1 Crime, violence and injury prevention in South Africa: Trends, emerging issues and opportunities

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The Crime, Violence and Injury Prevention in South Africa: Developments and Challenges is a biennial publication, which is similar in format to other reviews in the social and health sector in South Africa and is intended as a resource for policymakers, funders and service providers. This review seeks to provide a comprehensive, regular analysis of the crime, violence and injury sector that includes an analysis of the key developments and advancements, as well as the major emerging priorities in the sector. It is hoped that the publication will be utilised as a tool to assist the sector to focus its attempts towards the further development of a coordinated strategy aimed at the prevention and control of crime, violence and injury. The review also serves to identify emerging strategies that show potential as replicable, good prevention practices. It comprises eleven chapters, each of which investigates key trends, issues and opportunities that have recently emerged from the crime, violence and injury sector in South Africa. These contributions are by researchers, academically-oriented activists and practitioners, and represent an attempt to contribute to the further development of a coordinated response by the injury prevention and safety promotion sector. Collectively, the chapters enhance our understanding of the magnitude and determinants of violence and injuries in South Africa. The volume points to specific questions and areas that require further investigations, and highlights issues inherent to recently implemented safety promotion measures.

The generation of scientifically produced data and information is integral to our social responses addressing South Africa’s injury-related disease burden. In South Africa, home to 44.8 million people (Statistics South Africa, 2003), between 70 000 to 80 000 non-natural deaths occur each year (Matzopoulos, Cassim & Seedat, 2003). The National Injury Mortality Surveillance System (NIMSS) that presently captures data on about 35% to 40% of all non-natural deaths showed that in 2002 homicide (45%), transport-related incidents (27%), suicide (10%) and other unintentional

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2 See Selected Glossary on pages 205-206 for definitions of key terms.
injuries, such as burns and poisonings (10%), were among the leading causes of non-natural death. Another study, which analysed 2001 cause of death statistics and the premature mortality burden for the city of Cape Town showed that the top cause of death in Cape Town was homicide, followed by cardiovascular disease and HIV/AIDS. Such mortality data strengthens the long-standing call to have crime, violence, injuries and their prevention prioritised alongside other public health issues such as HIV/AIDS.

In chapter two, *The burden of injury in South Africa: Fatal injury trends and international comparisons*, Matzopoulos, Norman and Bradshaw assert that timely, accurate and reliable injury statistics are an important component of the platform required for the prevention of injury. Their chapter reports that injuries accounted for just over 12% of all deaths in 2000 and, as a category, was ranked as South Africa’s third leading cause of death after HIV/AIDS and cardiovascular disease. A comparative analysis with world and African rates indicates that South Africa has a disproportionately large burden of violence and injury mortality and morbidity. This chapter reviews morbidity and mortality due to four injury subcategories: homicide, suicide, road traffic injuries and other unintentional injuries. The authors conclude that reliable and accurate national and city-level information is an important tool for effective evaluation; mortality data provide a useful starting point for injury surveillance, the evaluation of prevention initiatives, and serves as a powerful resource for stimulating research and directing policy.

The *Interpersonal youth violence prevention*, chapter three, by Parker, Dawes and Farr recognises the concentration of violent assault, injury and mortality among South African youth, both as victims and perpetrators. The chapter investigates the challenging task of identifying effective interventions that address the effects of exposure to violence and that can prevent the development of violent tendencies in the young. High levels of interpersonal violence in a context of poverty and limited opportunities for youth pose a serious challenge for violence prevention agencies. The chapter describes a sample of twelve interventions that are aimed at the prevention or reduction of youth violence. Each intervention is described in terms of its programme theory and aims; the development of the intervention; its outcomes, impacts and measures of success; and its evaluation. The interventions are commonly aimed at the reduction of community risk factors and the promotion of support structures for programme recipients. However, the programmes typically struggled to measure programme impacts and indicators of success, with few programmes incorporating any evaluation mechanisms.

The issue of violence against women has come to be unequivocally defined as a national public health priority issue, as reflected in chapter four titled *An overview of gender-based violence in South Africa and South African responses* by Abrahams, Martin and Vetten. In their overview of gender-based violence in South Africa, the authors direct their focus to intimate partner violence specifically, and consider health sector responses and the performance of the criminal justice system in this respect. The authors’ scrutiny of the epidemiology of gender-based violence in South Africa reinforces the concern that existing national-level data is inadequate and fragmented. Through their analysis the authors make a compelling argument for the introduction of support services for survivors with a view to improving emergency response systems.
and preventing the secondary victimisation of survivors. While recent developments fostering better healthcare for survivors are recognised, institutional obstacles and disparities across provinces that stymie the implementation of policy remain a concern, as does the performance of the criminal justice system in respect of legal reform and criminal sanctions. The authors clearly invite further discussion about the institutional prerequisites for facilitating an efficient and coordinated response to gender-based violence prevention in South Africa.

In *Gun violence in South Africa* (chapter five), Keegan examines the incidence of gun violence and explores factors that appear to be prompting the apparent increased circulation of firearms. She reports that over the last decade, violent crime in South Africa increased by 33%, with the crime rate rising rapidly between 1997 and 2001, but stabilising thereafter. Firearms are reported to be commonly implicated in fatal violent crimes. In her examination of the determinants of gun violence, Keegan places the accent on a complex gun culture formed after centuries of low-level and open violent conflict, masculine identity, the proliferation and increased recent exposure to international criminal syndicates, and the easy access to unlicensed or stolen guns. Keegan also summarises recent arguments about the direct and indirect costs of gun violence, focusing on the physical suffering of individuals and their families, the considerable drain on health-care systems, and the pervasive fear of violence, widespread and prevalent even in communities where violent crime is uncommon. Keegan recognises that gun violence in South Africa is complex and pervasive, and requires a comprehensive approach on the part of both government and civil society. To this end she calls for a coordinated national strategy involving increased police interventions, stricter licensing procedures and the implementation of widespread, effective public awareness campaigns.

In chapter six, *Current perspectives on suicidal behaviour in South Africa*, Schlebusch indicates that suicide accounts for between 8% and 10% of all non-natural deaths in South Africa. In this review of both global and South African trends, the author draws attention to the divergent research findings in this sector, the emerging epidemiological profile of vulnerable groups, and the risk conditions and situations that appear to be associated with an apparent increase in suicide. Recent findings indicate that increasingly it is younger South Africans that are vulnerable to suicide, pointing to the need for the development of school-based prevention interventions. Schlebusch argues that prevention initiatives can begin in early childhood and can be incorporated at the levels of school, university, college and the family. Prevention programmes should target suicidal behaviour in all age groups, but especially among youngsters. The author emphasises a national, coordinated response to dealing with suicide, which incorporates the systematic and accurate collection of information, differentiates the types of suicidal behaviour, and guides the development of prevention models including management responses.

Road traffic injury is another leading contributor to the injury burden in South Africa and so poses as a serious public health problem associated with excessive human and socio-economic costs to the country. In chapter seven, *Road traffic injury in South Africa: An epidemiological overview for 2001*, Sukhai, Noah and Prinsloo provide an overview of the epidemiology of road traffic injuries in South Africa. Drawing from multiple data sources, the authors examine populations at risk, temporal and
spatial characteristics associated with traffic injuries, vehicular-related risks and high-risk driving behaviours. The authors, corroborating the views of the other contributors, emphasise the complex and multifactorial determinants of road traffic injuries, the value of quality data required to inform intervention and policy initiatives, and collaborative partnerships to ensure an integrated national response to traffic-related injuries.

In chapter eight, Monitoring alcohol and other substance use in South Africa: The alcohol and drug injury nexus, Marais, Sukhai and Donson recognise the scarcity of recent information on national trends for drug or alcohol use in the country. Although there is some information on alcohol use patterns, less is known about other drugs. In their review the authors confirm the alcohol-fatal injury nexus and indicate that blood alcohol concentrations are particularly high in firearms and sharp instrument related deaths, as well as in pedestrians and drivers who died in motor vehicle crashes. Marais, Sukhai and Donson detail a 3-year study investigating alcohol and illicit drug consumption amongst trauma patients at five health care facilities in three cities between 1999 and 2001. They offer initial recommendations for prevention strategies that may include alcohol screening, law enforcement and educative initiatives. In conclusion they suggest further investigation into substance abuse related injuries.

In chapter nine, Childhood burn injury: Epidemiological, management and emerging injury prevention studies, Van Niekerk, Du Toit, Nowell, Moore and Van As report on research examining childhood burn injuries, which are often associated with long-term physical and psychological consequences. Recent South African research has tended to focus on the clinical profile and management of individuals who have sustained burn injuries, and descriptions of the epidemiology of burn injuries. Strategies for preventing burn injuries have received minimal attention in South Africa. Similarly, less attention, if any, has been directed towards the impact of the more transient and modifiable individual, household, familial, and neighbourhood factors and circumstances associated with burn injuries. The authors suggest that the development of accurate diagnostic protocols, appropriate referral and injury management protocols, and the promotion of systematic investigation into burn injury prevention practices be prioritised.

In chapter ten, Paraffin ingestion, Carolissen and Matzopoulos expand the Review’s focus on unintentional injury among children. They reveal that existing data on paraffin ingestion and paraffin poisoning in South Africa remains sketchy and probably unreliable. Equally, well-defined information on risk factors for paraffin ingestion appears to be lacking, thereby offering inadequate insight into the development of focused intervention and prevention strategies for South Africa. Nonetheless, the response strategies identified by the authors attempt to address the individual, social and economic factors implicated in childhood paraffin ingestion and paraffin poisoning. Clearly, childhood paraffin ingestion and paraffin poisoning needs to be prioritised on South Africa’s public health agenda so as to facilitate further research on the subject.

In chapter eleven, Injury costing in South Africa: The state of the sector, Bowman and Stevens illustrate that injury costing represents a critical component of decision-
making related to policy, resource allocation and health planning. Injury costing is a valuable means for strengthening the advocacy and lobbying initiatives of safety promotion and injury prevention practitioners. They caution that while developments in injury costing studies are likely to contribute to policy formulation, injury costing is an ideologically loaded concept in that it may contain deleterious implications for disadvantaged populations if applied uncritically and used to replace the "health for all" mission. The authors point us to the limited availability of injury costing data in the public sector, and the consequent implications for the advancement of injury costing initiatives that aim to provide accurate, systematic and timely information on the costs of injury in South Africa's public health sector. The authors encourage further consideration of the contextual and conceptual issues relevant to injury costing work in South Africa.

Underlying all of the contributions we discern a compelling argument calling on funders, research councils, service agencies and government to reinforce their injury surveillance and broader health information systems research and development work so as to strengthen prevention policies and practices. Against this backdrop, in the final chapter of this volume, Shan Naidoo focuses our attention on Information management systems for injury data, examines the current status of health information systems, and foregrounds systems considered to have made a significant contribution to the development of specific injury information management systems in South Africa. In his review, Naidoo highlights the essential need for a comprehensive, integrated and coordinated approach to the development of injury and public health information management systems within the national context. Naidoo suggests that the management of data resources, utilisation of multiple frameworks of reference, incorporation of several methodologies, and the development of relevant institutional structures will favour future efforts to improve the management of injury information in South Africa.

WHERE TO?
The first edition of the Crime, Violence and Injury Prevention in South Africa: Developments and Challenges aims to facilitate the development of a fully-fledged subsequent review of research, policy and practice-related developments in the crime, violence and injury prevention sector, help us discern injury prevention priorities and challenges in our quest to promote relevant policies, practices and programmes, and strengthen systematic and co-ordinated responses from the sector itself. South Africa fortunately boasts a creative and vibrant safety promotion sector and infrastructure including governmental, civil society and corporate-based actors who are engaged in relevant service, policy and research-related activities. Our vibrant sector may strengthen itself and further the mission of injury prevention by drawing on the lessons from the tobacco control and HIV/AIDS sectors, which suggest that coordinated, focused and data driven proactive initiatives yield significant relevant interventions. This is the case when priority is accorded to the development of injury surveillance systems, risk-factor and injury-determinants research, the identification of champions and sectorial mobilisation around key issues, the documentation of champions' work, and the formation of a culture of cooperation.
Towards a data platform
Most significantly of all, the chapters consistently recognise the centrality of quality and routine epidemiological data on the who, what, where, when and how of crime and injury, as a prerequisite to effective crime and injury control systems and policies. Comprehensive data are also vital for identifying emerging trends and problem areas, and can serve as basis for programme evaluation (Matzopoulos, Van Niekerk, Marais & Donson, 2002). At a regional or provincial level, administrators can use mortuary caseload information to plan staffing and resource requirements, monitor staff performance and react to emerging injury trends. Ongoing surveillance also assists in inter-facility comparisons, and doctors and medical students can use the surveillance system as a tool for identifying subsets of fatalities and a management tool to review caseloads and autopsy outcomes, as well as to conduct research (Matzopoulos et al., 2002).

Although a number of injury and crime registration systems are now in place, there remain limitations; for example, the coverage of fatal injury systems is typically better in South Africa’s metropolitan centres, and distinctly poorer in peri-urban and rural settings. Registration systems, where they exist, are often incompatible with others as a result of divergent classification and terminological systems. Surveillance systems focused on non-fatal injuries, contributing to the major part of the injury burden, remain under-developed (Matzopoulos et al., 2002). Institutional difficulties related to conflicting organisational priorities, limited research capacity, an inadequate regard for science, gatekeeping tendencies, professional jealousies, and the competition for discursive and material resources also seriously hamper progress in the development of injury surveillance systems. Institutional, organisational and personal investments are therefore vital for advancing injury surveillance systems.

The determinants of crime and injury
The contributors to this review also call for greater recognition of research into the determinants of crime, violence and injury. Various contributors draw on the international literature to focus our attention on the determinants of various kinds of injuries, since for the most part South African research on injury risks is in its infancy. Data on the complex combinations of economic, social and individual determinants of injuries and injury surveillance data form the cornerstone of safety promotion work. Accordingly, science councils, research institutes, our tertiary educational institutions and funding agencies, including the relevant ministries of government, are requested to prioritise intellectual and material support for studies on the determinants of violence, injuries and crime.

Documentation, monitoring and evaluation
Following the urgent need for information on what works, many of the chapters in the Crime, Violence and Injury Prevention in South Africa: Developments and Challenges examine a selection of current crime, violence or injury control or prevention interventions in South Africa. The reviewed programmes comprise different strategic foci (e.g. legislation, educational, environmental, product development, community development), are directed at different risk and interest groups (e.g. children, parents, school staff, enforcement officials, policy makers), and incorporate various geographic levels (city, provincial, national) and different locations (schools, homes, work-places). However, the majority of South African safety promotion
interventions have not been systematically evaluated or costed. This paucity of information on evaluation outcomes appears to be pronounced in interventions coordinated by the smaller intervention agencies, which may have other organisational priorities and limited research capacities. The limited evaluation and documentation of crime, violence and injury prevention interventions has resulted in a consequent lack of clear evidence of the effectiveness, cost efficiency and contextual appropriateness of interventions.

A commitment to the rigorous monitoring and evaluation of prevention interventions requires greater investment in documentation, research-service agency collaboration, enhancement of evaluation expertise, and financial allocations to evaluations. Intervention practitioners could work alongside researchers to prioritise the development of good practice manuals (e.g. World Health Organisation - WHO- Handbook for the Documentation of Interpersonal Violence Prevention Programmes), and document the efficacy and value of the large body of existing prevention work along the lines of the WHO World Report on Violence and Health.

CONCLUSION: CHAMPIONS, SECTORIAL MOBILISATION AND NATIONAL PLANNING

The recommendations delineated above are not novel to the South African crime, violence and injury sector. These have been articulated by many other public health, social science and community development workers before. Therefore, if we are to successfully translate the recommendations into a coordinated programme of action, it may be essential to identify champions that can help to mobilise the sector and address the range of institutional, psychological, economic and professional issues that continue to compromise the quality and impact of our responses to crime, violence and injury. Recent national campaigns against crime, child abuse, and violence against women, amongst others, offer valuable lessons as to the effective strategies required to meet the challenges to this sector. We suggest that the development of a fully-fledged review can serve as a rallying point to mobilise the sector.

It bears repeating that crime, violence and injury are not inevitable, but can be predicted, understood and controlled (Laflamme, Svanstrom & Schelp, 1999). Much can be done to prevent and alleviate the suffering sustained by individuals, their families and communities. Following the WHO, experiences in the tobacco control and HIV-AIDS sectors and experiences among our global allies, our crime, violence and injury prevention sector may consider investing in the development of a national action plan that focuses on:

a) The strengthening of injury surveillance systems;

b) Risk-factor analysis;

c) The generation of knowledge products detailing what works;

d) Increasing overall capacity for data collection, analysis and evaluation;

e) Establishing mechanisms for cross-sectorial and multidisciplinary collaboration; and

f) The strengthening of existing primary and secondary work.
We invite our readers, as well as the many champions who are currently working energetically and passionately in practice, policy and research arenas, to take a critical and yet constructive look at all of the chapters contained herein, including the recommendations outlined above. In the spirit of our review we would welcome opportunities to dialogue and further the mission of crime, violence and injury prevention in South Africa.

REFERENCES


You may contact Ashley van Niekerk with your suggestions, comments and ideas for collaboration at Ashley.vanniekerk@mrc.ac.za.
2  The burden of injury in South Africa: Fatal injury trends and international comparisons

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Timely, accurate and reliable injury statistics are an important part of the public health approach to injury prevention. Unreliable statistics thwart efforts to monitor and respond to injury prevention and to assess the effectiveness of prevention initiatives. While most South Africans would concur that we have high incidences of injury and violence, official statistics do not explain the full extent of the problem. Police statistics do not describe in detail the causes or circumstances of homicide, and although statistics compiled by the Department of Transport do include considerable detail about injuries, deaths and costs as a result of collisions, there are still questions about the completeness of the information.

This was highlighted at the beginning of 2003, when the South African National Department of Transport's road safety campaign, Arrive Alive, received considerable negative press in view of the number of road fatalities that occurred over the festive season from December 2002 to January 2003. The media reports followed a perceived dramatic increase in road fatalities, from 648 fatalities in December 2001 to 1125 fatalities in December 2002 - an increase of more than 70%. The National Department of Transport's response was that the media had "sensationalised" the statistics for road accidents over the holiday period, and that the figures for fatal road accidents from December 2001 were wrong by about 30%.

More accurate estimates as to the extent of the problem are emerging as local health information and surveillance systems evolve. Within the Medical Research Council both the Burden of Disease Research Unit and the Crime, Violence and Injury Lead Programme are undertaking projects that aim to describe the incidence and causes of violence and injury more accurately.

The recently completed National Burden of Disease study suggests that injuries accounted for just over 12% of all deaths in 2000 and, as a category, they were ranked as South Africa's third leading cause of death, after HIV/AIDS (30%) and cardiovascular disease (17%) (Bradshaw et al., 2003). Injuries mostly kill young.

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In terms of premature mortality (estimated using the standard Global Burden of Disease approach to calculate years of life lost or YLLs), injuries accounted for 16% (22% for males and 8% for females) of the premature mortality burden. Among the specific causes of premature mortality two categories dominate the South African injury profile, namely homicide and road traffic collisions. Suicide and other unintentional injury deaths also contributed significantly to the national injury burden, but it was homicide and road traffic collisions that made the overall injury death rates in South Africa so high. Homicide and road traffic collisions were ranked as the second and fourth leading causes of death respectively among males in 2000 (Bradshaw et al., 2003).

This chapter reviews disability or morbidity and mortality in the four injury subcategories of homicide, suicide, road traffic injuries and other unintentional injuries, in order to contextualise the injury epidemic in South Africa in relation to other countries and, where possible, to identify injury trends.

INJURY MORTALITY

Since 1991 information on causes of death due to injuries, which should be the cornerstone of national injury surveillance, has been missing from the routine national vital statistics compiled by Statistics South Africa (Stats SA). This is because the Births and Deaths Registration Act of 1992 stipulated that details about the cause of a non-natural death need not be reported, in order to streamline the death registration process. To fill the data vacuum, the National Injury Mortality Surveillance System (NIMSS) was established by a consortium of research agencies, including the Medical Research Council, the University of South Africa and the Council for Scientific and Industrial Research, in order to provide information about causes of death due to injuries (Butchart et al., 2001).

NIMSS is a mortuary-based system capturing information on causes of fatal injuries from sentinel sites. The NIMSS has been collecting injury mortality data on an annual basis since 1999. Each year there has been an increase in the number of mortuaries included in the surveillance system and the number of cases recorded. In 1999, 14,829 fatal injuries were recorded at 10 mortuaries in five provinces (Butchart, 2000) and in 2000, 18,876 fatal injuries were recorded at 15 mortuaries, again in five provinces (Burrows, Bowman, Matzopoulos & Van Niekerk, 2001). In 2001, 32 mortuaries in six provinces collected information on 25,361 injury deaths, estimated at between 32% and 39% of the national non-natural mortality caseload. As the sentinel mortuaries were located predominantly in large urban areas, the NIMSS is believed to be reflective of an urban rather than rural injury profile (Matzopoulos, 2002). Nevertheless, the NIMSS is widely accepted as being the only recent source available for estimating a detailed cause of death distribution for injuries on a national level.
The National Burden of Disease Research Unit at the Medical Research Council independently validated NIMSS data against several other data systems, including the South African Police Services Crime Information Analysis Centre, which compiles data on homicide and culpable homicide; the Department of Transport, which collects information on road traffic accidents; the Department of Minerals and Energy, which collects statistics on mining accidents; and the forensic audit conducted by the Department of Health in 1998.

