and violent offender category.
- There is a need to supplement ecological risk factors for offending with local knowledge when theorising crime and offending in a South African context. The inability of the social disorganisation constructs to account for the spatial distribution of offenders can be attributed to the differing historical contexts and definitions of certain variables applied locally.
- The ‘social disorganization of apartheid’ contrast with the social disorganization constructs. To this end a need was expressed to identify the ecological determinants of offending in South Africa using any number of socio-demographic variables.

3: Identify the ecological determinants of crime and delinquency

- The location of offenders within Tshwane is associated with the spatial incidence of four factors – low social status and income, a large and young family, unskilled earners and high residential mobility. Findings indicate that socio-economic factors play the most important role in shaping offending in South Africa.

- Offenders in Tshwane are located primarily in the townships. Whilst a small number of offenders reside in impoverished white areas, the majority of offenders are located in townships in the northern periphery of Tshwane.
- Whereas high residential mobility was found to be geographically associated with high rates of offending in Tshwane, the measure was not found to be significant in the test of social disorganisation theory. While it may be that residential mobility needs to be measured with different indicators than those used in the test for social disorganisation, the finding suggests that internal migration from *outside* the Gauteng province is more important in understanding offending than simply high mobility.
- A small number of suburbs in Tshwane contain a high number of offenders. The spatial distribution of offenders within Tshwane is highly skewed with 70 suburbs (18.9% of the suburbs of Tshwane) accounting for almost 85% of offenders incarcerated within Tshwane.
- Patterns of racial and spatial inequality linked to levels of offending are strongly interconnected. Compared to predominantly white suburbs, black African suburbs in South Africa have higher levels of socio-economic disadvantage, residential instability and disrupted families; creating a more favourable environment for offending for black Africans. Pockets of low-income white suburbs also experience high offender rates although these suburbs are socially and economically less prosperous than the vast majority of the traditional white areas.

4: Profile neighbourhoods based on risk

- Neighbourhoods at a high risk for offender development in Tshwane are among the poorest and most deprived in Tshwane with residents being predominantly unemployed and with numerous young dependents.
- Neighbourhoods at a low risk for offender development in Tshwane are more affluent with residents being employed with middle to high socio-economic status.
- Neighbourhoods at a moderate risk for offender development in Tshwane are dispersed throughout the city with residents being predominantly employed or economically active but in an unskilled occupation and with a modest provision of basic services.
- High risk neighbourhoods in Tshwane are primarily located in the townships and are mostly occupied by black Africans (99%). This contrasts sharply with the racial distribution of residents living in low-risk suburbs, where 70% of the residents are white and only 26% are black African.
- A total of 12 neighbourhoods at a high risk for offender development have offender rates below the average offender rate for the whole of Tshwane. These neighbourhoods are once again located primarily in the townships. This finding illustrates the strength of the system since offender rates are typically low in these 12 suburbs, but the *risk* for offender development is high.

- A critical re-assessment of the current police-based crime reduction strategy is required. The current policy initiative that is tasked with reducing crime in the country, the NCCS, is not addressing the derelict social and economic conditions in high risk regions throughout Tshwane but rather focuses on enforcing the law.
- Racial divisions still characterise and define South African society. These divisions have a strong socio-spatial legacy, borne out of apartheid, that the present and past ANC administration has largely failed to address.

5: Understanding the complexity of crime and the urban environment

- There is a complex dichotomous relationship between offending and the urban environment in South Africa. While the South African city is desegregating and losing its original modernist-apartheid features the social geographies for offenders have remained largely unchanged.
- The pre-1994 urban structure has been largely retained in the country despite developmental policies being put in place to rid the country of the socio-spatial distortions of the apartheid-era. A history of social inequalities and segregation has ensured that much of the country's offenders remain distributed along social, economic and racial lines, with persisting geographic parallels to these distributions.

- Apartheid's spatial legacy has resulted in certain regions of the country becoming spatial symbols of crime that to some extent precipitates criminality among residents. These regions of the country are typically the townships where previous exposure to crime and violence under apartheid has colluded with current unmet socio-economic aspirations to result in crime-prone communities.
- The distribution of offenders cannot be explained solely in terms of the apartheid meta-narrative. Individual and local circumstances of inhabitants also play a facilitating role in offending together with macro-level forces.

Assessing the scientific meaning of the study

The scientific value of this thesis can be assessed by examining (1) the *main findings* (presented above) that evolved from the study, and (2) the *contributions to various disciplines* utilised throughout the course of the thesis. These disciplines include geoinformatics (geoinformation systems and science), criminological and social science theory, and crime policy.