The injury cause of death distribution identified by the National Burden of Disease was compared with the injury cause of death distributions from the 1988/1989 Stats SA death data, 1994 Cape Metropole Mortality Study (Lerer, Matzopoulos & Phillips, 1997), the re-analysed 1990 Cape Metropole Study (Norman, 2002) and the Agincourt and Hlabisa surveillance systems. In all studies, homicide and road traffic injuries accounted for the majority of deaths, with males being at a considerably greater risk than females. In addition, the National Burden of Disease age and sex distribution for the major causes of injury deaths (homicide, road traffic collisions, suicide, fires, and drowning) were compared with the alternative sources mentioned above. These distributions were, without exception, all very similar.

A comparison of the estimates of total deaths for homicides shows that the National Burden of Disease study estimate is reasonable in comparison with the Department of Home Affairs data, and higher than the South African Police Services data (Bradshaw et al., 2003). However, a comparison of the estimates of deaths for road traffic accidents suggests that the National Burden of Disease study estimate is about double the number of deaths reported through the Department of Transport. This is a substantial difference. One possible reason could be that the accident reports on which Department of Transport statistics are based include only deaths at the scene of the accident and exclude deaths that occur on the way to hospital or at some later point. The discrepancies in homicide statistics and transport statistics require further investigation. However, given the agreement noted for the total number of injury deaths, particularly with the forensic audit, it is inevitable that estimates for specific causes would be higher than the reported numbers from other sources and more similar to the NIMSS distribution.

**NON-FATAL INJURIES**

Non-fatal injuries need to be included in surveillance systems to ensure that they receive adequate policy attention, since they contribute substantially to burden of disease measures. Estimation of the non-fatal injuries component of burden of disease estimates (years lived with a disability or YLDs) requires incidence, severity and duration of disease data, much of which are not available in South Africa. Given the paucity of population-based morbidity data, the main focus of the first South African National Burden of Disease study was the causes of premature mortality experienced in 2000. Nevertheless, attempts were made to estimate the additional burden contributed by morbidity in order to determine disability adjusted life years (DALYs). The disability component of the DALY was approximated from the AFRO E region of Sub-Saharan Africa (AFRO) is one of the six World Health Organisation regions of the world and it has been subdivided into two regions according to the levels of mortality (AFRO D and AFRO E). South Africa falls into the AFRO E region, which has high child and very high adult mortality rates.
the Global Burden of Disease (GBD) 2000 study (Murray, Lopez, Mathers & Stein, 2001), and DALY estimates are referred to as AFRO E DALY estimates.

There have been many criticisms concerning the quality of data used to calculate DALYs in the GBD study (Schneider, 2001). In particular, the DALY review group of the WHO’s Advisory Committee on Health Research (1996) pointed out that a substantial proportion of the data used in the GBD study has been generated by modelling. The problem of poor-quality data is exacerbated for the Sub-Saharan Africa region where the estimates are considered to be based on an extrapolation from the relatively small part of the population covered by vital registration in South Africa. Cooper, Ogotomehin, Kaufman and Forrester (1998) assert that the estimates for Sub-Saharan Africa do not help define the burden of disease for that region and cannot be compared with developed countries. The more recent estimates of the GBD for the year 2000, however, have drawn on additional data sources such as in-depth demographic surveillance systems and household surveys. Although the quality has improved, the data for the Sub-Saharan Africa region are still of poorer quality than those for other regions.

For injuries an alternative approach was used to quantify the non-fatal injury burden for South Africa in 2000 using a local data source, the Cape Metropole Study (Bradshaw et al., 2003). The Cape Metropole Study was undertaken in 1990 and constituted the first complete cross-sectional metropolitan trauma study in Africa. It was designed to obtain a representative sample of the fatal and non-fatal injury cases that occurred in both the public and private sectors. The Cape Metropole Study data were re-analysed in 2002 and used to estimate the premature mortality and disability components for each cause of injury using the standard GBD study approach with some minor modifications (Norman, 2002). The ratio of YLD to years of life lost (YLL) obtained in the Cape Metropole Study was then applied to injury YLLs obtained in the South African National Burden of Disease Study 2000 by age and sex for each cause of injury category in order to estimate local YLDs and DALYs for injuries in South Africa in 2000 (Bradshaw et al., 2003). These Cape Metropole Study DALY estimates for injuries in South Africa were compared to AFRO E estimates presented in the South African National Burden of Disease Study 2000. It was found that DALY approximations from the AFRO E region result in an underestimation of the disability burden due to intentional injuries and therefore of the total burden for injuries in South Africa when compared to estimates based on local data.

DATA COLLATION AND ANALYSIS

DALY estimates due to specific injuries based on Cape Metropole Study data (Bradshaw et al., 2003) are shown in Figure 1 for males and females separately. Age-standardised (to the world population) mortality rates per 100 000 were calculated for South Africa in the South African National Burden of Disease Study 2000 (Bradshaw et al., 2003) and are presented in Table 1 for comparisons with World and AFRO estimates from the GBD 2000 study (Murray, Lopez, Mathers & Stein, 2001). Age-standardised DALY rates per 100 000 for each injury category were calculated for South Africa using Cape Metropole Study data (Bradshaw et al., 2003) and are also presented in Table 1 for international comparisons.
Two data sets were extracted from the electronic NIMSS database from 1999 to 2001. The first data set comprised fatal injury data from the 10 sentinel mortuaries in five provinces that were described in the first NIMSS annual report (Butchart, 2000): in the Eastern Cape, Woodbrook mortuary (East London) and Mount Road and Gelvandale mortuaries (both Port Elizabeth); in the Northern Cape, Kimberley mortuary; in the Western Cape, Salt River and Tygerberg mortuaries (both Cape Town); in KwaZulu-Natal, Gale Street mortuary in Durban; and in Gauteng, MEDUNSA mortuary (Pretoria) and Germiston and Roodepoort mortuaries (both Johannesburg). It was necessary to omit data from the additional mortuaries added to the NIMSS in 2000 and 2001 in order to make the sample for the 3-year period comparable.

Another 3-year data set comprising deaths from the two Cape Town mortuaries at Salt River and Tygerberg was extracted from the NIMSS database. The data were complemented by fatal injury information collected from the same mortuaries in 1994 and 1995 by the Cape Town Metropolitan Non-natural Mortality Study Group, which pioneered in South Africa the surveillance methodologies later used by the NIMSS (Cape Town Metropolitan Non-natural Mortality Study Group, 1996; Lerer, Matzopoulos & Bradshaw, 1995). These two years of additional Cape Town data enabled the review of trend data over a much longer period than was possible by reviewing only NIMSS data (8 years versus 3 years).
Cape Town population figures were calculated by adjusting population estimates from the 1996 Census by provincial population growth estimates. The Census data were obtained from the South African Municipal Demarcation Board (Demarcation Board of South Africa, 2002) and adjusted to the actual catchment areas of the two Cape Town mortuaries (i.e. the whole of Cape Town, excluding Helderberg, which falls under the Stellenbosch mortuary catchment area). As city-specific growth rates were unavailable, we used a provincial growth estimate of 2.5% per annum obtained from the Actuarial Society of South Africa (2002). Only crude estimates for the total population were possible since detailed demographic data to compare population trends by age and sex were unavailable.

The Chi-squared statistic for linear trends was used to analyse the trend data. Different control groups were used for the two data sets (i.e. the 10 original NIMSS mortuaries and Cape Town data set). Since the original 10 NIMSS mortuaries do not provide full coverage of a geographical area, trend data are based on the distribution of injury types as a proportion of all injury deaths in that year. These data are not sensitive to overall increases in injuries from year to year (i.e. the controls are all deaths in the data set excluding the outcome being measured).

However, for Cape Town the rest of the city’s population (survivors, who did not die as a result of injuries) were used as the control group exposed to risk (i.e. living in Cape Town), and the results therefore refer to actual increases and decreases in the incidence of fatal injuries. This was only possible because full, city-wide coverage of injury deaths negates the effect of logistical and resource allocation decisions that may cause year-to-year fluctuations in the distribution of fatality caseloads at different mortuaries.

**INTENTIONAL VS. UNINTENTIONAL INJURIES**

Age-standardised death rates and DALY rates per 100 000 population for injuries in South Africa are higher than the average rates for countries in the AFRO region, which were already among the highest in the world and considerably higher than the global average (Table 1). The unintentional injury rates in South Africa are similar to those for the AFRO region, which are about 30% higher than the global average. It is the disproportionately large number of intentional injuries that makes South African injury death and DALY rates among the world’s highest.

Age-standardised death rates for intentional injuries were nearly 50% higher than in the AFRO region and more than three times higher than the global average, whereas DALY rates were nearly double the AFRO region rates and more than four times higher than the global average (Table 1).

Analysis of data from the original 10 mortuaries included in the NIMSS in 1999 showed that there were no noticeable and certainly no statistically significant changes in the percentage of deaths due to intentional or unintentional injuries over the 3-year period from 1999 to 2001. Intentional fatalities accounted for 61.1% of cases in 1999 compared to 62.4% in 2000 and 61.1% in 2001 (Table 2). However, in the Cape Town data there was a significant increase in the rate of intentional injury deaths
Burden of injury in South Africa per 100,000 population \( (p<0.001) \), and in intentional injuries as a percentage of all injury deaths \( (p<0.001) \) between 1994 and 2001 (Table 3). Deaths due to intentional injuries increased from 2080 in 1994 to 2750 in 2001, whereas unintentional injury deaths decreased from 1806 to 1634 over the same period. Overall, the mortality rate due to injuries in Cape Town increased significantly \( (p=0.011) \), from 168.0 to 169.8 per 100,000 population between 1994 and 2001.

### Table 2. Injury mortality by cause for the 10 original NIMSS mortuaries, 1999-2001

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<td>8.8*</td>
<td>1205</td>
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<td>4518</td>
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<tr>
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<td>29.8*</td>
<td>3227</td>
<td>26.8*</td>
</tr>
<tr>
<td>- road traffic fatalities</td>
<td>2709</td>
<td>20.7*</td>
<td>1965</td>
<td>16.4*</td>
</tr>
<tr>
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<tr>
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<td>15481</td>
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</table>

\*Percent of all injury deaths where the manner of death had been determined i.e. undetermined deaths are excluded from the denominator/total

\*Undetermined deaths as a percentage of all injury deaths


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<th>Year</th>
<th>1994</th>
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<th>1999</th>
<th>2000</th>
<th>2001</th>
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<td>Total deaths/100,000 pop.</td>
<td>Total deaths/100,000 pop.</td>
<td>Total deaths/100,000 pop.</td>
<td>Total deaths/100,000 pop.</td>
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<td><strong>Total injury deaths</strong></td>
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<td>3617</td>
<td>158.4</td>
<td>4652</td>
<td>170.4</td>
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</table>
Homicide

Interpersonal violence rates in South Africa are exceedingly high compared to other regions (Table 1). South Africa’s age-standardised homicide rate was more than five times higher than the global average and 30% higher than the AFRO region’s rate. South Africa’s DALY rates were nearly 80% higher than the AFRO region rates and more than six times the global average. It must also be emphasised that most of South Africa’s violence is interpersonal, whereas internationally, and particularly in the AFRO region, deaths due to violence are often the result of war and conflict.

Data from the original 10 NIMSS mortuaries indicate that homicide accounted for an average of 52.4% of injury deaths in 1999 and 2000 and decreased to 51.2% in 2001 (Table 2). The decrease in homicide as a proportion of non-natural mortality over the 3-year period was not significant (p=0.076). By comparison, homicide in Cape Town increased significantly (p<0.001) from 1994 to 2001 (Table 3), and residents of the city were 15% more likely to be the victim of homicide in 2001 than in 1994.

Firearms were the leading external cause of death for homicide, accounting for approximately half of homicides from 1999 to 2001. The use of firearms for homicide decreased from 50.2% in 1999 to 49.9% in 2001. However, the decrease was not statistically significant and it remains to be seen whether the incidence of firearm homicide has peaked and is beginning to decrease due to better policing and more stringent gun control, or whether the reduction is temporary.

Again the picture was different in Cape Town. There were only 462 firearm homicides in 1994 (26% of homicides), but by 2001 firearm homicides had increased significantly to 1122 deaths, accounting for 46% of the homicides in the city. Since the number of non-firearm homicides remained relatively stable (1327 cases in 1994 compared to 1314 in 2001), the significant increase in the Cape Town homicide rate is almost entirely due to the increase in firearm homicide.

Although there seems to have been a dramatic increase in firearm homicide in Cape Town, it is worth noting that the problem is even more acute in other large urban centres. Review of the NIMSS 2001 data set showed that the Durban firearm homicide rate of 48/100 000 population was higher than Cape Town’s 40/100 000, and that firearms accounted for 70% of the homicides in Johannesburg, a rate of 63/100 000 population.

Females accounted for an average of only 13% of homicide victims from 1999 to 2001. Although the percentage of female homicides decreased from 13.3% in 1999 to 12.5% in 2001, the decrease was not significant, nor was the slight increase in male homicide from 86.7% to 87.5%.

There has been an interesting shift in the pattern of homicides between 1999 and 2001. Children younger than 4 years accounted for a significantly increasing proportion of homicides, growing from 0.7% in 1999 to 1.7% in 2001 (p<0.001). This pattern was reflected for both boys and girls. There were no significant trends among children aged 5 to 14 years. There was a significant increase in the proportion of homicides occurring in the 15 to 24 age range, accounting for 24.2% of homicides in 1999 and 26.3% in 2001 (p<0.009). This was due to the increase in male homicides in
17

this age category (p<0.003). There was a significant decrease in the proportion of homicides in the 55 years and older age category (p=0.029), from 5.2% in 1999 to 4.3% in 2001, which was attributable to the decrease in the proportion of male homicides in this age category (p=0.02).

Comparison of the South African and global homicide rates by sex and age category (Table 4) showed that homicide in South Africa exceeded the world rates for both sexes in all age categories except the 5 to 14 year age category. However, for both sexes it was in the 30 to 44 year age categories where the differences were most pronounced.

Table 4. Comparative South African and global homicide and suicide rates and road traffic fatalities by sex and age category, 2000

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>South Africa rate (per 100,000)</th>
<th>World rate (per 100,000)</th>
<th>Ratio SA rate: World rate</th>
<th>South Africa rate (per 100,000)</th>
<th>World rate (per 100,000)</th>
<th>Ratio SA rate: World rate</th>
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<td></td>
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<td>0.9</td>
<td>3.2</td>
<td>4.3</td>
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<tr>
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<td>30.0</td>
<td>7.8</td>
<td>3.8</td>
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<tr>
<td>30-44</td>
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<td>7.9</td>
<td>42.4</td>
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<td>6.6</td>
</tr>
<tr>
<td>45-59</td>
<td>113.5</td>
<td>21.9</td>
<td>7.7</td>
<td>21.9</td>
<td>6.4</td>
<td>3.4</td>
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<tr>
<td>≥60</td>
<td>84.4</td>
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<td>18.1</td>
<td>7.0</td>
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<td>23.7</td>
<td>6.6</td>
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<td>12.4</td>
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<tr>
<td>≥60</td>
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<td>6.9</td>
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</tr>
<tr>
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<tr>
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<tr>
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<td>2.2</td>
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</tbody>
</table>
*Source: South African National Burden of Disease Study 2000 (Bradshaw et al., 2003)
*Age-standardised

Suicide

Suicide and self-inflicted injury rates in South Africa were similar to the world rates (Table 1), but were between two and three times higher than in the rest of the AFRO region.

Data from the original 10 NIMSS mortuaries indicate that suicide accounted for 8.9% of injury deaths in 1999 and rose to 10% in 2000 and 9.9% in 2001 (Table 2).
The figures represent a significant increase in suicide as a proportion of non-natural mortality ($p<0.003$). There was no significant linear increase in suicide in Cape Town in the 8-year period between 1994 and 2001 (Table 3), but consistent with the rest of the country, data from 1999 to 2001 showed an increase from 8.6/100 000 to 11.3/100 000.

Access to the means to kill oneself is not only an important risk factor for a suicide attempt, but also an important determinant of whether the attempt will be successful or not (World Health Organisation, 2002). Firearms satisfy both criteria, and are among the leading external causes for successful (fatal) suicides in South Africa. Nevertheless, data from the original 10 NIMSS mortuaries indicate that there was a significant decrease in the percentage of suicides caused by firearms between 1999 and 2001, both nationally ($p=0.013$) and in Cape Town ($p<0.003$). Correspondingly, the proportion of suicides due to hanging has increased significantly ($p<0.008$).

Whereas firearms were the preferred instruments for suicide among whites, hanging was preferred among Africans and accounted for more than half of all African suicides over the 3-year period. The data show a steady, although not yet significant increase in African suicides between 1999 and 2001. There were no significant trends in the age distribution of suicide fatalities, either nationally or in Cape Town.

Comparison of the South African and world suicide rates by sex and age category (Table 4) showed that suicide in South Africa exceeded the world rates among males in all age categories between 5 and 59 years, but that the world rate was higher among males older than 60 years and among females in all age categories.

**Transport and road traffic injuries**

Whereas South Africa’s road traffic mortality rates are comparable with other countries in the AFRO region (only 26% higher), they are approximately double the global rate (Table 1).

Data from the original 10 NIMSS mortuaries indicate that there was a significant decrease ($p<0.001$) in the proportion of non-natural deaths due to transport-related injuries between 1999 and 2001, as well as a significant decrease ($p<0.001$) in the proportion of non-natural deaths due to road traffic injuries (Table 2). However, there were no significant changes in the proportion of transport-related deaths for different user groups (drivers, passengers, pedestrians, etc.).

In Cape Town there was a significant decrease ($p=0.023$) in the transport mortality rate from 48.6/100 000 in 1994 to 41.9/100 000 in 2001 (Table 3), which could largely be attributed to the significant decreases in road traffic fatalities ($p<0.001$) and, in particular, in the rate of pedestrian fatalities ($p<0.001$). However, closer inspection of the data revealed that this was mainly due to the unusually high proportion of transport deaths in 1994. A similar analysis for the 1995 to 2001 period revealed that there were no significant trends for transport, road traffic or pedestrian mortality rates.

The proportion of transport fatalities that tested positive for alcohol remained constant except in Cape Town, where the percentage of pedestrians with elevated blood alcohol levels decreased significantly ($p<0.001$).
Comparison of the South African and world road traffic fatality rates by sex and age category (Table 4) showed that South African mortality rates were on average double the world rates for both sexes. For both sexes the mortality rates in the 30- to 44-year age categories were the highest and also exceeded the world rates by a greater degree than the other age categories.

Other unintentional injuries
Only among other unintentional injuries (injuries from fires and burns, falls, drowning, exposure, electrocution, etc.) are South African mortality rates lower than the world and AFRO region rates (Table 1). However, DALY rates from other unintentional injuries in South Africa are higher than the world rates due to the high proportion of injuries from fires, which contribute substantially to disability measures.

Data from the original 10 NIMSS mortuaries showed a significant increase in the proportion of deaths due to other unintentional injuries from 9% in 1999 to 10% in 2001 (p<0.001), which was the result of significant increases in the proportion of fatalities due to fires or burns and falls. The proportion of deaths due to poisoning and drowning did not differ significantly.

In Cape Town in the 8-year period between 1994 and 2001 there was a significant decrease in the mortality rate due to other unintentional injuries from 28.7/100 000 to 16.9/100 000 (Table 3), mainly as a result of significant decreases in the rates of burn, poisoning and drowning fatalities. The mortality rates due to falls did not differ significantly.

CONCLUSION
Injuries and violence constitute one of South Africa's most important public health concerns. Although the analysis of local injury mortality data from the NIMSS does not indicate whether there has been an overall increase, the comparative analysis with world rates and those for the AFRO region clearly shows that South Africa has a disproportionately large burden of violence and injury mortality and morbidity. Also, the South African injury pattern is somewhat different to that of the rest of the world.

The belief that the transformation from apartheid to democracy would bring a cessation in violence (Butchart & Peden, 1997) has proved unfounded. A decade later, violence continues to be the single largest contributor to the burden of injury. Butchart and Peden (1997) surmised that the majority of intentional injuries do not result from clearly identifiable traits or political motives, but from interpersonal violence as a result of disrupted community structures and failed interpersonal relationships. The problem is not likely to abate of its own accord, as technological development and urbanisation are accompanied by increasing per capita injury rates (Butchart & Peden, 1997). This has been demonstrated in Cape Town, where the collection of fatal injury data over 8 years has shown a significant increase in the homicide rate.

Unreliable data collection systems can lead to entire safety awareness and injury prevention programmes being brought into question. Reliable and accurate
information is an important tool for effective evaluation, and mortality data provide a useful starting point for injury surveillance. This kind of information is important for the effective evaluation of prevention initiatives, and a powerful resource for stimulating research and directing policy.

The Crime, Violence and Injury Lead Programme hopes to continue to expand the NIMSS until full coverage is achieved. As the number of mortuaries included in the NIMSS increases and the time period also increases, the data will become more sensitive to changing injury trends and will provide clear indicators of changing mortality profiles for different injury categories and different cities. The Crime, Violence and Injury Lead Programme will also undertake (in collaboration with the Burden of Disease Research Unit) a validation project to explain the discrepancies in the injury mortality data from various sources, and suggest measures to address the problem.

REFERENCES

3 Interpersonal youth violence prevention

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Children's Institute, University of Cape Town

South Africans are not new to violence. Even during the years of apartheid oppression, rates of criminal violence far outstripped political violence, and rates of abuse against women and children were already very high (Dawes & Donald, 1994). A culture of violence has been evident in the society for many years.

The National Injury Mortality Surveillance System’s (NIMSS) Third Annual Report for 2001 showed that contemporary youth are particularly vulnerable to violent assault. In that year, 36% of all non-natural deaths occurred in the 15- to 29-year-old group. Firearms were the major cause of death among children aged 10 to 14 years, and accounted for 48.3% of all homicides in this age group. Sharp objects accounted for 36.6% of homicides in the 15 to 19 year age group, a higher percentage than for any other age group (Matzopoulos, 2002). The NIMSS data have also revealed a relatively high percentage of child homicide victims under the age of 20 (10.1%), and Peden (2000) reported that gunshot wounds accounted for 16% of all violent injuries presenting at hospitals. Males account for the overwhelming majority of these victims.

The evidence indicates that many of those who perpetrate this violence are themselves of school-going age or young adults (Matzopoulous, 2002). Perhaps it is not surprising that in the early 1990s, Flisher and his colleagues found that around 10% of secondary school males and 1.5% of females in Cape Town carried knives to school (Fisher, Ziervogel, Chalton, Leger & Robertson, 1993).

It has become imperative to determine effective ways to address the effects of exposure to violence, and to prevent the development of violent tendencies in the young. This is a very challenging task in a context of high levels of poverty, few opportunities for youth, and a well-embedded culture of violence. Public health initiatives have a role in rising to the challenge. However, we need to be aware that they are not likely to have a major impact in the absence of significant reductions in unemployment and chronic poverty – the major contextual drivers of violence and criminal activity (Krug, Dahlberg, Mercy, Zwi & Lozano, 2002).

1 To whom correspondence should be addressed.
Interpersonal youth violence prevention

South African children’s exposure to violence does not occur in pure forms, and violence against children may be political, criminal, domestic and structural. These forms of violence include child abuse, gangsterism, beatings, stabbings, and school shootings, which lead to heavy casualties. Although a focus on violence against children is necessary for a review such as this one, it is not the emphasis of this chapter. This chapter addresses interpersonal youth violence prevention, more precisely, initiatives which focus on how to prevent children from becoming violent. It commences with a brief outline of the various developmental pathways that lead toward aggressive conduct, and then discusses a framework for violence prevention, drawing on relevant international models and research. In the final section we report on some lessons learned from a preliminary investigation of South African youth violence prevention and peace education (VPE) initiatives, that point the way towards the development of ‘good practice’ violence prevention programmes.

MATTERS OF DEFINITION

It is important to be clear about how we are defining interpersonal violence for present purposes. The WHO defines violence as follows:

The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, physical harm, maldevelopment or deprivation (Krug, Dahlberg, Mercy, Zwi & Lozano, 2002, p. 5).

The following is a more limited definition, which we devised and use in this chapter. It has been particularly framed for interpersonal violence, which excludes intergroup violence and self-injurious behaviour:

Interpersonal violence refers to acts that involve the intentional use of physical force on another person in order to achieve some objective.

The definition does not include terms sometimes evident in the literature, such as emotional violence, nor does it consider the violence inherent in structurally determined relations of power (say between men and women).

It is not helpful that the terms “aggression” and “violence” are often used interchangeably. “Aggression” may refer to an emotional state or to a range of behaviours. As overt behaviour it may be verbal or non-verbal, intentional or unintentional. The definition of violence presented here is closest to the term “instrumental aggression”, used to describe behaviour that is intended to hurt in order for the perpetrator to gain something from the victim (Cole & Cole, 2001).

THE DEVELOPMENT OF VIOLENT BEHAVIOUR

Violence prevention is challenging because the causes and maintaining factors associated with interpersonal violence are complex. They have individual, familial, community and cultural components, and the power of their influence varies across child and adolescent development. The brevity of the current contribution permits only a brief outline of some pertinent findings derived from this complex field.
Some idea of the intricacy of the determinants of violent behaviour is evident from the ecological model (Tolan & Guerra, 1998), which was originally formulated to address the causation of child abuse. Tolan and Guerra (1998) postulated three linked influence systems which, with some adaptation, remain useful in the present context. The systems are: the macro-societal system, proximal social contexts, and the behavioural system of the individual child.

The macro-societal system provides cultural scripts for the use of interpersonal violence. There is variable adherence to the scripts within and between different cultural communities and families. Proximal social contexts refer to the primary settings of development outside the family, such as the neighbourhood, school and peer group within which styles of conflict management are practiced and learnt. At the next level, particularly powerful sources of influence are close interpersonal systems, which refer to enduring contexts of development, such as the family. At this level, for example, family codes of practice for discipline, problem-solving and attitudes toward violent behaviour are repeatedly evident. Finally, the individual level addresses proclivities to aggression that have their roots in the child’s biological and psychological make-up, and which may be particularly important in the causation of early conduct problems (Rutter & Herzov, 1985). The complex challenges for violence prevention should already be evident from this brief outline of the various potential sources of the problem.

Historically the focus of research and intervention has been of a clinical tertiary nature, and has focused on addressing the problem at the individual psychological and family levels (e.g. Dodge & Coie, 1987; Patterson, 1982). More recently, models of the pathways along which different groups of children proceed on their way to disruptive, violent and serious antisocial behaviour in adolescence have been constructed by Loeber and Farrington (1997), Loeber et al. (1993) and Moffit (1993). Based largely on retrospective and prospective longitudinal research, path studies attempt to ascertain the stable sequences of behaviour that are evident on the road to violence (typically, behaviour A is followed by B and then C, etc.). The research evidence is that when disruptive overt antisocial conduct starts in early childhood, is associated with authority conflict, and does not diminish prior to school, it is likely to continue into adolescence and youth. On the other hand, Moffitt (1993) shows that adolescence is a period during which many males engage in antisocial behaviour (including violence). However, unlike the group on the life course path identified above, for most youth antisocial behaviour is limited to adolescence.

In sum, the sources of violent conduct in the young are multiple. They involve complex interactions between child factors and those located in familial and social environments.

Figure 1 outlines the key contextual and individual risk factors that have been shown to influence the development of antisocial behaviour, particularly interpersonal violence. They include characteristics of the neighbourhood, the family, the caregiver and the child. The figure shows how each of these elements combine to exert both direct and indirect influences on child outcomes. For example, dangerous neighbourhoods can have a direct influence on both the child and the care
environment. In the latter instance, the influence on child outcomes is indirect. Here the caregiver’s (caring) response to a high-risk neighbourhood could be harsh discipline in order to protect the child from bad influences. However, the unintended consequence may be that the child, particularly if male, develops aggressive behaviour and resentment of the caregiver. Ironically, the home becomes an unpleasant place to be, and the child heads for the street.

Neighbourhood factors also have direct influences on the individual child, such as when the presence of many antisocial peers increases the risk that a child will become absorbed into an antisocial group.

It is also well known that a family characterised by adult conflict has a negative influence on children and is associated with antisocial outcomes in boys in particular (Patterson, DeBaryshe & Ramsey, 1989). Patterson et al. also note that caregiver risk factors, such as a history of antisocial behaviour and substance abuse, are associated with aggressive antisocial behaviour in children.

Finally, caregiver characteristics and parenting behaviours interact with the characteristics of the individual child to contribute to child outcomes (Patterson et al., 1989).
Interpersonal youth violence prevention

Different types of risk for aggressive and antisocial conduct are influential at particular points in childhood. Table 1 illustrates the main risks associated with each developmental period (Reid & Eddy, 1997).

Insults to the child’s neurological system may occur in utero, predisposing the child to attention deficits and poor impulse control. Both are associated with aggressive traits.

During infancy and early childhood the child’s temperament and interactions with key socialisation agents may reduce or escalate the probability of later child behaviour problems. During this developmental period, therefore, preventive family level interventions that focus on improving supportive and non-authoritarian caregiver discipline and pro-social ‘family management’ skills may be most appropriate (Patterson et al., 1989).

During middle childhood, the child’s circle of peer and adult relationships expands and opportunities for learning both pro-social and antisocial conduct increase. The child’s scholastic performance will also influence engagement with the learning process. Success is likely to increase self-esteem, while repeated failure is likely to increase the risk that the child will reject academic activity and draw closer to peers with similar negative school experiences. Initiatives to promote pro-social behaviour may need to focus on changing teacher and/or child behaviour, or on a wide range of practices in the school as a whole (Samples & Aber, 1998). For conduct-disordered preschool and school age children, tertiary level individual clinical interventions may be necessary, preferably complemented by family interventions (e.g. Dodge & Coie, 1987; Petersen & Carolissen, 2000; Webster-Stratton, 1985).

<table>
<thead>
<tr>
<th>Period</th>
<th>Major Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prenatal</td>
<td>Maternal nutrition and substance abuse</td>
</tr>
<tr>
<td>Infancy</td>
<td>Caregiver inconsistency and abuse</td>
</tr>
<tr>
<td></td>
<td>Difficult disruptive child temperament</td>
</tr>
<tr>
<td>Early childhood</td>
<td>Coercive caregiver discipline</td>
</tr>
<tr>
<td></td>
<td>Exposure to violent conflict at home</td>
</tr>
<tr>
<td></td>
<td>Disruptive defiant child behaviour</td>
</tr>
<tr>
<td>Middle childhood</td>
<td>Negative scholastic experience</td>
</tr>
<tr>
<td></td>
<td>Engages in fights</td>
</tr>
<tr>
<td></td>
<td>Poor parental monitoring &amp; involvement</td>
</tr>
<tr>
<td>Adolescence</td>
<td>Academic failure</td>
</tr>
<tr>
<td></td>
<td>Engages in fights</td>
</tr>
<tr>
<td></td>
<td>Poor parent-child relationship</td>
</tr>
<tr>
<td></td>
<td>Poor parental monitoring &amp; involvement</td>
</tr>
<tr>
<td></td>
<td>Presence of high risk peers</td>
</tr>
</tbody>
</table>

Table 1: Developmental periods and risk factors for violent conduct
The school experience continues to have a powerful effect in early adolescence - a time when boys from high-risk communities may drop out of school. Peers have an increasingly important influence in the adolescent period. Allen, Weisberg and Hawkins (1989, in Samples & Aber, 1998) contend that whether the child's peer group is primarily pro-social or antisocial in orientation affects the probability of the development of aggressive and violent behaviour. Community level interventions may be necessary to reduce the possibility of adolescent and youth drug-taking and violent behaviour, which places younger children living in that area at risk for engaging in these activities (Hawkins, Arthur & Olson, 1997).

The findings of research in this area therefore not only assist in mapping the various risk factors in the causation of violence in young people, they also suggest points for intervention (McGuire, 1997; Reid & Eddy, 1997). Reinforcing the point that knowledge of developmental pathways toward violence is essential for programme development, Reid and Eddy state that “developmental life span targeting is a critical ingredient to effective prevention trials” (1997, p. 348).

INTERPERSONAL VIOLENCE PREVENTION

By the late 1980s a variety of South African stakeholders had adopted a public health approach to violence (Stevens, Wyngaard & Van Niekerk, 2001). In the past decade public health adherents have advocated for the recognition of violence as a high-priority threat to the health and well-being of South Africans (Butchart, Hamber, Terrebliene & Seedat, 1997). Public health practitioners have conceptualised violence in terms of determinants, risk factors, incidence and cost consequences (Butchart, 1996; Krug et al., 2002). Those engaged in interpersonal violence prevention have taken a similar approach (for a full discussion of violence prevention within this framework see Offord, 1997). Epidemiological research has been employed to understand patterns of violence that affect inner-city youth in the United States of America and place them at risk for involvement in violence (Garbarino & Sherman, 1980). South African work on this topic has emerged in recent years (e.g. Ensink, Robertson, Zissis & Leger, 1997; Louw, 2000; Seedat, Van Nood, Vythlingum, Stein & Kaminer, 2000; Van der Merwe, 2001). Epidemiological studies are also important in understanding determinants of violence and for intervention planning. They “provide data on the burden of suffering, which can be useful to policy makers ... in justifying the scope of the intervention and the evaluation enterprise needed to advance our knowledge about how to prevent antisocial behavior” (Offord, 1997, p. 359).

Public health interventions typically define three levels of prevention based on the problem and the target group of interest, namely primary, secondary and tertiary prevention (Flannery & Williams, 1999).

Primary prevention is universal and population-based (for example, training all primary school children in non-violent conflict resolution skills) (Samples & Aber, 1998).

Secondary prevention programmes target selected groups at high-risk for violent conduct due to the nature of their proximal extra-familial social contexts or interpersonal factors (e.g. boys in dysfunctional families in high crime neighbourhoods). Normally they have not sought help but have been identified by screening or other methods. Particularly during early and middle childhood, growing
up in dysfunctional families predicts later delinquency (Eron, 1997; Loeber et al., 1993). Other risk factors for the development of antisocial pathways derive from internal child states such as social skills deficits and poor impulse control. Dodge’s Social Information Processing (SIP) model addresses these dysfunctions and has been used to design interventions with at-risk children (Dodge & Schwartz, 1997). Petersen and Carolissen’s (2000) early school-based child and parent intervention programme for aggressive preschool children is a South African example of an early preventative intervention.

Tertiary prevention is normally high cost- and treatment-based, targeting clinical populations who have already sought help and who have already been diagnosed with conduct or other antisocial disorders. The problem is commonly conceptualised to have a primarily individual level source and solution.

However, it is also crucial to note the importance of non-clinical aspects of the problem. Children who are diagnosed with conduct disorder or antisocial behaviour represent only a small part of the general population within which a generalised acceptance of aggressive modes of problem-solving may be apparent. The high prevalence of conduct disorder and aggressive behaviour together with the difficulty and expense of treating established cases make the search for effective primary and secondary prevention programmes of central concern to workers in the field (Offord, Boyle & Rancine, 1991, in Pepler & Rubin, 1991). The literature so far derives from clinical psychology and the public health perspective. Further literature derives from peace education, with its roots in the education sector and the philosophy of non-violence.

While prevention initiatives may focus on one source of the problem of violence among the young (namely, the child or the family or the school), it is clear that given the complexity of causal factors and pathways, multi-site multi-focus programmes are likely to have the best and most sustained outcomes. This is particularly true in the case of primary and secondary level interventions for children living in disadvantaged communities characterised by high levels of violence (Bierman, Greenberg & CPPRG, 1996; Offord, 1997; Thornton, Craft, Dahlberg, Lynch & Bauer, 2000). Such programmes are very expensive to mount (K. Bierman, personal communication, 2001). However, in terms of cost-effectiveness it may well be better to spend more money and time on a complex multi-site programme that has good outcomes, than to devote fewer resources to a programme that has little to show for the effort. As with any other intervention, violence prevention programme designs require a theoretically sophisticated evidence-based understanding of the several sources and developmental pathways that may lead to violent conduct in children and youth. Without such an understanding, money may be wasted on well-intentioned initiatives that do not take sufficient account of the developmental level of the target population and the complex range of influences to which they are subject.

Regardless of their type, prevention programmes require several basic ingredients. Thornton et al. (2000) have provided the following checklist. If their outcomes are to be adequately assessed and if they are to have a basis for success, violence prevention programmes require:
a) Clear goals and objectives.
b) Clear target populations and a good rationale for their selection for this particular intervention for the target group in question.
c) Designs that are informed by theory, evidence and good practice models appropriate to the target population and problem.
d) Carefully designed delivery systems that take account of potential threats to the implementation and success of the programmes at the intervention sites. Here one must note that programmes imported from elsewhere that were successful under different conditions may not transfer well.
e) Well-trained delivery staff whose own programme delivery behaviour is monitored as part of the process evaluation.
f) Appropriate and valid measures of key programme variables.
g) Evaluation and monitoring systems built into the process from inception until termination - preferably carried out by programme outsiders.
h) In the case of primary and secondary level interventions in particular, the support of the target community and key persons who can affect delivery is essential.

As already noted, the challenge facing violence prevention practitioners in South Africa is considerable. Psychosocial initiatives alone can only hope to have a very limited impact on the problem, given the significant structural violence evident in the country. There is a need for a critical examination of South African programmes in order to improve practice.

How do South African initiatives shape up? In the section below we report on some first steps in answering this complex question. Our discussion is based on findings from a preliminary investigation of local primary and secondary level violence prevention and peace education (VPE) initiatives.

**PRIMARY AND SECONDARY LEVEL YOUTH VPE PROGRAMMES IN SOUTH AFRICA: A PRELIMINARY INVESTIGATION**

The objective of this investigation (Farr, Dawes & Parker, 2003) was to examine programmes in order to ascertain the extent to which they met the basic criteria outlined in the section 'Interpersonal Violence Prevention' earlier. In particular, we were interested in the extent to which evaluations were undertaken, and whether the programmes had clearly articulated theoretical and research underpinnings that informed their design and delivery.

This task was not easily undertaken. The lack of a comprehensive database of violence prevention programmes precluded the programme survey approach we had intended (since we did not know the population of programmes, we were unable to sample from it). We therefore adopted a snowball sampling approach, starting with known

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1Institutions such as the Medical Research Council and the Centre for Peace Action (UNISA) have, in the past, attempted to create and maintain such a database, but since violence prevention programmes are intended for the highly mobile school population and are often precariously funded, they found it an impossible task (G. Stevens, personal communication with Dawes, June 2002).
larger-scale initiatives based in academic institutions, governmental departments and non-governmental organisations around the country.

Senior staff members were invited to participate, and if the request was accepted an interview schedule was e-mailed to them prior to an interview. The schedule was based on Thornton et al’s (2000) proposed set of essential principles or ‘best practice’ guidelines to follow when designing and/or implementing a youth violence prevention programme. These guidelines are based on knowledge derived from rigorous evaluations of interventions reported in reviewed United States literature. The schedule solicited information on: programme origin and aims; programme resources and sustainability; programme staff and target recipients; the rationale for the programme (theoretical and research underpinnings), its evolution and mode of delivery; programme outcomes, and evaluation methods; and programme costs.

A total of 12 programme managers were interviewed (one withdrew from the study; the related programme and views are therefore not included here). Table 2 provides a brief overview of the programmes included in this investigation, their location and predominant focus. As will be evident, the intervention site for all but one of the programmes is the school.

Similar to practices in other parts of the world, the three preventive intervention tiers can be identified in the interventions we studied. Primary level interventions are typified by the school safety programmes that seek to create environments in which the possibility of injury and violence within the school are proactively reduced, and effective school management is enhanced.

While the majority of secondary level interventions in our study were confined to schools, wilderness diversion programmes for adolescents at risk for criminal behaviour were also included. These emphasise capacity-building and risk reduction through improvement of personal relationships, anger management and family strengthening. We did not initially intend to include any tertiary prevention programmes (designed for individuals who have already entered the justice system as violent or chronic offenders) in our assessment, but the chronic rates of violence in South Africa and the youthfulness of many offenders means that some school-based programmes are also paying attention to rehabilitating young offenders to prevent future violent activity.

**LESSONS LEARNT FROM SOUTH AFRICAN PROGRAMMES**

Key lessons learnt from the interviewees are presented below. They highlight the design and evaluation challenges that they faced.

**Programme theory and aims**

Those who design psychosocial interventions need to understand and articulate their theoretical and research basis (Louw, 2000). In general, respondents described an eclectic theoretical underpinning to their work, in that they felt free to draw from a variety of different approaches in planning their programmes. However, there was often vagueness concerning how they had evolved the particular programme theory.
### Table 2: List of V.P.E. programmes, location & focus

<table>
<thead>
<tr>
<th>V.P.E. PROGRAMME</th>
<th>LOCATION</th>
<th>FOCUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACCORD: Bellville Schools Programme (BSP) and UWC Honours BA module in Conflict Studies (UWC).</td>
<td>Bellville, Western Cape</td>
<td>Peace education and group transformation</td>
</tr>
<tr>
<td>2. Alternatives to Violence Programme (AVP).</td>
<td>Gauteng and national</td>
<td>Peace education and working in the juvenile justice system</td>
</tr>
<tr>
<td>3. Centre for conflict Resolution (CCR)</td>
<td>Cape Town</td>
<td>General peace education training</td>
</tr>
<tr>
<td>4. Centre for the Study of Violence and Reconciliation (CSR)</td>
<td>Gauteng, especially Soweto</td>
<td>Violence prevention and school safety</td>
</tr>
<tr>
<td>5. Community Psychological Empowerment Services (COPES)</td>
<td>Cape Town</td>
<td>Works with primary school children and educators; emphasis on positive discipline and classroom management</td>
</tr>
<tr>
<td>(part of Trauma Centre for Victims of Violence and Torture and New World Foundation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Directorate for Education Management &amp; Governance Development (including National Safe Schools Programme)</td>
<td>National</td>
<td>School safety</td>
</tr>
<tr>
<td>7. Eduvo</td>
<td>Cape Town</td>
<td>Wilderness therapy initiative/diversion programme</td>
</tr>
<tr>
<td>8. Independent Projects Trust (ITP)</td>
<td>KwaZulu-Natal.</td>
<td>School safety; specific work with SGBs and other management.</td>
</tr>
<tr>
<td>9. Khulisa</td>
<td>Gauteng</td>
<td>Diversion and violence prevention; works with at-risk youth in schools and youth in prisons</td>
</tr>
<tr>
<td>10. Project for Conflict Resolution and Development (PCRD)</td>
<td>Port Elizabeth</td>
<td>Violence prevention; specific work with school management.</td>
</tr>
<tr>
<td>11. School and Community Programme of the Quaker Peace Centre (QPC)</td>
<td>Cape Town</td>
<td>Positive discipline, in-service training</td>
</tr>
</tbody>
</table>
Interpersonal youth violence prevention

that they used, and few were able to locate the design and delivery of their work in relevant current research literature. Greater attention to evaluation (see below) would be of significant benefit in helping practitioners explain more clearly what it is that makes their intervention work (Louw, 2000).