Geoinformatics

First, the study outlined the important contribution that GIS can make in the fight against crime in South Africa. The lack of the use of GIS in existing criminological research in the country is alarming yet this study has illustrated *the potential of the technology to create tangible solutions to address crime issues*. GIS has often been labelled as an enabling technology in that it supports all disciplines that must deal with spatial data. As crime is inherently a spatial phenomenon, only the users of the

technology limit the potential and further use of GIS in crime applications in the country. *Second*, in this study a new variant of a geodemographic classification system was developed using GIS software. This task-specific system integrated a variety of quantitative geo-analytical techniques (e.g. spatial correlation, factor analysis and cluster analysis) to profile neighbourhoods based on the risk of individuals resorting to criminal behaviour. The output of the system was displayed in a clearly defined taxonomic delineation of high-to-low risk areas. The method employed in the creation of the system is original and the resultant system provided valuable insight into delinquency and its etiology in South Africa.

Social and criminological science perspective

The study represents the first attempt to account for the spatial distribution of offenders in post-apartheid South Africa. As a result the findings of the study not only provide a first empirical clue of the geographical context of delinquency in South Africa but also allow a number of inferences to be made regarding the scientific meaning of these findings for international criminological theory.

First, a number of basic socio-demographic variables and other key factors, which are identified by leading ecological theories of crime such as the social disorganisation theory, as being key predictors of delinquency, are confirmed in the study; these include factors such as unemployment and socio-economic deprivation. Other variables however, which are common predictors of delinquency in ecological theory such as residential mobility give conflicting results. In general the study confirms that South African offenders are influenced by much the same ecological risk factors, as are ‘international’ or at least ‘Western’ offenders. Discrepancies do exist however and

this finding highlights the importance of historical circumstance, local community context, and their relationship to delinquency in South Africa. The findings suggest that the presence of ecological risk factors within the urban environment can have differential influences on an individual depending on their historical circumstance. For instance, being unemployed in South Africa is different to being unemployed in the United Kingdom (UK), the implications are different and the resulting behavioural patterns (criminal or non-criminal) elicited by individuals are different depending on historical circumstance. Similarly individuals react differently to being marginalised in, for example, the United States (US) as opposed to being marginalised in South Africa.

Second, the study highlights the need to include ‘unconventional’ variables in future studies of delinquency in South Africa. Factors such as political instability, historical neglect, and circumstance, and socio-economic exclusion, may be just as important as unemployment in predicting offender residence simply because these factors are so heavily concentrated in certain areas in the country and its cities and have strong geographical and historical undertones. It is only through a proper understanding of these ‘unconventional’ variables within which the plethora of ‘other’ ecological variables is displayed that one can truly begin to understand causality in ecological theory.

Third, neighbourhood effects can be considered as an independent risk factor for delinquency in South Africa. Certain neighbourhoods most notably located in apartheid’s black/non-white townships, cluster together on the basis of a number of ecological risk factors (also called spatial symbols in this study) for delinquency. This

finding suggests that the demographic context of townships has instilled ‘dysfunctional’ norms, values and criminal behaviour in residents and has triggered a cycle of social pathology that few residents escape. In international literature the idea of neighbourhood effects implies that residents in these so-called townships are themselves responsible for their own social and economic situation. This however is not the case, and this study illustrates how, in the context of legislatively charged exclusion and segregation policies, ecological crime ghettos can artificially emerge in an urban environment. It is widely acknowledged in international literature that a major shortcoming of neighbourhood effects lies in explaining *why* neighbourhood and individual circumstances are correlated. This study highlights the fact that a more thorough understanding of the socio-political context of neighbourhoods may go some way in explicating this problem. Understanding cultural and social exclusion, social marginality, perceived cultural inferiority within a historically repressive political framework could possibly explain why the neighbourhood has such a strong effect on behaviour, at least in the South African context.

Finally, the social geography of offenders has not changed since apartheid times. This is despite the changing structure and dynamics of cities in post-apartheid South Africa as well as increased spatial mobility and increased inter-connectivity. Township communities are still being exposed to a range of ecological risk factors for offending that continue to exist in these communities. Exposure to these ecological risk factors alone does not cause criminality *per se*, rather risk factors work over time to influence the likelihood of offending. Thus, the longer the exposure to these spatial symbols of crime, the greater the likelihood of criminality. For township residents under apartheid the exposure to criminogenic risk factors was both long and sustained. The

desegregation and deracialisation of the state has however, not resulted in any changes in the spatial patterning of delinquency in the country nor has it resulted in any significant improvement in addressing the derelict conditions in the townships but rather it has only served to accentuate spatial polarisations of race and class and led to more inequalities and, as a result, a surging and seemingly unstoppable, crime rate.