Among those interviewed there was a high level of awareness of the need to distinguish between immediate programme outcomes, such as improved classroom and school management (e.g. CRD and IPT) or personal assertiveness (QPC), and longer-term impacts. In the majority of cases the ultimate programme goal was individual self-transformation. This included a capacity to take responsibility for oneself (Ecotherapy Institute and Educo), to shift perspectives and move forward from past trauma (AVP, CRD, CCR, and COPES), and to develop strategies for dealing with new manifestations of violence (CSVR).

Linking these aims to the earlier discussion of sources of risk for the development of violent conduct (see Figures 1 and 2), it seems that South African violence prevention programmes are more commonly directing their efforts towards community risk factors and resources (e.g. school quality, and social support/isolation), and the developmental periods of middle childhood and adolescence.

Programme evolution

The achievement of long-term behavioural changes requires, of course, that interventions be sustainable. However, a sustainable programme if it is to be effectively evaluated will also be one that demonstrates changes over time (Louw, 2000). A significant change that was reported by programmes related to the target audience. In two cases school programmes had started by focusing on youth (single target focus), soon realising that this group would not ultimately maintain the programme's goals unless educators became involved. Also, the programmes initially failed to take into account that educators themselves are often survivors of violence and need to be “empowered before they can embrace the policies of the programme” (CCR). In the case of IPT another lesson learnt was that it is school management who offer the best chance of sustainable change, and so school-based programmes need to take into account the level of school management functioning. It was noted earlier that interventions with complex problems, such as violence, normally require a multi-pronged approach rather than a single focus if they are to have a chance of lasting impact. The experience of the ITP echoes this observation in the South African school context.

Several programmes commented on having become “more South African in focus”, a process where one respondent described as having made her organisation “amazingly adaptable and flexible” (AVP). Others described the increasingly indigenous heart of their work as having come from a better understanding of local conditions. The wilderness programmes both commented on the difficulty of expecting programmes such as theirs to stand alone (again a realisation that single-focus interventions on personal change, on their own, are not adequate to reduce risk). These programmes reported that they have now developed careful strategies to support participants on their return to their communities (Ecotherapy Institute and Educo) (see also Roberts, undated). Those involved with work with youth in prisons (AVP and Khulisa) also spoke of the importance of developing broad-based support structures for programme recipients.
Programme outcomes, impacts and measures of success

Several programmes commented on the importance of baseline assessments in the preparatory period before a programme is instituted. Having learned to take time in setting the groundwork in place before programme implementation was described as a valuable lesson. Few of the programmes actually started in this way.

All the respondents felt that the programmes they offered had an impact beyond the individuals they trained. One respondent felt that the effect was qualitative, not quantitative and best seen in a “reduction in crime in schools and improved feelings of safety in target schools” (IPT). This was echoed in a comment that learners change when “educators use the proper language to manage them” (QPC). It was felt that the training spreads “through people’s future relationships” (CCR) both at home and at school, and through broader professional connections. “We hope teachers might share things with other teachers and we encourage this especially,” said one respondent (COPES). Another felt that parents were impacted “because their kid’s behaviour changes. Children grow and leave those behind who don’t mature with them, and they become less troublesome” (QPC).

However, it was evident from the interviews that it was very difficult for programmes to provide objective evidence of these claims. Indeed, while most programmes believed they were having an effect as a result of informal feedback, they did not attempt to measure this effect. An example of an exception to this trend is evident in the Khulisa programme, which uses its mentors to speak to family members and record their responses to changes in the person in the programme.

Those who had not found concrete measures to assess their broader impact were nevertheless engaged in considering how to do so. The IPT interviewee remarked that:

Measuring effectiveness is quite difficult, especially if you work in schools that don’t keep effective records. In such cases, sometimes it looks like violence has worsened but in reality, people are talking more about their experiences. Denial has been a strategy for coping with violence in schools since a cover-up is one way to keep them running; and it’s hard to overcome that tendency.

Programme evaluation

If measures are not adequate, evaluation is compromised. The best way to improve performance and establish whether interventions are effective is to incorporate “an evaluative way of thinking into... everyday activities while integrating evaluation into programme processes, to strengthen the intervention and make the evaluation a built-in part of it” (Louw, 2000, p. 60). Unfortunately, evaluation is often far down the list of programme priorities. However, for a variety of reasons, including good practice, programmes must be able to account for their actions, offer documented evidence of their effectiveness, and learn from their own experiences as well as the insights of others in the field. In order for good practice to be identified, sustained, and replicated, evaluation must be central to the design and delivery of VPE initiatives. Where this is not the case, claims of success may rely solely on anecdotal evidence that improvements are felt after an intervention has taken place.
At present we do not know if inadequate evaluation methods are a widespread problem among the population of South African programmes. In our sample, both the need for evaluation and successful processes to undertake evaluation studies were well-recognised. Only two programmes did not undertake any formal internal evaluation at all. Both of these had experienced at least one external evaluation. In neither case was the external evaluation considered entirely helpful. It was felt that the evaluators had done too little to prepare themselves for their work, and had missed many of the most valuable nuances of the programmes they were assessing. We infer from these respondents that their pre-existing scepticism about the difficulty and utility of evaluation was reinforced by the evaluations they have experienced thus far. It is of note that in both these cases the absence of a systematic collection of baseline and outcome measures would have made the evaluator’s task difficult.

In contrast to these two initiatives, seven programmes reported that the measurement of the outcome of the programme is explicitly built into their process and that the full spectrum of internal evaluations – formative, process and outcome – as well as external evaluations are undertaken (AVP, COPES, CRD, CSVR, IPT, Khulisa and QPC). All of these respondents were able to offer concrete examples of how their programmes have benefited from the evaluation process, and all of them are striving to improve their evaluations along with the programmes they deliver. However, it was evident that programmes’ ability to measure outcomes was not well developed. Their notions of evaluation did not always accord with good practice.

There was a general consensus among interviewees that there is a paucity of good external evaluators in South Africa and that in their experience, external evaluations do not always produce as much useful feedback as those conducted internally. Perhaps as a result of this problem, there was a high level of commitment to training programme implementers to develop and manage their own evaluation processes. Interestingly, programme staff felt that focus groups are one of the most appropriate forums for conducting evaluations. They argued that people feel intimidated by questionnaires requiring written responses. The onus of writing up reports falls squarely onto the workshop facilitator, and so many programmes have paid particular attention in their training of trainers to simplifying and professionalising this process (AVP, COPES, CSVR, Educo and Khulisa). It is of concern that one (not necessarily appropriate) methodology predominates, for reasons that may not necessarily be sound. The method should be driven by the best way to address the evaluation question, and not the other way around.

Discussions with participants addressed the question of how to overcome the lack of adequate theory to inform practice. Respondents suggested that one way of addressing this problem is to put more energy into sharing the results of different interventions. Here, IPT has perhaps made the greatest progress in disseminating their findings. They have a policy of publishing as much as possible about their work, both in book form and online, and making products easily accessible to other programme staff that have internet access. Of course, it is not known how many programmes have computers, let alone Internet access. One cannot assume that this technology will be available to all, particularly in smaller programmes and rural areas.
RECOMMENDATIONS
We conclude the chapter with a set of recommendations based on our findings and the most comprehensive review of eight school-based interventions in South Africa, Preventing Crime and Violence in South African Schools (Griggs, 2002). The report proposes eight best practices for the VPE community, most of which are consonant with our findings on school-based programmes. They recognise the obstacles to implementation noted earlier (outlined in italics):

a) In programmes that target educators, the latter must be thoroughly trained in the use of learner support materials on VPE so that programmes are delivered properly and are sustainable (addresses the risk of poor indirect modes of delivery).

b) Research-based resources, information and training must be offered on the subject of drug education so that schools can play a greater part in the prevention of substance abuse and related problems (recognition of an opportunity for addressing a range of co-occurring problems in one programme).

c) Democratic school management must be facilitated by better training and resources, and nurtured through community partnerships so that school security plans can be developed, implemented and sustained (recognition of the need for community support and school functioning as central to implementation success).

d) Recognise that many learners (and educators) are themselves traumatised by violence and need healing and introspection, as well as skills for anger management.

e) Active learning techniques work best in helping schools and communities learn new ways of taking ownership of, and finding solutions to problems (awareness of the need for sustainability).

f) Learners (and educators) need specific training in how to identify, understand and reject gender-based violence.

g) Democratic classroom management techniques should be taught to parents so that behaviours that promote pro-social responses can also be modelled at home (recognition of the limits of one-site interventions for this complex problem).

h) School safety teams are key to the development, implementation and maintenance of school security plans, and resources must be directed towards their training (Griggs, 2002).

It is of note that Griggs does not mention the need for improved measurement and evaluation in this list. This is no doubt because all the programmes he examined had at least adequate systems in place.

Griggs alludes to the difficulty of forging alliances between NGOs to address programme difficulties in an environment characterised by competition for resources. In contrast, among our interviewees we found a high level of willingness to cooperate and share information and materials. The frequency of contacts between the organisations we interviewed suggests that firm relationships have already been founded, but that they are often being informally maintained. We propose, therefore, that an attempt be made to create and maintain a comprehensive database of all violence prevention programmes in South Africa. This would not only facilitate contact between organisations operating in this area, but would also, with careful planning and sufficient stakeholder buy-in, provide a means to monitor and more systematically evaluate existing programmes and design new ones. The Department of Education,
which is currently establishing a comprehensive call-in centre for school security, would seem a logical place to house and develop this national database.

We also recommend regional meetings of VPE practitioners (perhaps facilitated by an umbrella organisation, such as the Directorate for Education) in order to strengthen their connections and to allow for a better exchange of information and resources.

In our view the ITP information dissemination model should be harnessed to overcome what one programme staff member referred to as “the ongoing problem of a lack of documented evidence of what’s happening” in South African programmes. This sort of initiative could also go some way to building evaluation capacity.

Finally, attention should be focused on increasing the numbers of trained evaluators. This is a key role for social sciences departments in tertiary institutions.

Perhaps the most important observation we can make from our study is that all the programmes we interviewed found measurement and evaluation a challenge. Some were inclined to make claims of success that even they recognised were not based on hard evidence. However, it is encouraging that as a function of self-reflection, all had established some form of evaluation mechanism and were seeking to improve their practice.

It is disturbing that none of those interviewed employed the best practice of randomised controlled trials to test their models. Indeed, only COPES employed some form of quasi-experimental comparison of treatment of control groups. For almost all of the programmes under discussion, one cannot say whether or not the observed changes would have occurred by chance in any event. The lack of rigorous studies is not surprising, and is probably not unusual. A scan of South African psychological and medical journals over the past 10 years revealed no reports of evaluation studies on interpersonal violence prevention that used best or even good practice research designs. While it is recognised that real world evaluations are expensive and complex to undertake, they remain the best way to demonstrate programme effectiveness.

Due to our limited sample of school-based initiatives, we cannot answer the question posed earlier: “How are we doing in South Africa with regard to violence prevention programme quality?” Several (though by no means all) programmes employed pre-post testing to establish change. However, as we have noted, only one (COPES) utilised a control group design. If this observation reflects a more general trend, as we suspect it does, judging from the journal scan, this is a situation that needs serious attention.

ACKNOWLEDGEMENTS

We would like to thank the respondents to our rather searching questions for their frankness and their willingness to reflect on the difficulties they face – as well as for sharing with us the pleasures inherent in doing work that is designed to move young South Africans and their caregivers forward to a more positive future. We were struck by their high levels of commitment, and the creativity shown in overcoming difficult challenges. They agreed to us naming their programmes – a brave and encouragingly open approach.
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An overview of gender-based violence in South Africa and South African responses

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Centre for the Study of Violence and Reconciliation

Violence against women is a public health problem that accounts for many negative health outcomes for women (Campbell, 2002; Heise & Garcia-Moreno, 2002). It is the most invisible but the most common form of violence and it is distinguished from other forms because it is perpetrated by male intimate partners. It is a universal problem that transcends social, economic and cultural boundaries. Non-governmental organisations (NGOs) and women's organisations have been trying for more than three decades to locate this problem on the international agenda. It only received recognition as a human rights violation in 1993 (United Nations, 1993), and in 1996 the World Health Organisation (WHO) recognised gender violence as a public health priority (World Health Organisation, 1996).

In this chapter we present an overview of gender-based violence in South Africa. The focus is on intimate partner violence and health sector responses. We also present an analysis of how the criminal justice system has performed in its response to the violence. The terms 'gender-based violence' and 'violence against women' are used interchangeably throughout the chapter.

DEFINITIONS

A lack of consistency in definitions has been identified as one of the major flaws in the research on this problem since it prevents adequate comparisons. Definitions vary according to the reason for use, whether for a legal, research or social purpose. Often definitions used in research depend on the disciplinary perspective of the researchers (legal, criminological, social justice, public health, etc.). In addition, the cultural context of the geographical region also influences standardisation of definitions. For example, sexual coercion in one cultural setting may not mean the same thing in another. This has resulted in non-comparability of prevalence data.

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between studies. To overcome some of these problems the WHO is currently completing a study on intimate partner violence in seven countries using a standardised instrument and methodology to ensure adequate comparisons (World Health Organisation, 1999).

**Gender-based violence**

Gender-based violence encompasses a wide range of violations against women and girls, and includes any number of behaviours that serve to undermine the physical, sexual and emotional integrity of women. This is captured in the United Nations (UN) Declaration on the Elimination of Violence Against Women as:

Any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivations of liberty, whether occurring in public or private life (United Nations, 1995, n.p.).

This definition emphasises that all these acts of violence are rooted in the power imbalances between men and women. For a depiction of the array of violent acts over the lifespan of girl children and women, the reader is referred to Watts and Zimmerman (2002). The Centers for Disease Control (CDC) (1999) and the WHO, for their multi-country study (World Health Organisation, 1999), have developed other useful definitions for research, shown in Box 1.

**Box 1. Definitions of intimate partner violence**

- **Centers for Disease Control**
  Pattern of coercive control of one intimate partner against another that includes physical and sexual violence, threats of physical or sexual violence, and emotional abuse in the context of physical and sexual violence (Centers for Disease Control, 1999).

- **WHO Multi-country study**
  Any act or omission by a family member (most often a current or former husband or boyfriend), regardless of the physical location where the act takes place, which negatively affects the well-being, physical or psychological, integrity, freedom or right to full development of a woman (World Health Organisation, 1999).

A definition for gender-based violence in South Africa can be found in the Domestic Violence Act 116 of 1998 (1998), which defines domestic violence as:

Physical abuse, sexual abuse, verbal and psychological abuse, economic abuse, intimidation, harassment, stalking, damage to property, entry into complainant’s residence without consent where they do not share the same residence or any other controlling or abusive behaviour towards a complainant where such conduct harms or may cause imminent harm to the safety, health or well-being of the complainant (Domestic Violence Act 116 of 1998, 1998, p. 4).
Intimate partner violence is commonly used and refers to violence that occurs between people who are in intimate relations. Most often the perpetrator is a husband, ex-husband, a boyfriend or an ex-boyfriend. Domestic violence and family violence is also not gender-specific, and although it includes violence between intimate partners (where women are overwhelmingly the victims), it also includes violence against children, violence between family members, and violence between people who share households.

**Physical violence**

*Legal definitions*

Legal definitions of physical violence can be found in the two legalrecourses available to South African women. Firstly, in the Domestic Violence Act 116 of 1998 (1998) described above, and secondly in the crime of assault, which is seen as a crime against bodily integrity (Snyman, 1991).

**Sexual abuse**

*Legal definitions*

Legal definitions of sexual violence in South Africa fall under the ambit of crimes against the person and those against the community, and at present are defined in terms of rape, indecent assault, incest and unnatural sexual offences in common law. Rape is defined as intentional, unlawful intercourse with a woman without her consent (Snyman, 1991). Indecent assault is defined as unlawfully and intentionally assaulting another person with the object of committing an indecency. The Act also includes a provision to protect the sexual integrity of young persons by criminalising sexual intercourse below the age of 16 years even with the consent of the persons.

**Sexual law reform**

The South African Law Commission has published a report on sexual offences that redefines sexual offences and related matters. Rape is defined as any act which causes penetration to any extent whatsoever by the genital organs of the person committing the act into or beyond the anus or genital organs of another person, or any act which causes penetration to any extent whatsoever by the genital organs of another person into or beyond the anus or genital organs of the person committing the act (South African Law Commission, 2002). An act which causes penetration is *prima facie* unlawful if it takes place in any coercive circumstances; under false pretences or by fraudulent means; or in respect of a person who is incapable of appreciating the nature of an act which causes penetration. The Bill is far-reaching in its definition of coercion, including the use of any physical or psychological force, any threat or abuse of power and authority, and situations where a person is detained.

**Health sector legal duties**

Submissions to the South African Law Commission have recommended the following positive legal duties for health workers. Among others, the health care practitioner must provide the patient with information relating to the legal rights and options available, the examination, pregnancy, sexually transmitted infections (STIs), HIV,
post-exposure prophylaxis (PEP), post-traumatic distress stress disorder and rape trauma syndrome, medications, local resources and available literature, and the outcome of the examination. The health care practitioner must obtain fully informed consent, the examination must be conducted within 2 hours of presentation, a support person is allowed to be present, and the health care practitioner must ensure that it is conducted in a safe and private space. Lastly, the health care practitioner must utilise a standard management protocol, complete the protocol forms (the j88 if a charge is laid), and inform the police of the relevant findings (South African Law Commission, 2002).

In addition, non-legislative recommendations by the South African Law Commission in respect of the Sexual Offences Report have imposed a number of positive duties on health care practitioners, health institutions and Departments of Health. Some of these are listed in Table 1.

<table>
<thead>
<tr>
<th>Category</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| Forensic medical examination                | • An appropriately trained health worker (which includes doctors and nurses) should conduct a proper medical examination, which includes treatment and referrals, at the first consultation.
• The collection of evidence and treatment of the patient should be done by the same health worker.
• The adult patient should be given the option of a full examination with collection of forensic evidence that can be kept at the health care facility for 90 days while the patient decides whether or not to report to the police.
• A full and detailed explanation should be given to the patient (or caregiver in the case of a child or mentally disabled person) about the examination, potential pregnancy/STI/HIV, any medication given, and the outcome of the examination.
• Patients should be tested for and counselled about HIV, or referred for it.
• The results of the examination should be shared with the investigating team, specifically around evidence found for comparison with the scene and the suspect/s.
• The SAPS must provide training for health workers in the use of the sexual assault evidence collection kits (SAECK).
• The health worker must refer the patient for appropriate counselling. |
### Category: Training
- Specific training should be given to health workers to manage cases of sexual assault, which must be continually monitored and evaluated.
- This training should include how to perform medico-legal examinations, how to correctly manage the health care of sexual abuse patients, knowledge about and correct use of the SAECK, how to complete the required documentation (e.g. the J88), police procedure, and legal aspects including the presentation of expert evidence in court.
- Training at all levels should include collaborating with the South African Police Service (SAPS).
- Social and cultural context concerns with respect to sexual violence should be included in the training.
- Gender and gender-based violence should be included in the curricula of undergraduate health workers.