Strategic, tactical and operational policy

The identification of the ecological root causes of delinquency can assist in the prescribing of strategic policies that work to reduce crime. The fact that South African offenders are influenced by roughly the same ecological risk factors as ‘Western’ offenders has two significant policy implications. First, it implies that solving the crime problem in South Africa, at least from a long-term strategic perspective, is not as difficult as it may seem initially. This is because there are few ‘unknown’ or ‘unexplained’ geographical factors driving offenders in the country; in general, an highly mobile individual with a low social status, and low income, a large and young family and will resort to crime. Second, it may be possible to mimic other crime reduction initiatives and strategies that have worked to address the so-called root causes of crime internationally, within a local context. Unfortunately the current policy initiative that is tasked with reducing crime in the country, the NCCS, is not addressing the root causes of crime in high risk regions throughout South Africa, in general and Tshwane, specifically, and a critical re-think is required. For as long as the spatial symbols of crime are there, offenders will emerge.

From a tactical and operational perspective the change of focus on policy should be on detecting and managing risk. This includes the identification of high-risk

individuals as part of a short-term strategy to deal with delinquency in South Africa, and the identification of high-risk areas from which offenders emanate, as part of a long-term strategy. In *tactical terms*, operational units within the SAPS should be guided to specific ‘high-risk’ locations within South African cities potentially leading to the arrest of wanted suspects and suspicious persons. In *operational terms*, operational actions undertaken by the SAPS can be better informed. For example, the routes for vehicle and foot patrols could be delineated to high risk areas; the locations of roadblocks, and cordon-and-search and stop-and-search operations could also be targeted not necessarily take place where the ‘most crimes occur’ or where the ‘most offenders live’ but where the *risk* of crime occurring or offenders residing is high.

From an overall policy perspective the crime situation in South African cities is curable. For example, this study revealed that 87% of offenders located within correctional centres within Tshwane emanate from suburbs in apartheid’s black/non-white townships within the city and that 70 suburbs (18.9% of the suburbs of Tshwane) account for 82.5% of the offenders within Tshwane. This implies that aggressive, direct and sustained strategic, tactical and operational policy initiatives aimed at these 70 suburbs will theoretically reduce the amount of offenders within the municipality by almost 90%. The strongly skewed spatial pattern of delinquency in Tshwane should therefore be used as an advantage in the fight against crime in the city.

Noticeable shortcomings

From a criminological perspective the biggest noticeable shortcoming of the study relates to the so-called ‘dark number’ of offenders. This refers to those offenders residing within the Tshwane municipality upon their apprehension but who are currently incarcerated in correctional centres located outside the Tshwane municipality. Although this does place some limitations on the research, the author, in consultation with various representatives from the DCS, was reliably informed that the vast majority of incarcerated offenders ($\approx 95\%$) who were residing in Tshwane upon their arrest and apprehension are imprisoned within Tshwane as well. This is partly due to the desire of offenders to be incarcerated close to friends and family. In order to determine the exact ‘dark area’ in this context would require direct access to the MIS’ of all correctional facilities in the country, and the author’s research agreement with the DCS prohibited access to this information.

Summation

The current study attempted to go beyond prior research, and contribute towards an urban ecological theory of crime in South Africa. In doing so, the study illustrated the importance of historical circumstance and local community context when theorising offending from an ecological perspective. While the ecological risk factors for offending identified in the study do not differ largely from similar ecological studies conducted internationally, the effects are felt differently on South Africans as a result of the historical circumstances upon which they are played out. When measures of prosperity and wealth are heavily skewed; and to the detriment of certain geographical areas which have historically been neglected and prone to crime the result is criminality. For proof of this one need look no further than the current levels of

violent crime in South Africa where, according to crime statistics released by the South African Police Services (SAPS), roughly 70 000 people have been murdered during the course of this study. The thesis provided a multidisciplinary treatment of offenders and space in the city of Tshwane, South Africa. But it is only a starting point. A geo-informatics starting point. The onus for the successful reduction of crime in South Africa lies at the hands of other interested parties involved in crime in South Africa. These include criminologists, sociologists among others, to work together to utilise the geographic solution presented here in a way that can seek to inform policy-makers in local or provincial government to effect change.

The dynamics of crime and the urban environment are in a state of flux and are constantly changing. Almost every single person in South Africa has been in some way affected by crime, yet ecological case studies that provide empirical evidence are lacking in the literature. Future research must continue to work across disciplines and employ novel geo-analytic methodologies that seek to inform in an integrated and spatial manner future policy and prescriptions to reduce this scourge that afflicts this unique country.