### Category: Protocols
- A national system of accreditation for health workers in the management of survivors of sexual assault should be established by the Department of Health; thereafter those accredited health workers should be given the designation ‘Sexual Assault Care Practitioner’.
- Until this system is established health workers should be obligated to manage such patients according to a management protocol.
- When a patient presents to a health care worker/facility (including private practitioners) who have not received training, the health worker must refer the patient to a facility or health care worker who has received the accredited training.
- Protocols for the management of rape survivors for health care workers should be developed by the Department of Health.
- These protocols should include the following minimum standards of care:
  - The physical, emotional and psychological safety, health and well-being of the patient is given precedence;
  - Standardised evidence collection and documentation procedures must be developed nationally and used in all sexual assault cases;
  - Patients must receive the same quality of care regardless of where the assault happened;
  - Health workers must have the ability to recognise, document and appropriately interpret injuries, or the lack thereof;
  - Health workers must have the ability to collect and package the appropriate forensic specimens as per the new SAECK.
- The protocols should contain:
  - Measures to protect the privacy and dignity of patients and measures to expedite the examination and management.
  - All patients must be examined immediately after presenting to a health facility.
  - This assessment must include the patient’s risk of acquiring HIV infection; patients must be informed and counselled.
Emotional, verbal and economic abuse

These three forms of abuse are captured in both the UN definition and the South African Domestic Violence Act 116 of 1998. This type of abuse has not enjoyed the same attention from researchers and therefore no agreement has been reached on definitions for research purposes. The Domestic Violence Act 116 of 1998 defines emotional abuse as a combination of verbal and psychological abuse and describes it as:

A pattern of degrading or humiliating conduct towards a complainant including repeated insults, ridicule, or name calling; repeated threats to cause emotional pain; or the repeated exhibition of possessiveness or jealousy which is such to constitute a serious invasion of the complainant's privacy, liberty, integrity or security (Domestic Violence Act 116 of 1998, 1998, p. 4).

The WHO defines emotional abuse as any act or omission that damages the self-esteem or identity (World Health Organisation, 1996) of a person, while the CDC recommends that emotional abuse only be considered as a type of violence when there has been prior physical or sexual violence (actual or threats). Psychological abuse would therefore not be considered in the absence of physical and sexual violence (Centers for Disease Control, 1999). Researchers should identify specific behaviours as emotional abuse; for example, in a South African study abandonment and issues of infidelity (unfaithfulness and bragging about girlfriends) were included as emotional acts (Jewkes, Penn-Kekana, Levin, Ratsaka & Schrieber, 2001).
Research into economic abuse has been given the least attention. Where it has been measured, it has often been included as a dimension of emotional abuse (Centers for Disease Control, 1999; Elsberg, Peña, Herrera, Winkvist & Kullgren, 1999; World Health Organisation, 1999). Tactics identified and used by abusers include ensuring that women are persistently short of money, taking away money that the women have earned, and damaging their possessions.

**PREVALENCE**

**Physical violence**

Consistently high levels of physical violence have been reported in both developed and developing countries. The Population Report reported on nearly 50 population-based studies (including South Africa) done between 1982 and 1999 (Heise, Elsberg & Gottemoeller, 1999). Between 10% and 50% of women reported physical abuse on one or more occasions by an intimate partner sometime in their lifetime.

Until 5 years ago no empirical research had been done to answer the question of how big the problem of violence against women was in South Africa. The first South African Demographic and Health Survey (SADHS) was conducted in 1998 and included questions on violence against women. This national and representative study interviewed a total of 11 735 women aged between 15 and 49. The prevalence of women who had been physically abused by an intimate partner at least once ranged between 8.7% and 17.8%, with an average of 12.5% for the whole country. The prevalence for each province is presented in Table 2. The highest levels were reported in Gauteng (17.8%) and the Western Cape (16.9%) (Department of Health, 2002a).

<table>
<thead>
<tr>
<th>Province</th>
<th>Ever physically abused by partner (%)</th>
<th>Physically abused by partner in last year (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SADHS</td>
<td>Three Province study</td>
</tr>
<tr>
<td>Western Cape</td>
<td>16.9</td>
<td>8</td>
</tr>
<tr>
<td>Eastern Cape</td>
<td>8.7</td>
<td>26.8</td>
</tr>
<tr>
<td>Northern Cape</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Free State</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>KwaZulu-Natal</td>
<td>10.2</td>
<td></td>
</tr>
<tr>
<td>North West</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>Gauteng</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Mpumalanga</td>
<td>15.2</td>
<td>28.4</td>
</tr>
<tr>
<td>Northern Province</td>
<td>8.8</td>
<td>19.1</td>
</tr>
<tr>
<td>Total</td>
<td>12.5</td>
<td>6.3</td>
</tr>
</tbody>
</table>
A second major representative study was conducted in 1999 and had a more specific objective than the SADHS: to describe the epidemiology of violence against women in specific areas and to further validate the findings of the national survey (SADHS). A similar sampling frame as the SADHS was used to allow for comparison and 1306 eligible women aged between 18 and 49 years in Mpumalanga, the Eastern Cape and the Northern Province were interviewed (referred to as the Three Province study) (Jewkes et al., 2001). A comparison of the prevalence estimates of physical violence in this study and in the SADHS is shown in Table 2.

A few other studies among particular groups reported higher rates. In a study of municipal male workers in Cape Town, 42% of the men reported using physical violence against female intimate partners of the past 10 years (Abrahams, 2002). In a study of women attending antenatal clinics in Soweto (N=1395), 50% of the women reported having experienced physical violence in their lifetime (Dunkle, Jewkes, Brown, McIntyre & Gray, 2002).

Sexual violence

In the 1995 Human Rights Watch report, South Africa was dubbed the “rape capital” of the world (Human Rights Watch, 1995). Two years later a second report highlighted the shortcomings of the medico-legal system with respect to rape survivors (Human Rights Watch, 1997), and in 2001 a third report featured rape and sexual harassment as the main reasons for girls abandoning school (Human Rights Watch, 2001).

Official figures of the SAPS

Official data on sexual violence for South Africa are derived from the narrow legal definitions and captured into three crime categories for reporting purposes. Consequently, the official figures do not give an accurate picture of the extent of violence against women, which is better obtained from empirical research (see below). Table 3 reflects the reported cases for South Africa over the past years. Data from 1996 showed that 240 out of every 100 000 women reported rape and attempted rape to the police (Crime Information Analysis Centre, 2001). This is three times what is reported in the USA (80/100 000) (Ramin, Satin, Stone & Wendel, 1992). Compared to crime ratios from 89 Interpol member states, South Africa has the highest ratio of reported rape cases per 100 000 population (Bollen, Artz, Vetten & Louw, 1999).

<table>
<thead>
<tr>
<th>Year</th>
<th>Rape (including attempts)</th>
<th>Intercourse with a girl under the prescribed age and/or female 'imbecile'</th>
<th>Indecent assault</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>42 429</td>
<td>787</td>
<td>3874</td>
<td>47 090</td>
</tr>
<tr>
<td>1995</td>
<td>47 506</td>
<td>666</td>
<td>4073</td>
<td>53 045</td>
</tr>
<tr>
<td>1996</td>
<td>50 481</td>
<td>580</td>
<td>5220</td>
<td>56 281</td>
</tr>
<tr>
<td>1997</td>
<td>52 159</td>
<td>537</td>
<td>5053</td>
<td>57 749</td>
</tr>
<tr>
<td>1998</td>
<td>49 280</td>
<td>474</td>
<td>4851</td>
<td>54 605</td>
</tr>
<tr>
<td>1999</td>
<td>51 249</td>
<td>489</td>
<td>5762</td>
<td>57 500</td>
</tr>
<tr>
<td>2000</td>
<td>52 860</td>
<td>523</td>
<td>6602</td>
<td>59 985</td>
</tr>
</tbody>
</table>
Survey data

In South Africa huge differences are observed between the number of cases reported to the police and the number reported in studies. A nine-fold difference was reported by Jewkes and Abrahams (2002) in their comparison between the cases reported to police (240/100 000) and those reported in a representative community-based study (2070/ 100 000 women per year in the 17- to 48-year age group).

A number of South African surveys on sexual violence have been conducted. Direct comparison is not easy because of different definitions used. The national study (SADHS) showed that 7% of women reported having ever been ‘forced or persuaded to have sex against their will’ (Jewkes & Abrahams, 2002). The Three Province study showed similar figures (M pumalanga 7.2%, Eastern Cape 6.7%, and Northern Province 6.3%) (Jewkes et al., 2001). In a study of ante-natal attendees in Soweto, 20% of the women reported a lifetime prevalence of sexual violence by an intimate partner, while 9.7% reported this happening within the past year (Dunkle et al., 2002). A study among 500 sex workers in Hillbrow in 2000 revealed that 59.7% had experienced some form of violence while working. When clients of sex workers were asked if they had ever been party to a violent act with a sex worker, 10% said they had, while 47% said they had witnessed violence (Naire, 2001). In Cape Town 15.3% of working men reported having forced or tried to force an intimate partner to have sex during the last ten years (Abrahams, 2002).

Studies on adolescents have provided important data on sexual coercion. Buga, Amoko and Ncayiyana (1996) reported that 28% of the Transkei scholars they studied reported forced sexual initiation while Richter (1996), in her random sample of 864 boys and girls aged 20 years and younger at three sites in South Africa, found that 17% of the males reported having forced a woman and 28% of the girls reported having been forced to have sex.

The broad epidemiology of rape has also been described by a surveillance project at three medico-legal clinics in Johannesburg where women who had reported to the SAPS were taken for examination (Swart, Gilchrist, Butchart, Seedat & Martin, 2000). The study reported on 1401 cases and although limitations included a bias in the collection of the data, with the majority of cases (1008) reported from only one of the three clinics, it does highlight important factors for prevention programmes. Some of the findings were that young women were at greater risk of being raped; most rapes were intra-racial (most women raped by men from their own race group); most rapes happened over weekends; and open spaces and homes were the most likely places for rape to occur.

Another aspect of sexual violence in South Africa is gang rape. The rape surveillance undertaken in Johannesburg reported that more than one-third of the women reported being raped by more than one perpetrator (Swart et al., 2000). Gang activity in South Africa includes “jackrolling”, which is the forceful abduction and possible sexual abuse of women. “Stream-lining” is another form of gang rape in South Africa. In this case, girls usually know the perpetrators. A young man may arrange for a number of his friends to have forced sex with his girlfriend, usually when he intends to end the relationship or when he wants to teach her a lesson, for example when she has transgressed rules (Wood, 2001).
The only South African study to describe the epidemiology of fatal sexual violence was done by Martin (1999) in Cape Town. She found a 1.2% fatal sexual violence rate, which equates to 12 fatalities per 1000 cases of rape reported to police. This rate was 12 times higher than that reported in the USA (Marchbanks, Kung-Jong & Marcy, 1990).

HEALTH SECTOR RESPONSES

National level

In 1998 the Department of National Health issued the Uniform National Health Guidelines for Dealing with Survivors of Rape and other Sexual Offences as part of national policy guidelines spearheaded by the Department of Justice and Constitutional Development (Department of Justice and Constitutional Development, 1998). These guidelines quite clearly delineated the responsibilities and requirements for and of medical practitioners, as well as for and of provincial and national Departments of Health, especially with regard to training and establishing accredited health care practitioners. In particular, they acknowledge that:

- Special skills are required to provide proper health care plus forensic examination of survivors. These skills are only available at certain centres at present and thus extensive training programmes are required throughout the country to increase access for the victims (Department of Justice, 1998, n.p.).

In these guidelines an accredited health care practitioner is further defined as being:

- Highly proficient in medico-legal knowledge, credible to the justice system through accreditation of their skills and qualifications, and competent to give evidence in court confidentially (Department of Justice, 1998, n.p.).

Despite these guidelines, the required rollout, implementation and monitoring did not follow.

The 2001 health policy document, The Primary Health Care Package for South Africa (Department of Health, 2001), also very clearly states the norms and standards required for the management of victims of sexual abuse, domestic violence and gender violence, stating the requirement that:

- A member of staff of every clinic has received training in the identification and management of sexual, domestic and gender related violence (Department of Health, 2001, p. 57).

Furthermore, following the April 2002 announcement by the National Department of Health regarding the provision of antiretroviral therapy (ART) to sexual violence survivors (Department of Health, 2002b), the HIV/AIDS and TB Cluster of the National Department of Health produced a draft Protocol for Management of Sexual Assault Survivors (Department of Health, 2002c), which is more holistic and all-embracing in the provision of PEP for STIs and HIV following sexual violence. These guidelines list, as one of the medium-term policy objectives, specialised training for health care.
workers in all aspects of rape counselling and care, including the medico-legal and forensic aspects and the provision of PEP.

By mid-2002 existing policy on health services from the National Department of Health for survivors of sexual violence was therefore available in the following documents:

a) Uniform National Health Guidelines for Dealing with Survivors of Rape and Other Sexual Offences (Department of Justice & Constitutional Development, 1998).

b) A Comprehensive PHC Service Package for SA (Department of Health, 2001).

c) Policy guideline for management of transmission of HIV and STI in sexual violence (Department of Health, 2002b).

d) Draft protocol for management of sexual assault survivors (Department of Health, 2002c).

Attention to the management of sexual violence had gained enormous impetus at ground level with the realisation of the magnitude of the HIV epidemic and the potentially fatal consequences for rape survivors. Many clinicians provided ART to their patients (see Table 4). The introduction of PEP management as national policy, although criminal in its tardiness, has provided the mechanism for the provinces to address the provision of services to sexual violence survivors adequately.

To provide a comprehensive, holistic management package that is patient-centred requires coordination between various programmes and clusters at national and provincial levels, with clearly defined competencies and responsibilities for each. The HIV/AIDS and TB cluster, as well as the Gender Focal Point programme, has acknowledged the need for this coordination, and the process of composing a definitive Sexual Assault Policy document is underway. A draft for comment was released in June 2002 (Department of Health, 2002c). The drafting of this policy has been aided by the efforts of the South African Gender Based Violence and Health Initiative (SAGBVHI), which has provided technical assistance and expertise.

The SAGBVHI is a national specialist partnership of individuals and organisations within the health sector that was established in December 2000 to help develop an appropriate health sector response to gender-based violence. Its focus lies in training, research and advocacy around gender-based violence. To this end, SAGBVHI co-hosted a two-day workshop in March 2001 with the Women’s Health and Genetics sub-directorate and the Gender Focal Point programme of the National Department of Health to initiate the development of an appropriate health sector response. The workshop attracted participants from all provinces, as well as national government and NGO stakeholders. Some of the recommendations from the workshop were for the Department of Health to clearly delineate responsibilities with regard to the prevention, management and provision of services and standards for gender-based violence (Jewkes, Jacobs, Penn-Kekana & Webster, 2001).

A more recent collaboration has been the drafting of the Sexual Assault Policy. The content focuses on the transformation of sexual assault services, drawing on the experiences of various provincial projects and initiatives. Training of health care practitioners was recognised as a priority in the provision of adequate services.

2 Authors’ emphasis.
Overview of gender-based violence

Provincial level

Medico-legal services are provided at a provincial level. Individual services for survivors of sexual violence are rendered at a variety of institutions in each province. The health care practitioner who sees patients can be either a very inexperienced intern and/or community health officer, or may be a very experienced senior medical officer with many years of District Surgeon practise.

Because of this long and arduous process by national government to define responsibilities and service delivery, many provinces have forged ahead with their own initiatives. However, there are unfortunately many disheartening disparities between provinces. The current status is presented in Table 4 (the Western Cape province has a policy and standardised guidelines for the management of sexual violence survivors).

Table 4. Health sector responses to violence against women by province

| Western Cape | Western Cape Province in 1999 set up a Reference Group to establish a provincial policy, with standardised guidelines and protocols for the management of survivors of sexual assault (Martin & Denny, 2000). This process was completed in November 2000 with the issuing of these guidelines as Provincial Policy. Two important aspects of this policy included the provision of services at designated health care facilities with the intent to establish centres of excellence, and the provision of PEP. Two specialised centres of excellence were established, one at Groote Schuur Hospital (the largest tertiary care centre in the Western Cape), and the second, the Thuthuzela Clinic at G. F. Jooste Hospital (a secondary level provincial hospital) in Manenberg on the Cape Flats. These centres piloted the examination protocol and treatment guidelines, including the provision of AZT as PEP. The Thuthuzela Clinic was established in conjunction with a Dept. of Justice initiative, which is to provide specialised sexual offences courts through the country. The clinic has a separate specially assigned space in the hospital and is staffed full-time by nurses. There is a medical officer immediately available 24 hours a day. The special feature of the clinic is the presence of a prosecutor from the outset/initial contact with the patient. As part of the formulation of the guidelines and protocol, various experts from the Reference Group compiled a training package and training team. The training package was first piloted in the 4 regions of the Province, culminating in the production of a Training Manual, facilitator notes, pre-course and in-course reading. The training consists of a 2-day in-service workshop, aimed primarily at the medical officers conducting examinations of sexual assault survivors, but does not preclude, and in fact encourages, participation by nurse practitioners, social workers, members of the SAPS, prosecutors and local NGOs. By the end of 2002 approximately 12 such workshops had been completed with approximately 360 attendees. This training is the |
only formalised Dept. of Health programme for health care workers on the management of sexual assault survivors. It owes its success and sustainability to 'adoption' by the Provincial Dept. of Health as a special project, assigned to the Maternal, Child and Women's Health sub-directorate with a dedicated co-ordinator at the level of Deputy Director, and the stipulation of a budget for its implementation.

**Northern Cape**
Kimberly in the Northern Cape provided training for approximately 26 nurses in clinical forensic skills. Unfortunately, following that training only 2 nurses were given posts that utilised these skills. Some medical officers in the province hence received didactic training (4-5 hours) from a very experienced clinical forensic examiner (Martin, 2001).

**Gauteng**
In Gauteng services have been provided at a few ‘medico-legal clinics’, which were established in Hillbrow, Soweto, Pretoria and Lenasia in the 1990s. Additionally, the private health care group Netcare established a sexual assault survivors’ clinic at one of their private hospitals in Sunninghill, Johannesburg. The Sunninghill clinic has also always provided PEP to their patients (Swart et al., 2000). Gauteng’s Dept. of Health has a medico-legal directorate that is responsible for clinical forensic services. They are in the process of creating forensic training for health care providers comprising curriculum development and practical requirements through an accredited institution (National Clinical Forensic Medicine Committee, 2002a).

**Mpumalanga**
An initiative in Mpumalanga established in 2000 by a group of concerned women provides support and counselling to survivors, as well as offering ART to survivors (Kenyon, 2002). This project has provided doctors in the hospitals in which it works with information and access to ART. A medical officer at the Tintswalo hospital recently formulated protocols specific for the hospital and community resources to guide doctors in the provision of services to sexual assault survivors.

**KwaZulu-Natal**
KwaZulu-Natal is the other province with a medico-legal directorate in its Dept of Health. It works very closely with the Independent Medico-Legal Unit (IMLU). Part of the province’s health policy is to establish Crisis Care Centres at health facilities in various locations to improve services to survivors of sexual violence (Amnesty International, 2002). They have also recognised the importance of specialised postgraduate training for examiners as being integral to implementation of the policy. The directorate, together with IMLU, has developed a generic clinical forensic medicine curriculum and training course comprising 15 modules in 4 blocks of 5 days run over a period of 1 year (McQuoid-Mason, Pillenmer, Friedman & Dada, 2002). This curriculum strongly endorses a mentorship programme (National Clinical Forensic Medicine Committee, 2002b).
Other health sector responses
Numerous other localised health sector responses exist and continue to evolve as concerned individuals recognise the need for provision of adequate services. These responses emerge both from individuals in governmental organisations (for instance managers within Provincial Departments of Health and, more frequently, from medical officers working in clinics) and individuals in the NGO sector.

Many of the NGO health sector responses are directed at training. These programmes focus mainly on awareness and sensitisation around gender-based violence and are aimed at health care workers, as well as lay counsellors. Few of them address the provision of clinical skills (Martin, 2002).

Some of these initiatives use the Vezimfihlo package (Jacobs & Jewkes, 2002), which includes training materials developed for primary health care workers on gender-based violence (Vezimfihlo is an Nguni word which means “getting things off your chest”). Similar training by the Gender Advocacy Project (Khan, 2002) for primary health care nurses has been conducted with an emphasis on the Domestic Violence Act. Soul City is a health promotion initiative in the form of a prime-time TV drama series. One of its programmes depicted violence against women at the time that the Domestic Violence Act was enacted. It has been repeated since because of its popularity (Soul City, undated). The Centre for the Study of Violence and Reconciliation (undated) and the Women’s Health Project (undated) have both developed training packages for health workers and work mainly with medical personnel in the Gauteng region.

CRIMINAL JUSTICE RESPONSES TO GENDER-BASED VIOLENCE
This section of the chapter will explore how, against the background of constitutional obligations, the criminal justice system (including the Department of Justice and Constitutional Development, the SAPS and the Department of Correctional Services), fared in meeting its mandate to deal with domestic violence and sexual violence. The policies, legislation and specialist structures established to address the problem of violence against women are discussed, followed by an examination of the criminal justice system’s performance in implementing these various initiatives. Given the size and complexity of the criminal justice system, only a brief overview of recent developments can be presented.

Key policy and legislation addressing gender-based violence
National Crime Prevention Strategy (NCPS)
This strategy, finalised in 1996, is the first key document guiding the state’s initial response to violence against women. The document identifies gender-based violence as one of a number of priority crimes, and recognises that gender inequality is one of a cluster of factors giving rise to this crime. The NCPS proposes a four-pillar approach to crime prevention: criminal justice processes; reducing crime through

1 The other priorities are crimes involving firearms, organised crime, drug-trafficking, gang-related crimes, white collar crime, violence associated with inter-group conflict, vehicle theft and hijacking, corruption within the criminal justice system, illegal immigrants and trade in endangered species.
Overview of gender-based violence

environmental design; public values and education; and transnational crime prevention. Violence against women and children is cited as a national priority, with the bulk of strategies to address the problem located in pillar one, the criminal justice process, under the section on victim empowerment and support (National Crime Prevention Strategy, 1996).

National Rape Prevention Strategy

This strategy was initiated in March 2000 after Cabinet directed the Ministers of Health and Safety and Security to develop a strategy to reduce rape. An inter-departmental management team, including the Departments of Health, Social Development and Safety and Security, as well as the Sexual Offences and Community Affairs (SOCA) Unit of the National Directorate of Public Prosecutions, was subsequently set up to undertake this task. The aim of this initiative was to investigate what was being done already, to measure the impact of these initiatives and to develop a coherent strategy based on the findings (Vetten & Khan, in press). Although completed by January 2002, the report has never been made public. However, in November 2002 the Mail and Guardian newspaper (Kindra & Gabrielse, 2002) published some of the report’s key findings and conclusions after obtaining a leaked copy. Some of these findings are presented in Table 5.

Table 5. Recent empirical research on prosecution of rape cases and implementation of the Domestic Violence Act (116 of 1998)

| Sexual violence | According to the November 2002 Mail and Guardian report referred to earlier (Kindra & Gabrielse, 2002), 9% of reported child rapes and 7% of adult reported rapes resulted in convictions in 2000. Mpumalanga province recorded the lowest number of convictions (3% and 4% respectively) followed by Gauteng, which secured convictions in 7% of reported child rape cases and 5% of adult cases. In the same year, perpetrators could not be traced in 30% of cases nationally. The percentage of cases where the suspect could not be traced has been increasing by 10% every year since 1996, with an 11% increase having been recorded between 1999 and 2000. Of reported rape cases, 43% were withdrawn in 2000, with 46% of these withdrawals occurring at the request of the victim. The Director of Public Prosecutions withdrew a further 36% of cases and the police 14%. A reconciliation between the parties involved, or their settling of the matter among themselves accounted for 19% of withdrawals. Victims could not be found in 17% of cases and in a further 15% of cases, inconclusive or contradictory evidence led to the matter being withdrawn. Cases judged as ‘false’ accounted for 7% of withdrawals (ibid). Unfortunately no further information is available outlining the criteria by which cases were judged as false or not. The article goes on to quote the report as stating that a “longer-term, sustainable anti-rape strategy can only become a reality once the criminal justice system as a whole improves” (Kindra & Gabrielse, 2002, p.3). |
Domestic Violence Act

The clerks, being gatekeepers to the courts, are an important link in the chain of gaining access to a protection order. Importantly, data from the Dept. of Justice (Stack & Soggot, 2001) indicates a decline in administrative officers and clerks from 6897 to 4101 between 1996 and 2000 - a loss of 2796 employees. The Dept. of Justice and Constitutional Development (2002a), in its briefing on Budget 2001 to the Portfolio Committee, states that the implementation of new legislation such as the Domestic Violence Act has placed serious pressure on its offices. The Dept. then goes on to say that since the 2001/2 budget for personnel seems to be less than that required for the number of approved posts, fewer individuals can therefore be employed. The Dept did not appear to consider how the broader definition of domestic violence, as well as the more inclusive understanding of family and domestic relationships, was going to impact upon the courts.

The shortage has led to some organisations setting up services to assist in court functions. These NGOs are thus subsidising the functions of the Dept. of Justice. One such NGO, Mosaic Training Service and Healing Centre for Women, working in the Cape Town area, assisted 15,142 applicants to obtain protection orders during the period April 2000 to February 2001. From January 2001 to November 2001, Mosaic spent a total of R373,364.15 providing this service to women (Vetten & Khan, in press). In addition, two evaluations on the impact of the Act (Mathews & Abrahams, 2001; Parenzee, Artz & Moul, 2001) highlighted many other barriers experienced by women, including completing the application forms, language limitations and the cost of the sheriff’s fee for serving the protection order. The interviews conducted by Parenzee et al. (2001) with criminal justice personnel implementing the Act point to further barriers to implementation. These included inconsistent interpretations of the Act; lack of training around the Act; lack of support services outside of the criminal justice system; lack of collaboration between the courts and police, resulting in a fragmentation of services; lack of involvement by the health sector; lack of resources such as vehicles, faxes and photocopiers and personnel; and the burden of the emotional toll exacted by dealing with distressing cases of domestic violence, further exacerbated by working in circumstances for which insufficient resources are available (Parenzee et al., 2001).

National policy guidelines for victims of sexual offences

National policy guidelines have been developed to ensure the provision of an effective and comprehensive service to victims of sexual violence (Department of Justice & Constitutional Development, 1998). These include guidelines for the Department of Justice, the SAPS, the Department of Welfare, the Department of Correctional Services and the Department of Health (discussed in more detail earlier).
The Gender Policy
The Gender Policy issued by the Department of Justice notes violence against women as one of its critical areas of concern and commits itself to undertake all possible measures within its mandate to eliminate violence against women, to facilitate an integrated national response to violence against women as set out in the Southern African Development Community's (SADC) Declaration on the Eradication and Prevention of Violence Against Women (SADC, 1999), and to develop a specific policy framework on violence against women. Strategic areas of intervention include domestic violence, sexual violence, witch-hunting, female genital mutilation, trafficking in women and children, women in armed conflict and refugee women.

Five-Year National Strategy for Transforming the Administration of Justice and State Legal Affairs
Also known as Justice Vision 2000, this asserts that it aims to achieve “a justice system that is responsive to the needs of victims of crime, including vulnerable groups such as women and children” (Department of Justice & Constitutional Development, 1997, p. 79). One strategy for achieving this goal is “developing and implementing training programmes to sensitise court officials to the experiences of victims of crime and to ensure that victims get support and sensitive treatment” (Department of Justice & Constitutional Development, 1997, p. 80).

A premier project put forward by the document is the prevention of violence against women. Activities proposed to achieve this goal include developing a holistic, coordinated and integrated approach to dealing with violence against women through all government departments and NGOs; establishing a high-level task team involving the SAPS, district surgeons' offices, senior prosecutors, court staff, judicial officers, social workers and NGOs to develop a set of standards and practical guidelines on sexual violence against women; reforming the substantive law and prosecutorial matters concerning sexual violence; and establishing gender information desks in every magistrate’s court.

Strategic Plan for the SAPS, 2002-2005
The SAPS has been heavily criticised for the manner in which it has traditionally dealt with violence against women - displaying insensitivity, ignorance, indifference and hostility to victims of rape and domestic violence (Human Rights Watch, 1997). The NCPS has however ensured that gender-based violence becomes a priority crime, and over the years strategies to address rape and domestic violence have appeared in the police's strategic plans.

The Strategic Plan outlines a number of activities to address crimes against women and children under the Crime Prevention and Combating Programme (SAPS, 2002).

These include improving service delivery by the SAPS to all victims of crime; improving services provided by the Family Violence, Child Protection and Sexual Offences units to all victims of abuse; improving SAPS services around domestic violence and vigorously implementing the Domestic Violence Act; developing an interdepartmental strategy for the prevention of rape and sexual offences; preventing the unauthorised removing of women and minors abroad; implementing the Safer Schools project in priority areas; and implementing Project Women in priority areas.

We have no information describing what “Project Women” entails.
Partnerships with the National Network on Violence Against Women, the Commission on Gender Equality and Human Rights Commission are mentioned. Best practices such as the intersectoral approach, crisis centres and awareness programmes are also singled out as strategies to be introduced in areas where gender-based violence is widespread. Compiling a DNA database to ensure successful prosecution (presumably of rapists) is also mentioned.

**Legal Acts**

**Domestic Violence Act (No. 116 of 1998)**

This Act was implemented on 15 December 1999 and introduces South Africa's first definition of domestic violence, including a broad range of behaviours that were presented earlier (Domestic Violence Act 116 of 1998, 1998). Those applying for protection orders may ask the court to order the abusive party to refrain from committing any of the acts previously mentioned. In addition, applicants may also ask the courts to order the police to remove firearms and/or other dangerous weapon(s); that the police accompany the applicant to collect her belongings; that the abuser be evicted from the house and continue paying the bond/rent; that the abuser provide emergency monetary relief; that the abuser have either no, or structured, contact with any children; and that the court not disclose her whereabouts if she is not living with the abuser.

The protection afforded by the Domestic Violence Act is available to those in heterosexual or same-sex relationships. It also covers adult and child members of both the immediate and extended family.

Another innovation of the Domestic Violence Act is how it has effectively ensured that domestic violence is now the responsibility of the police. The Act compels police officers to intervene in situations of domestic violence and to follow the national instruction, which includes informing women of their rights to lay criminal charges and obtain a protection order; helping women find medical treatment when they are injured or shelter in the event of further risk; and supplying a protective escort to women wishing to collect their belongings. Failure on the part of the police to meet their obligations may result in the officer(s) concerned being charged with misconduct.

**Criminal Law Amendment Act (No. 105 of 1997)**

This Act makes provision for the setting aside of all sentences of death and also imposes minimum sentences for rape among other categories of crimes (Criminal Law Amendment Act No. 105 of 1997, 1997). Those convicted of raping girls under the age of 16, physically disabled women or mentally ill women should be sentenced to life imprisonment, as should those who rape the same victim more than once, inflict grievous bodily harm on the victim, participate in gang rape, or who rape knowing that they are HIV-positive or have AIDS. Those who have been convicted of two or more rapes should also be sentenced to life imprisonment. Only the presence of “compelling or substantial circumstances” allows for imposition of a lesser sentence (and these circumstances have not been statutorily defined).

According to research investigating the impact of this piece of legislation, the Act has created a distinction in the severity of sentence for child rape which did not exist in the past. Before the amendments were introduced, there was no statistically
significant difference in the length of sentence handed down for the rape of women and girls of different ages. After the Act was introduced, those convicted of raping girls under the age of 12 received significantly more severe sentences than those raping older women and girls. Overall, the effective median years of imprisonment for rape increased from eight to ten years (Paschke & Sherwin, 2000).

The same piece of legislation also imposes life sentences on those who commit planned or premeditated murder. This has had particularly severe consequences for those women who kill abusive partners, a matter we take up in the latter part of this section.

**Bail legislation**
Bail legislation has undergone numerous amendments since 1994. The interim Constitution confirms the right of an accused person to be released on bail, but because of the apparent leniency with which accused persons were being released, the Criminal Procedure Second Amendment Act 85 of 1997 specified stricter criteria for bail, including provisions for specific offences such as sexual offences. Both the SAPS and the National Prosecuting Authority have been issued with national policy that directs investigators and prosecutors to apply careful consideration in bail applications for sexual violence cases because of the nature of the offence. These include taking cognisance of the close relationship that often exists between the perpetrator and the victim, and the potential of threats to and intimidation of witnesses. They are also instructed to consult with the victim prior to the bail hearing and to inform her of the outcome. However, the recent research report by the Consortium on Gender Equality has identified many constraints in the implementation of this legislation, and recommendations for interventions at various levels are offered (Barday & Combrinck, 2002).

**Proposed Bill on Compulsory Testing of Alleged Rapists for HIV**
This Bill arose out of research conducted by the South African Law Commission into the question of whether or not it is possible to introduce legislation to provide for compulsory testing of sexual offenders for HIV. Should the Bill come into effect, it will permit a rape victim (or person acting on their behalf) who has reported the attack to the police to apply to a court to have the alleged rapist tested for HIV (South African Law Commission, undated). The application should be brought within fifty days of the rape having taken place. The results of the test may only be made known to the victim and alleged perpetrator and cannot be used as evidence in either civil or criminal matters arising from the rape.

The Commission claims that this process will benefit rape survivors in at least two ways: not only might this knowledge give women some peace of mind about their attackers’ HIV status, it should also assist them to make important choices around the use of antiretroviral drugs and safer sex practices.

**Sexual Offences Bill**
See earlier discussion on Sexual Law Reform.
Specialist structures established to address gender-based violence

Family Courts
Five pilot Family Court centres were established in 1997, one of the premier projects prioritised by Justice Vision 2000. Services offered at all of these courts include divorce, maintenance, domestic violence and a children's court. However, a report notes that at least two of these courts, Johannesburg and Cape Town, are located in unsuitable premises (Department of Justice & Constitutional Development, 2002b). Concerns about safety were also expressed since prisoners and those standing trial were sharing the same entrance to the building as users of the Family Court. The report concludes that most of the pilot family courts were not offering integrated services, nor was their approach to these services identical. At the time of writing, they were being reviewed with a view to strengthening existing services.

Sexual Offences Courts
The first specialised rape court was opened in Wynberg in the Western Cape in 1993. In 1999 it was announced in the Mail and Guardian (Smith, 1999) that a further 18 rape courts were to be set up nationally and be fully operational by April 2000. According to the blueprint for Sexual Offences Courts developed by the SOCA Unit, the objectives of establishing such courts are to increase the rate of reporting of rape, to improve conviction rates for rape, to reduce secondary victimisation, and to reduce the turnaround time for finalisation of cases.

Eight criteria need to be met in order to qualify a court as a Sexual Offences Court, including a minimum of two dedicated and experienced prosecutors per court; dedicated magistrates; counselling services, intermediaries and victim assistant services; case managers and administrative support; and special courts which should include closed-circuit television cameras, waiting rooms located away from suspects, private consultation areas and anatomical dolls. Twenty eight courts are in operation around the country at the time of writing, but not all meet blueprint standards and are described instead as dedicated courts, meaning that they meet some but not all of these requirements (P. Smith, personal communication, 3 March 2003). An associated initiative with the Department of Health has been the establishment of the multidisciplinary care centre, Thuthuzela, at the G. F. Jooste Hospital in Manenberg, Western Cape (see Table 4).

Family Violence, Child Protection and Sexual Offences Units
These units evolved out of the Child Protection Units first set up in 1986. By 2000, a total of 15 had been set up nationally. A further 27 Child Protection Units exist, as well as 4 Indecent Crimes Units. In addition, specialised individuals located in 156 smaller towns around the country deal with crimes against children, as well as the localised incidence of sexual crimes (South African Society for the Prevention of Child Abuse and Neglect, undated).

Sexual Offences and Community Affairs Unit
The SOCA Unit is a recent innovation of the Department of Justice and was established to deal with cases of rape, domestic violence, maintenance and child justice. It is responsible for establishing the Sexual Offences Courts and has also provided training around both domestic violence and rape (Department of Justice & Constitutional Development, USAID & BAC, 2002).
Performance of the criminal justice system

The Department of Justice has been candid in describing its shortcomings, stating that it is characterised by “huge bureaucratic inefficiencies, wastefulness, not obtaining value for money for the resources it has deployed” and showing “no urgency and persistent customer dissatisfaction for inferior services” (Department of Justice & Constitutional Development, 2002a, n.p.). Some of the ineffective implementation of programmes and legislation addressing violence against women results from the haphazard functioning of the Department overall. Limited resources have also played a large role. The fate of rape cases in the criminal justice system in 2000 and performance of the implementation of the Domestic Violence Act are described in Table 5.

CONCLUSION

Intimate partner violence is indeed prevalent in South Africa. In the last five years an increase in research has described the scope of the problem, but most studies continue to warn that the true prevalence is likely to be much higher. Although it was not within the scope of this chapter to review risk factors for gender-based violence and its health impact, both of these areas are critical in the development of effective public health intervention. Some critical work has been done in describing the risk factors, but very little has been done on the impact of the violence on the health of South African women. Given the size of the problem, future research agendas should consider this a critical aspect of explaining the impact of this public health problem.

Health sector responses have been sadly lacking, and have only received attention within the last two years. These responses have been led mainly by advocates outside government in response to the HIV epidemic, and as a result sexual violence has received the most attention. In addition, strategies have been focused on treating victims in the aftermath of an assault (mainly sexual violence); a comprehensive national strategy, with health as a key component of addressing violence against women, has not emerged. However, efforts by organisations such as SAGBVIH and the Department of Health to address this gap are a step in the right direction.

The criminal justice system has made the most progress towards meeting its constitutional mandate to address violence against women. However, the preponderance of criminal justice interventions has resulted in gender-based violence being framed as a problem of criminal law and procedure, police investigation, and appropriate counselling programmes for both victims and perpetrators. Again, this approach emphasises amelioration rather than prevention.

The impact of the projects, programmes, policies and legislation developed at various levels were not as expected. Many of these initiatives were set up to fail because proper costing had not been done beforehand or because they were not adequately resourced.

Globally, the health sector is emerging as an important role-player in the multi-sectoral response to the prevention and management of violence against women. This is clearly seen in South Africa as well, with the emergence within the last year of new policies that place duties on the health system and health care practitioners...
regarding the management of this problem. The challenge for the South African health sector is to ensure that it does not fail women – it must develop effective responsive partnerships and strategies to meet the needs of women that experience violence.

REFERENCES


Overview of gender-based violence


5  Gun violence in South Africa

Margaret Keegan1, 2
Gun Free South Africa

While people speak of many forms of violence - domestic violence, community violence, communal violence, gang violence - gun violence is the only term in common use that refers to the type of weapon used. This reflects the increasing role that guns have come to play in the different kinds of violence that confront us globally, and the fact that firearms - because of their easy use and lethality - have an extreme impact in situations in which they are used.3

This chapter attempts to provide an overview of recent literature on gun violence, particularly as it occurs in South Africa. It is not intended to be an academic treatise, but a guide to some of the more central data and arguments that are currently shaping debates. It looks at the incidence of gun violence and explores factors that are prompting the increased circulation of firearms. It summarises recent arguments about the cost of gun violence and its impact on development. It then focuses on key issues, including the impact of gun violence on youth and women, and concludes with a call for coordinated programmes by different government departments to address the symptoms and root causes of gun violence.

THE INTERNATIONAL PICTURE

The 2001 Small Arms Survey estimates that globally at least half a million people are killed each year by small arms and light weapons - about one death every minute. It notes that:

[Victims] die in an astonishingly diverse number of ways: as combatants in internal and inter-state wars; as participants in gang fights and criminal battles; as casualties of government-sponsored or -condoned violence and terror; as innocent civilians trapped in deadly wars and social conflicts; and as victims of suicide, homicide, or random acts of violence (Graduate Institute on International Studies, 2001, p.1).

1 To whom correspondence should be addressed.
2 The opinions given in this chapter reflect the author's views and not necessarily those of Gun Free South Africa.
3 The terms firearms and guns are used interchangeably in this chapter. According to Gove (1986) a firearm is a weapon from which a shot is discharged by gun powder. The word gun seems older, dating back to Middle English, and includes various items, including a mounted weapon. It also refers to a portable firearm (as a rifle, shotgun, carbine, pistol) which is the meaning given to the term here. Small arms is slightly broader and refers to both commercial and military firearms up to the size of light machine guns. Light weapons are larger and include heavy machine guns, hand-held under-barrel and mounted grenade launchers, portable anti-tank and anti-aircraft guns, portable launchers of anti-tank and anti-aircraft missile systems and mortars of less than 100 mm calibre (Graduate Institute on International Studies, 2001).
More die annually because of small arms and light weapons, the study adds, than the number of deaths in almost all recent wars. In view of this, it argues that small arms and light weapons are “the real weapons of mass destruction” (Graduate Institute on International Studies, 2001, p. 1).

COMPARATIVE INCIDENCE

South Africa has a high incidence of gun violence compared to the rest of the world. A 1998 United Nations (UN) study of firearm-related violence in 69 countries found that South Africa had the second highest firearm homicide rate, at 26.3 per 100,000, second only to Colombia at 53 per 100,000. This compared very unfavourably, for example, with Germany, where the UN reported a firearm homicide rate of 0.21 per 100,000, or even the more heavily armed United States at 6.24 per 100,000 (1998, pp. 108-9).

Unfortunately, South Africa displays most of the risk factors for gun violence. In terms of global patterns, South Africa is a low- to middle-income country, one of a group of nations whose rate of violent death is more than twice that of high-income countries. It also fits in with the continental patterns. According to the World Health Organisation (WHO), countries in Africa and South America experience far more deaths as a result of homicide than their European and South East Asian counterparts (which, however, experience more deaths by suicide) (2002, p. 10).

South Africa is also a post-conflict society. Conflicts create problems that outlast the signing of peace agreements. Conflict changes socio-cultural behaviour, which cannot simply revert to pre-war patterns after peace has been restored. Moreover, weapons outlive conflict, and their presence creates a continuous risk that they will be used in future political struggles or in crime (Amnesty International and Oxfam, 2003).

Finally, South Africa is a society in transition. Shaw (1998) found that countries in transition to democracy tend to experience increasing crime. This is because as oppressive systems of policing and the ideologies that underpin authoritarian rule give way, gaps are created where criminal activity can flourish. It takes time to establish new practices in the criminal justice system and new social mores that are better suited to democracy.

Even so, South Africa experiences greater gun violence than other countries undergoing similar change. This must be acknowledged if we are to take the kind of long-term and inter-departmental approaches that are required to stem the tide.

RECENT TRENDS IN SOUTH AFRICA

Between 1994/5 and 2001/2, violent crime in South Africa increased by 33% (Masuku, 2003, p. 18) (Table 1). The crime rate rose particularly rapidly between 1997 and 2001, and began to level off or ‘stabilise’ thereafter. Masuku noted that while ‘stabilisation’ is an important trend, “overall crime rates remain very high” (2003, p. 17).
Police statistics do not disaggregate violent crimes that involved firearms from violent crimes that did not. However, commentators report that firearms are prevalent in most categories of violent crime (Meek, 2002). Masuku (2002, p. 6) found that:

Firearms are used in most violent crimes reported to the police. About 10 854 (49%) of murders recorded by the police in 2000 were committed with a firearm. The trend for attempted murder is quite different. 21 967 of 29 418 attempted murders (75%) recorded by the police involved the use of a firearm, as did 80% of 110 590 serious robberies reported in 2000.

Murder trends differ slightly from those for other violent crimes. The number of murders in South Africa fell steadily from 26 832 in 1994 to 22 030 in 2000. However, murders involving firearms went against the norm and actually rose in number from 11 134 in 1994 to 12 011 in 1999 (Table 2). They only began to fall in 2000 (Gun Free South Africa, 2002).

Beneath these statistics an important transition was occurring, as firearms supplanted knives and other objects to become the most common weapon used in murder. This was confirmed by the National Injury Mortality Surveillance System (NIMSS). The NIMSS Second Annual Report found that, in 2000, “among homicides, roughly half the victims died from firearms, one-third from sharp instruments, and a further one-tenth from blunt objects” (Burrows, Bowman, Matzopoulos & Van Niekerk, 2001, p. 41).

Table 1: Violent crime in South Africa

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994/4:</td>
<td>360 110</td>
</tr>
<tr>
<td>1995/6:</td>
<td>654 907</td>
</tr>
<tr>
<td>1996/7:</td>
<td>656 195</td>
</tr>
<tr>
<td>1997/8:</td>
<td>668 223</td>
</tr>
<tr>
<td>1998/9:</td>
<td>702 981</td>
</tr>
<tr>
<td>2000/1:</td>
<td>830 294</td>
</tr>
<tr>
<td>2001/2:</td>
<td>839 641</td>
</tr>
</tbody>
</table>


Table 2: Number of murders with firearms 1994 – 2000

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total murders</td>
<td>26 832</td>
<td>26 637</td>
<td>25 782</td>
<td>24 588</td>
<td>24 075</td>
<td>24 210</td>
<td>22 030</td>
</tr>
<tr>
<td>Murder with firearm</td>
<td>11 134</td>
<td>11 056</td>
<td>11 394</td>
<td>11 224</td>
<td>12 298</td>
<td>12 011</td>
<td>10 854</td>
</tr>
<tr>
<td>Firearm murders as a % of the total</td>
<td>41.5%</td>
<td>41.5%</td>
<td>44.2%</td>
<td>45.6%</td>
<td>49.4%</td>
<td>49.6%</td>
<td>49.3%</td>
</tr>
</tbody>
</table>

Source: Gun Free South Africa (2003)
Gun violence

12). The NIMSS Third Annual Report reported exactly the same pattern in 2001 (Matzopoulos, 2002). In 2000 NIMSS analysts found that “firearms overshadowed all other external causes [of death due to accident or injury] and accounted for 28% of all cases. The total of 5201 firearm deaths [in the study] was greater than the 4315 deaths due to all motor vehicle collision (MVC) categories combined” (Burrows et al., 2001, p. iii). In 2001 NIMSS reported “for both sexes, gunshots were the major external cause of death,” once again exceeding all categories of motor vehicle collisions combined (Matzopoulos, 2002, p. 15).

Clearly the availability and use of firearms is a significant factor, fuelling the high levels of crime and violence in South Africa.

Underlying factors
The causes of mounting gun violence are complex, linking South Africa’s past of violence and racial exploitation to its present of high unemployment and unequal distribution of resources. It is important to look at some of the key factors at work.

Firstly, the ‘new’ South Africa inherited a complex gun culture, steeped in centuries of low-level to openly violent conflict, and linking masculine identity to guns. Gun-related violence reached particular intensity in the early 1990s as the apartheid government unleashed a violent ‘third force’, and many communities responded by forming armed self-defence units (Truth and Reconciliation Commission, 2003). The new government has worked to suppress the more violent facets of this culture. However, deep social anxiety remains, for social identities and traditional values and practices have been disrupted and breached, but not yet fully replaced (Cock, 2001).

Secondly, since 1994 international crime syndicates have set up operations in South Africa (Haefele, 2003; Kinnes, 2000). From the early 1980s the growth of international drug syndicates, linked particularly to the sale of crack cocaine, resulted in a surge of gun violence in countries ranging from the United States to Brazil (Dowdney, 2002). Drug cartels looked to South Africa as an emerging market and, from 1994, began operations in the country, exploiting the new government’s relative inexperience in dealing with drug and other international syndicates. A wide range of international syndicates now operates in South Africa, including Nigerian cocaine cartels, Chinese triads, Moroccan protection gangs and others (Kinnes, 2000).

This has resulted in the emergence of particularly vicious forms of criminal violence - whether at the hands of gangs selling Mandrax in the Western Cape or syndicates engaged in hijackings in Gauteng - that uses guns to intimidate and control. Violence in such instances can be purposefully ruthless.

Thirdly, ready access to unlicensed or stolen guns creates opportunities for people to use firearms in other crime (see Box 1). Cock (2001) argues that widespread poverty and the high unemployment rate have contributed to the “commoditisation of violence” as increasing numbers of people come to rely on criminal violence as a means of livelihood. “A hungry stomach,” one informant told her, “knows no law” (Cock, 2001, p. 44). In such instances, firearms become preferred ‘tools of the trade’ - for example in armed robbery.
Gun violence

Ready access to firearms seems to have had a direct impact on rising crime levels by making crime a viable option for youth or others who, in the face of high unemployment, feel that they have few marketable skills. However, this begs the question of why and how individuals ultimately decide to take up violent crime (see 'Youth strategies' below).

Fourthly, more and more ordinary people may be acquiring guns in response to rising levels of crime and violence (see Table 3). It seems that until 1999 only a small fraction of Africans or ‘coloureds’ owned firearms or believed that a firearm made you safe (see Table 4). However, a groundbreaking study by the Institute for Security Studies (ISS) has shown that this pattern is changing (Jefferson, 2001).

Table 3. Firearm ownership in South Africa by race

<table>
<thead>
<tr>
<th>Race</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>2%</td>
<td>98%</td>
</tr>
<tr>
<td>Coloured</td>
<td>3%</td>
<td>97%</td>
</tr>
<tr>
<td>Indian</td>
<td>11%</td>
<td>89%</td>
</tr>
<tr>
<td>White</td>
<td>37%</td>
<td>63%</td>
</tr>
<tr>
<td>Total</td>
<td>7%</td>
<td>93%</td>
</tr>
</tbody>
</table>

Source: Chetty (2000)

Table 4. Perceptions of whether a gun makes one safer or more at risk

<table>
<thead>
<tr>
<th>Race</th>
<th>Very safe</th>
<th>Safe</th>
<th>Neither safe nor unsafe</th>
<th>At risk</th>
<th>Very at risk</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>10%</td>
<td>19%</td>
<td>12%</td>
<td>23%</td>
<td>31%</td>
<td>6%</td>
</tr>
<tr>
<td>Coloured</td>
<td>6%</td>
<td>16%</td>
<td>21%</td>
<td>25%</td>
<td>26%</td>
<td>7%</td>
</tr>
<tr>
<td>Indian</td>
<td>7%</td>
<td>12%</td>
<td>6%</td>
<td>22%</td>
<td>43%</td>
<td>11%</td>
</tr>
<tr>
<td>White</td>
<td>10%</td>
<td>32%</td>
<td>13%</td>
<td>20%</td>
<td>23%</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>10%</td>
<td>20%</td>
<td>12%</td>
<td>23%</td>
<td>29%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Source: Chetty (2000)

Box 1: Legal and illegal guns in South Africa

By 1999 the Central Firearms Register had issued 3.5 million firearms licences to private individuals, or 106 firearms for every 1000 people. About 1.4 million people had licences for one gun each, while just under 700 000 had licences for two or more guns (Chetty, 2000, p. 38). About two-thirds of these firearms (or roughly 2.5 million) were pistols, revolvers and shotguns, which may be best suited for self-defence purposes. The remainder were rifles, which might be best suited for sports shooting and hunting (Gun Free South Africa, 2002). Currently, the Central Firearms Register receives about 14 000 applications for new firearm licences each month, the vast majority (73%) for self-defence (Mistri, Minnaar, Redpath & Dhlamini, 2003, p. 46). Current estimates are that there are 500 000 illegal firearms in the country. This is very much a ‘working’ number. No one knows how many illegal guns there really are, how many of these are used primarily for self-protection, or how many are used in crime.
The ISS surveyed residents in three communities - KwaMashu in Kwazulu-Natal, Tsolo-Qumbo in the Eastern Cape and Lekoa-Vaal in Gauteng - and found that there was an increasing prevalence of firearms in each. Most attributed this to the youth, who were the group most often seen carrying firearms, particularly those youth who were involved in gangs (Jefferson, 2001). Most of the people interviewed wanted to live in a community without firearms: 88% in the Lekoa-Vaal region, for example, argued that guns cause more violence than they prevent (Meek, 1998). Still, 40% said that they were willing to own a gun because they were worried about rising crime and violence, even though 80% said that they would encourage gun-owning friends to get rid of their firearms if the security situation improved (Jefferson, 2001).

What is happening may resemble what Blumstein calls a community ‘arms race’, whereby “more guns in the community increase the incentive for the next person to arm himself” (2002, p. 41). Gun Free South Africa’s work in communities has picked up this trend (Gun Free South Africa, 2000). While a majority of South Africans may see gun ownership as a risk or even as a great risk, attitudes are softening in the face of perceived increases in levels of crime and violence. However, only additional research can confirm whether and to what extent this is occurring.

Those who advocate gun ownership might see this as a positive development - enhancing the capacity of individuals to protect themselves against criminals. However, no concrete research supports this proposition. In contrast, Altbeker (2000) found that when people carrying guns are the victims of crime, most by far have their guns stolen, and only a small minority succeed in using their firearms to protect themselves. Similarly, international research indicates that the presence of firearms may in fact put people at greater risk - by introducing the possibility of firearm accidents, suicide, or the use of guns in domestic violence in the home (Kellerman, Rivara, Rushforth, Banton, Reay, Francisco et al., 1993; Wintemute, Parham, Beaumont, Wright & Drake, 1999).

Indeed, there is increasing concern that the proliferation of firearms in communities is increasing the number of firearm accidents, suicides and deaths within the contexts of domestic, community and interpersonal violence. Although firearms are only one of a large range or weapons, they are lethal instruments. Blumstein noted that “with guns even transitory violent impulses can have lethal consequences” (2002, p. 8).

This seems to be reflected in police statistics. The SAPS analysed thousands of 2002/3 murder dockets and discovered that in half of the cases the perpetrator was either a partner, family member or friend of the victim. Moreover, “a majority of 56% of murders started as an argument, which degenerated into a fight and then an assault. The assault subsequently went wrong and ended up in murder” (National Commissioner of Police, 2003, Part 6, p. 7). Guns were involved in 54% of these murder cases.

**Regional and area differences**

There are significant differences between and within regions. The NIMSS Third Annual Report looked at the estimated crude mortality and homicide rates (or deaths per 100 000 people) for five areas and found significant variations (see Table 5). The figures suggest that firearm-related crimes are more of an urban phenomenon than a rural one - although Kwazulu-Natal may be the exception to the rule - and that they are most common in large urban centres.
This is supported by the ISS rural victim survey (Pelser, Louw & Ntuli, 2000), where researchers interviewed 756 crime victims living in African settlements in over 40 magisterial districts in the Eastern Cape, KwaZulu-Natal, Mpumalanga, Limpopo, North West and Free State. The survey found that property crimes, especially stock theft and burglary, were far more prevalent in rural areas than violent crimes. However, far more research is needed to confirm this pattern.

Finally, there may be significant differences within regions. The Institute of Criminology at the University of Cape Town looked at the kinds and prevalences of crime that occurred between 1994 and 1998 along a single corridor in Cape Town: stretching from the prosperous suburb of Claremont, through the ganglands of Hanover Park and Manenberg, to informal settlements in Phillipi. It found that there was a higher incidence of property and commercial crime in the wealthy suburbs. In the poorer, informal settlements violent crime predominated; at the time of the research these communities were the epicentre of taxi violence, although armed robbery was the fastest growing crime. A slightly higher than normal rate of violent and property crime occurred in the ganglands in the middle, but these areas were more significantly affected by the activities of street gangs and intermittent gang turf wars (Institute of Criminology, 1999).

**THE COST OF GUN VIOLENCE**

In the past heated public debate over the right to possess firearms has overshadowed discussions about the impact of firearm violence on people and on development. Recently, however, activists have begun to challenge governments to implement effective gun control measures by highlighting the cost of gun violence. This new approach has motivated analysts to look in detail at the impact of gun violence - on human life, on communities and on governments (Muggah & Batchelor, 2002).

**Firearm-related deaths**

Police statistics indicate that between about 11 000 and 12 000 people in South Africa are murdered with firearms each year, or about 30 each day. We need to add to this the number of suicides committed using firearms and the number of accidental shootings each year, which seem to be far smaller in number, but not insignificant.

This is cause for great concern not only at a humanitarian level, but also because it affects South Africa's potential for development. Of special concern is the fact that the vast majority of victims (over 85%) are young men - potentially key actors in the
Gun violence impacts on the health care system not only because of the number of gunshot injuries that occur, but also because each one is so difficult to treat. Gunshot wounds require urgent and intense treatment. According to the Centre for Humanitarian Dialogue (CHD), Engelstad, an American facial trauma surgeon said “guns are extremely efficient at damaging soft tissue and causing massive loss of blood” (CHD, 2003, p. 7). They can also splinter bones (Van As, 2003). Moreover, “because a bullet leaves a tract of damage that usually crosses the entire body, these
wounds typically necessitate long and numerous procedures, [and] multiple days in the intensive care unit” (CHD, 2003, p. 7).

We do not know the overall national cost of treating gunshot wounds in South Africa. However, anecdotal evidence would suggest that it is very high. The initial cost of treating gunshot wounds may vary greatly, depending on the injury involved. However, the head of the Johannesburg General Hospital trauma unit reported in 1999 that treatment of gunshot victims admitted to Johannesburg General in 1998 alone may have cost R39 million (Gun Free South Africa, 1999b).

A cost analysis undertaken at Groote Schuur Hospital in Cape Town looked at how much the hospital spent on treating the 969 firearm-injured patients who presented at the hospital in 1993. The study looked at the cost per bed per day, as well as the cost of visits to the outpatient department, and so excluded costs arising from long-term management and rehabilitation. It was calculated that the 969 firearm-injured patients treated in 1993 cost Groote Schuur Hospital R3 858 331 (Peden & Van der Spuy, 1998).

These are simply two hospitals among a whole grid of day hospitals, provincial hospitals and private medical facilities and hospitals that are now treating gunshot wounds. In the light of this, a conservative estimate might be that initial treatment of gunshot injuries alone may cost the health care system tens if not hundreds of millions of rands each year.

To this must be added the cost of rehabilitating gunshot victims after the initial surgery. Engelstad reported that this cost could be very high (CHD, 2003, p. 8):

The rehabilitation of victims includes efforts to deal with amputated limbs, the loss of sensation from severed nerves, permanent physical disabilities, inhibited internal organ functions (such as the loss of the spleen, which necessitates daily antibiotics permanently) and digestion problems arising from the loss of sections of the bowels, amongst other issues.

This impacts not only on government, but also on families, who may go into debt to pay medical expenses. Gun Free South Africa spoke at length with 14 gunshot victims in Soweto in 1999. Their injuries ranged from paralysis (including quadriplegia, paraplegia, or paralysis of the limbs; and hemiplegia, or paralysis of one side of the body) to sensory disability (in this case, blindness) to limb amputation. All were severely challenged by coping with their disability and found this compounded by the high costs of medical care, including the costs of additional surgery, prescriptions, rehabilitation (including long-term physiotherapy) and nursing home care (Motaung & Taylor, 1999).

Any rise in the number of firearm injuries is bound to have a magnified impact on the health care system. There is good evidence that the number of firearm injuries is on the rise. Wigton (1999) looked at firearm-related injuries among children treated at Red Cross Children’s Hospital, Groote Schuur Hospital and Tygerberg Hospital in Cape Town between 1992 and 1996. She found that the incidence of firearm injuries among youth under 19 almost trebled during this period, from 20.2 per 100 000 in 1992 to 58.1 per 100 000 in 1996.
Dr Van As, who heads the Trauma Unit at Red Cross Hospital, concurred that the number of children admitted with gunshot wounds rose steeply between 1992 to 1995, and also noted that it has risen continuously albeit more gradually since then (Van As, 2003). Similarly, the head of the Trauma Unit at Johannesburg General Hospital, Professor Bolfard, reported in 1999 that gunshot victims had trebled over five years; 650 were admitted to that hospital in 1998 alone. Gunshot wounds, he said, had become the largest cause of quadriplegia (Gun Free South Africa, 1999b).

Engelstad noted that the treatment of gunshot wounds requires the expenditure of "enormous allotments of cash that could be channelled elsewhere" (CHD, 2003, p. 8). This has had a very negative impact on South Africa. The surge in gunshot injuries coincided with the transformation of the health care system, and in 1999 in particular pushed trauma wards in many city hospitals almost to breaking-point. Although hospitals now seem more able to cope, the growing number of firearm injuries siphons off critical resources that are badly needed elsewhere; for example, to help curb the HIV/AIDS pandemic or to further extend the provision of health care services into rural areas.

We also need to consider the impact of gun violence on health care workers who experience secondary trauma while treating increasing numbers of gunshot victims. At times these workers feel physically under siege because of the gun violence around them.

**Psychological impacts of gun violence**

Far more pervasive, but far less understood, are the psychological impacts of gun violence and the effect these are having on South African social relationships.

It seems that the fear of violence is very widespread and occurs even in communities where violent crime is not highly prevalent. Masuku reported (2002, p. 1):

Victim surveys generally show that violent crimes are of major concern to the public. The physical and emotional impact of these crimes is devastating for victims, their families and communities. The occurrence of these crimes, coupled with the fact that this subject dominates the news headlines, heightens public fear of crime. This creates misery for individuals and destabilises communities.

The situation is more complex in communities that experience high levels of gun violence. Guns fit into a diverse mix of experiences - in the home, on the street, in school or at work and in the media - where individuals encounter conflict, aggression or even violence on a regular or even daily basis. However, when incidents occur firearms have a different impact than fists, blunt objects or even knives, in that they can easily and quickly - often with a single pull of a trigger - cause death or serious injury. This exceptional lethality can be extremely disempowering for a victim because of the depth of the threat and the lack of opportunity to resist (Reich, Cultross & Behrman, 2002). As one woman put it, "You cannot run from a bullet" (Gun Control Alliance, 1999, n.p.). For survivors, this can deepen trauma and lengthen the time needed for recovery (L Devoux, personal communication, 2003).
Guns also have the capacity to “project fear” (Cook & Ludwig, 2002, p. 91). Firearms can kill at a distance and stray bullets may find accidental victims. A gun-related incident may traumatisé large numbers of passers-by who witness a shooting, even at a distance.

Finally, where people are repeatedly exposed to gun violence the perception of risk - that there is no safe place - can be heightened by the simple sound of gunfire (Cook & Ludwig, 2002). This may be particularly true in informal settlements, where bullets have been known to pass not only through windows, but also through walls and even roofs. In communities where there is chronic violence there is great potential for continuous traumatic stress, which can profoundly affect individuals (Dawes, 2003).

The impact can be multiple and complex - people exposed to gun violence can display a wide range of symptoms, including anxiety, sleeplessness, hyper-vigilance, avoidance, and marginalisation. These can result in lost motivation, lost capacity, illness, alcohol and drug abuse and involvement in other risk behaviour, including violence and crime.

Gun Free South Africa’s work in communities - for example, through its Youth and Guns workshops in Western Cape schools - has found that gun violence has a far wider and far deeper psychological impact than is commonly acknowledged, especially in communities with high rates of crime and interpersonal violence. Moreover, most people, especially in the poorest communities, go untreated. This creates the potential for a generational spiral of violence, with violence perpetuated by one generation stimulating violence in the next, particularly in communities where there already is poverty, unemployment and high levels of crime and violence (Dawes, 2003).

Indirect costs
Cook and Ludwig (2002) argue that most people are not really concerned about statistics - about how many people are killed or injured or the cost of gun violence. Most people are concerned about safety - about preventing gun violence from affecting them or their families, from damaging their businesses or intruding into their places of work. The authors note cynically that the concern is not with value of life, but with risk of death.

Preventing gun violence, they note, is a costly exercise both for government and for private citizens. However, both are willing to pay if it means reducing the threat. For government this includes the cost of securing premises - fencing schools, providing bullet-proof glass for clinics and hospitals, installing metal detectors and employing private security personnel to guard government buildings.

For private individuals and businesses this involves building high walls, installing burglar bars and anti-car theft devices, and hiring private security firms. In some areas there are even ‘walled communities’ where automatic gates or booms and full-time security guards restrict entry and exit. Significantly, the private security industry in South Africa is booming. The value of the industry grew from R1.2 billion in 1990 to R13 billion in 2000. By 2001 it already employed more personnel (with 190 000 active security officers) than the South African Police Service (with 112 000 personnel) (Security Officers Interim Board, 2001).
Cook and Ludwig (2002) argue that we can look even further, to the ‘flight to the suburbs’ and the impact on property prices. This is reflected in the depression of housing prices in ‘dangerous’ communities and the inflation of housing prices in ‘safe’ ones.

This, the Graduate Institute on International Studies argues, is a matter for great concern - “money spent on private security is diverted from productive or productivity-enhancing activities. Unproductive spending drains household (and corporate) savings, resulting in fewer resources for local investment” (Graduate Institute on International Studies, 2003, p. 139). Seen altogether, these costs are staggering.

**Cost to development**

The Graduate Institute on International Studies (2003, p. 128) argues that “small arms availability is a predisposing rather than a fundamental cause of underdevelopment. The misuse of small arms affects human capacities, such as health or education, and people’s ability to use their capacity in conditions of safety and security”.

This can be seen in a multiplicity of ways. Firstly, the increased use of guns in crime and interpersonal conflict increases the violence and lethality of these incidents. There are far-reaching consequences:

a) In the case of death, the cost of lost labour and lost earning power (which can have devastating consequences for families and communities).

b) In the case of injury, the cost to government, businesses and families of working hours lost to emergency and long-term rehabilitative treatment, and lost productive potential where there is permanent disablement or severe psychological distress.

In addition, there are further costs:

c) To health services of treating victims of gun violence.

d) To welfare services of supporting those who are permanently disabled.

e) To the police of upgrading capacity to respond to and investigate gun-related crimes.

f) To the courts of prosecuting the growing number of cases involving serious, violent crime.

g) To the prisons of maintaining increasing numbers of criminals for longer sentences.

Secondly, gun violence can lead to the potential decline in and even withdrawal of government services. As noted earlier, the increasing number of gun injuries drains urgently needed resources from the health care system. Gun violence also affects education, for gun-related incidents regularly occur in schools across the country, forcing at least temporary closure of the affected schools and disrupting education there. Other services can also be disrupted. In Cape Town in 2003, for example, gun incidents forced the closure of clinics, libraries and even community centres in various communities across the Cape Peninsula (P. Naidoo, personal communication, 2003).

Gun violence, then, is threatening key services that South Africa needs to develop and to enhance the quality of its people’s lives.
Moreover, it diverts resources away from development. Over the last few years, government spending on law and order has grown more rapidly than its spending on social services, despite the government’s commitment to reconstruction and development. In 2000/1, for example, the South African police budget was significantly higher than the health budget. In addition, “lower levels of [government] spending on social services,” the Small Arms Survey (Graduate Institute on International Studies, 2003, p. 145) stresses, “force people to spend their own savings. Lower levels of domestic savings reduce investment and ultimately affect national productivity”.

Thirdly, gun violence has direct economic effects. The Small Arms Survey (Graduate Institute on International Studies, 2003) could not establish a clear link between gun violence and international investment. Yet it did find that gun violence can threaten the activities of formal businesses and lead to the collapse of informal businesses in cities and rural areas. Of great concern too is the diversion of economic and human resources out of the legitimate economy and into crime.4

Fourthly, gun violence impacts in complex ways on “social capital,” or “the features of social organisation, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated action” (Graduate Institute on International Studies, 2003, p. 146; see also White, 2003). Firearms can lead to the misuse of social capital through membership in armed gangs, for example, or a surge in the incidence of domestic violence. More subtle is the impact on popular confidence in local conflict-resolution techniques, which can lead to deterioration in neighbourhood relations, to faction fighting and to community violence.

While part of this may be visible - for instance, the impact on health care or the impact on schools - far more “invidious and potentially of greater concern” are the limitations that gun violence puts on the choices available to people (Graduate Institute on International Studies, 2003, p. 156). These range from impaired trust, to decreased mobility, to the narrowing of economic opportunities. Clearly, gun violence negatively affects development in multiple and complex ways.

YOUTH AND GUNS
Death and injury
One of the most compelling issues for policy makers and the public overall is the impact that gun violence is having on youth. Each year between 1997 and 2001 about 800 children under 17 years old died in South Africa because of gunshot injuries. Gun violence is the ninth major cause of death due to accident or injury for infants under 1 year old. From there the ranking of firearms tragically climbs: to eighth position for children between 1 and 4; to sixth position for children between 5 and 9; to third position for children between 10 and 14; and to first position for people from 15 until 64 (Matzopoulos, 2002). Although even infants are at risk, it

4A recent report found that gangsterism is an ‘economy’ with a basic workforce in Cape Town of over 100 000. Entire communities on the Cape Flats are dependent on gangs. Of great concern, too, is the blurring of legitimate and criminal activities, with profits from the drug trade, the sex industry and loan-sharking, for example, being invested (or laundered) in legal business operations (Graduate Institute on International Studies, 2003; Haefele, 2003).
would seem that the more mobile and independent that children become, the more exposed they are to gun violence.

Van As (2003) looked at cases seen at Cape Town’s Red Cross Children’s Hospital over ten years. He found that children were shot most frequently in their own homes or in their yards. Second in frequency were children who were shot in the road or in a public place. A smaller number were shot in another person’s house or yard, and an even smaller number were shot at school or on a sports field. Upon reflection, it would seem that children are most at risk at home, in their yard or on the street where they play. Thus, places that should be safe for children to grow and learn in become places of great danger.

Van As found that most of the young gunshot victims came from Gugulethu, Hanover Park, Khayelitsha, Philippi and Bonteheuwel, areas with significant gang activity or high rates of violent crime. Most, Van As noted, were shot in crossfire. Second in frequency were children who were deliberately shot by adults (this moved up from sixth or seventh position to second place in 2002). Third were children shot while playing with guns; fourth and fifth were children shot in taxi wars or by gangsters; and sixth (and relatively infrequent) were children shot by another child or friend.

Children who witness gun violence
Children who witness gun violence or hear of incidents involving family or neighbours are also directly affected. This phenomenon may be far more widespread than is commonly acknowledged. Soul City (2000) interviewed 50 groups of children between 8 and 12 years old, from urban and rural backgrounds across the country, as well as across the race and cultural spectrum. Researchers were very disturbed to discover how widespread children’s experience of guns was and that most of the fears expressed by the children related to guns. The difference then may not be the fact but the extent of exposure.

Garbarino, Bradshaw and Vorrasi (2002) note that simply living in communities where gun violence is common can affect children’s development negatively, even if they do not directly witness the gun violence. However, direct exposure to gun violence can scar young people emotionally as well as physically. When children are exposed to gun violence in shared spaces such as neighbourhoods or schools, they are reminded of the trauma every time they pass the spot or enter the building where the shooting occurred. However, children exposed to gun violence in their own homes are at special risk of post-traumatic stress disorder, especially if the victim is a family member.

This is compounded when children are exposed to multiple incidents of violence:

The greater the intensity and frequency [of exposure], the more likely that the brain will form an ‘indelible internal representation’ of the trauma. Recurrent exposure to the trauma strengthens this response and lowers the child’s ability to deal with any type of trauma. The child’s brain becomes highly sensitive to threat and trauma-related cues, which in turn can affect his emotional and psychological wellbeing. Several studies have documented that children with a history of trauma develop a persistent, low-level fear, and respond to threats either with dissociation (separating certain ideas or
Exposure to gun violence can lead to a wide range of effects, including intrusive thoughts about violence, sleep disturbance, hyper-vigilance, withdrawal from significant relationships and survivor guilt. If left untreated, these can evolve into post-traumatic stress disorder, which in younger children can affect brain development. Young people may also experience pathological adaptations, including hopelessness, fatalistic thoughts, desensitisation to violence, truncated moral development, and high-risk behaviour such as alcohol or drug use, promiscuous sex or association with dangerous people.

Garbarino et al. (2002) believe that the psychological impact of gun violence can be particularly severe if it occurs during early childhood or early adolescence. Studies in the United States have found that when children under the age of 11 are exposed to gun violence, they are three times more likely to experience post-traumatic stress disorder than children over the age of 12. However, teenagers may feel another range of emotions, including survivor guilt, anger and desire for revenge.

Adolescents may also create protective barriers by joining gangs or arming themselves with knives or guns. Some youth may perceive gun violence as attractive and emulate or copy crimes (Garbarino et al., 2002). This begins to explain what might otherwise seem a paradox: that while youth and young adults (especially from the age of 15 onwards) are the main victims of gun violence, they are also the main perpetrators.

Youth as perpetrators of gun violence
Youth play a prominent role in gun violence (Hennop et al., 2001) for a complex mix of reasons. These factors play out differently in each youth's life.

Firearm technology
One set of considerations is the nature and availability of firearms. "For much of the 20th century," McIntyre and Weiss argue (2003, p. 13), "weaponry was either too expensive and/or too heavy for children to handle". Technology changed that, and firearm manufacturers can now produce guns that are simple, light and easy for youth to use - and with the potential to maim or kill easily. Moreover, the "wholesale flooding of redundant, cheap, but efficient weapons" on the market has given youth easy access to firearms (McIntyre & Weiss, 2003, p. 16).

Economic factors
There is a further, more complex set of economic, social and cultural factors which play out in subtle patterns in each youth’s life. Perhaps the easiest to understand are the economic factors. Youth interviewed at the Ekupholeni Mental Health Centre pointed to poverty and unemployment as major factors that lead young people to take up crime:

Tsotsis [criminals] like us started talking about having old shoes and no money and they just said agh! Forget it, let’s take a gun and do crime (Clacherty & Kistner, 2001, p. 7).
It is not only poverty but also the social stigma attached to poverty that often marginalises youth, leaving them feeling isolated and ashamed, and convincing them to begin robbing people for money. There may be a progression from using a gun to alleviate immediate poverty to using it to get luxuries or substances such as alcohol and drugs. One Ekupholeni youth said:

They start by using a gun for groceries but then they get used to the money and then they buy clothes for them and their girlfriends. They also buy alcohol and dagga. They buy this because they want to forget their life and what they do with their gun (Clacherty & Kistner, 2001, p. 9).

**Social environment**

Far more complex is the child's social environment. The causes of interpersonal violence have individual, familial, community and cultural components. The power of each in shaping young lives changes as young people grow and develop (Dawes, 2003).

Of particular importance during infancy and early childhood (birth to 6 years of age) is a child's home environment, including relationships with caregivers, parenting and possible exposure to violence or abuse.

While this undoubtedly continues during middle childhood (7 to 12 years of age), the child's circle of peer and adult relationships expands, and experiences in school and relationships with friends and others outside the home become increasingly important. New issues arise, including the overall school experience, parental supervision, access to recreational facilities and possible exposure to anti-social behaviour, drugs and alcohol.

In young adolescence (13 to 17 years of age) family and school experiences continue to play an important role, but peers and peer pressure become highly influential. Peer group pressure can lead to a sense of inclusion or to withdrawal from accepted social interactions, marginalisation and exclusion (Clacherty & Kistner, 2001). Peer groups can oppose or encourage violent behaviour or participation in criminal activities. In addition, peer groups can open up access to high-risk activities like alcohol or drug use, or membership in gangs (Dawes, 2003).

It is important to remember that all of these relationships are played out in the real world, and structures that should be supporting the child can be compromised. For example, Dawes (2003) found that in some communities there is a preponderance of single-parent families, where stress factors can be high and where, because the parent works long hours, there are long periods without parental supervision. This situation is being exacerbated by the high preponderance of deaths due to AIDS (Palmary & Moat, 2003). Moreover, the presence of other factors can also undermine the capacity of a family to support the child, including severe poverty, alcoholism or drug abuse in the home, and domestic violence or child abuse.

Schools can also be compromised. “Schools worst affected by violence are likely to be in such a state of dysfunction, and the staff so traumatised by violence themselves, that sophisticated interventions simply won’t get off first base” (Dawes, 2003, p. 8). Moreover, the capacity of a school to provide support is curtailed when circumstances
force the child to leave school. On the one hand, domestic violence and child abuse can lead to frequent truancy. On the other, there can be a high dropout rate because of poverty, pregnancy, the illness of parents or the need to provide childcare for younger siblings (Palmary & Moat, 2003).

All of these factors play out in the broader community, where a child might be regularly exposed to violence. A key risk factor here is the presence of gangs. Recent studies argue that children living in areas where there is significant gang activity are exposed to a level of organised armed violence that approaches war (Dowdney, 2003). “Crime and banditry, urban gang-related violence and terrorism create environments in which youth are exposed to instability and physical danger and where communities face long-term consequences similar to those in wartime” (McIntyre & Weiss, 2003, p. 5). Moreover, gangs can be predatory in recruiting youth, mixing strategies of economic enticement with terror (McIntyre & Weiss, 2003).

In these circumstances guns can have a dramatic impact:

They can be used to threaten, coerce, or offer a sense of empowerment. More importantly, they can fuel the conflicts that keep violent groups in business, spur widespread displacement that can leave children vulnerable to recruitment and sustain local civilian demands for guns valued as hard currency (McIntyre & Weiss 2003, p. 5).

Cultural factors

Finally, we need seriously to consider the cultural factors that prompt youth to take up firearms; not only the messages conveyed on television and in arcade games, for example, but also those conveyed in our homes and on our streets. It is important to note that gun violence is highly gendered. Young men are the key perpetrators of gun violence. Moreover, although gun violence is most commonly perpetrated against other young men, it also spills over, intensifying the existing systemic violence against girls and women (Palmary & Moat, 2003).

Far more research needs to be done on the cultural messages being sent out about masculinity, indeed a complex issue given the diversity of South Africa culture and the variety of urban and rural settings in which different cultural messages are transmitted (Morrell, 2001). Still, messages must be sent out that challenge the perception that “when you carry a gun you feel like you are a human being” (Clacherty & Kistner, 2001, p. 13).

Youth strategies

Youth take up guns for a number of reasons. They obtain guns to engage in crime “to force people to give them money” (Clacherty & Kistner, 2001, p. 7). They obtain guns to solve problems, especially conflict. They obtain guns for self-defence, so that “people will listen to you and be scared of you” (Clacherty & Kistner, 2001, pp. 11-12). Moreover, they obtain guns for status: not only for clothes or wealth, but also to win dignity and respect.
If we are to develop effective programmes, McIntyre and Weiss argue, we must stop seeing youth simply as victims, but also as “actors and decision makers in violent environments, responding to the pressures, opportunities, norms and values of their societies” (2003, p.3). We need to acknowledge that “children and youth, in their resourcefulness, develop survival strategies that make use of violence in accordance with the social, economic and political pressures and opportunities presented in their environments” (McIntyre & Weiss, 2003, p.3).

Both Masuku (2002) of the ISS, and Palmary and Moat (2002) of the Centre for the Study of Violence and Reconciliation offer excellent, comprehensive recommendations for preventing and combating violence and criminality among youth. These merit serious consideration. Of special note, Palmary and Moat raise the need to address the “demand triggers” - or why youth want guns. Gun Free South Africa’s work with youth - for example, through its Firearm Free Zones School Pilot Project and its ‘Youth and Guns’ workshops in schools - has indeed found that by recognising that young people are active decision makers, we can effectively challenge and change their behaviour.

WOMEN AND GUNS

Very little is known about the impact of gun violence on women. The Medical Research Council is due to publish a seminal work on femicide in 2004, which may bring us far closer to understanding this. However, while we await that publication, three points are worth raising here.

First, while guns kill far fewer women than men, firearms are the most significant weapon used in femicide. In 2001, for example, guns were used in 42% of the cases of femicide reviewed by the NIMSS (Matzopoulos, 2002).

Second, media reports indicate that firearms are commonly used in domestic violence. However, research is urgently needed to identify the incidence and the impact of firearms in domestic conflicts and domestic violence.

In 1999 the Medical Research Council surveyed women in three provinces in an investigation of violence against women (Jewkes & Abrahams, 2000). It found that one in ten of the women surveyed had experienced physical violence or had been threatened with a weapon within the 12-month period before the survey. The study concluded that there were 74 firearm-related incidents of domestic violence per 100 000 women aged 18-49 in the Eastern Cape, and 47 firearm-related incidents of domestic violence per 100 000 women aged 18-49 in Mpumalanga. It found that a quarter of all the weapons used in violent incidents were guns. This is ten times the incidence reported in the United States (Jewkes & Abrahams, 2000).

Unfortunately, it is not clear whether these findings reflect broader trends. Moreover, we need to look at not only the use of firearms in domestic violence, but also their impact on domestic violence. The simple presence of a gun in a home, for example, can generate fear and intimidation when there is conflict in domestic relationships. Discussions with community workers in Cape Town found that at least some women
whose partners threaten them with guns held back from seeking protection orders or reporting this to the police, until they were certain that the relationship could no longer be salvaged. It is not clear why - whether this is due to fear or concern for the partner. It would be ironic if silence in such cases was a survival strategy (Ashby, 2003). This illustrates the complexity of the issue and the need for specific research on the impact of guns on domestic violence.

Third, urgent attention needs to be given to the impact that gun-related deaths have on women survivors. Women, like everyone else, are exposed to gun violence in their communities and suffer similar symptoms. However, the most profound suffering is caused by the loss of a family member as a result of gun violence or by actually witnessing the death of a family member, especially a child. This, arguably, is unique in the depth of psychological stress it produces (see Box 2).

There are few long-term, public support services to help women recover from such incidents. This leads to long-term private suffering, which impairs the ability of the family and the surrounding community to cope with the rigours of daily life and survival. In many communities the number of women living with trauma is very high, and increases each time there is another shooting incident, compounding conflict and compromising the ability of the family to function as a supportive structure.

Box 2: Bereavement

Masnoena Isaacs lost her husband when he was shot in his shop in Valhallah Park in 1995. In 1996 her sister’s daughter, to whom she was very close, was also murdered. “From being a fun-loving social person, she became listless and wouldn’t go out. She left the creche she worked at because she was scared she would hurt the children there. She shouted a lot at her own children. ‘It was as if a mountain had fallen around me,’ she said. ‘I lost my will. I just wanted to die.’ In all this time she couldn’t talk to anyone. It felt too overwhelming. I kept everything in for three years;’ she said. She entertained thoughts of suicide. ‘I wanted to throw myself under a train, but every time something stopped me. I just had to think about my children and what would happen to them.’ However, unlike many other women, Mrs Isaacs had access to bereavement counselling at the Trauma Centre in Cape Town, which allowed her to heal” (Viall, 21 March 2000, p.6). In the experience of Gun Free South Africa, many hundreds if not thousands of women suffer similar trauma but do not have access to any long-term counselling or support.

This poses two urgent challenges. First, we need to know far more about how this kind of bereavement impacts on the social fabric of communities - particularly communities experiencing high levels of violence. Second, we need to look creatively at ways to address this problem - particularly given the central role that women play in supporting families and in community transformation. Programmes such as Family and Marriage Society of South Africa’s (FAMSA) lay counsellor programme may begin to point the way.
CONCLUSION
The abuse of guns in South Africa has led to very high levels of violent crime and large numbers of deaths and injuries, as well as dysfunction at the family and community levels. It has diverted key resources from development and compromised service delivery. As a result, it constitutes a crisis area in any crime prevention strategy.

Urgent intervention is needed on at least three levels. First, there is a need to step up police interventions and to curb gun-related crime, as well as gang and interpersonal violence. Second, there is a need to implement the stricter licensing procedures required under the Firearms Control Act. This will reduce the possibility of guns being used negligently or in domestic violence. Third, there is an urgent need for effective public awareness campaigns:

a) To convince gun-owning parents to abide by the law and handle guns responsibly;
b) To explain to children and youth the real dangers that firearms pose; and
c) To inform the victims and potential victims of gun violence about their rights under the law.

Public awareness campaigns should be run on the scale of Arrive Alive to ensure that the message seeps into the public consciousness.

However, while we need programmes that address gun violence, we also need programmes to address its root causes. In terms of this, we need to view programmes relating to gun violence as part of a more general response to crime and violence in South Africa. Ideally, these would consist of the kind of long-term, integrated, inter-departmental approaches prescribed by the National Crime Prevention Strategy.

The only department actively engaged in this issue at present is the police. The SAPS prioritises the reduction of illegal firearms in communities and has run important programmes to this end. These have included, for example, Operation Sethunya, implemented this year to bring in illegal guns and promote responsible gun ownership, and, since May 2001, the regular destruction of surplus, redundant and obsolete weapons. Since May 2001 the SAPS and the South African National Defence Force (SANDF) have destroyed 400 000 firearms, permanently removing them from circulation. The police are currently considering other options as well, such as amnesties.

The police also have the potential to improve gun control quite dramatically by strictly implementing the provisions of the new Firearms Control Act. The Act will require people who wish to apply for firearm licences to pass tests on how much they know about using firearms and how much they know about the law. This may reduce negligent firearm use and accidents that result from improper storage of firearms. It will also require the police to do background checks. If properly implemented, this might curtail the use of firearms in community and domestic violence.

A study by the SAPS Crime Information Analysis Centre on firearm theft between 1996 and 1998 found that of the case dockets studied, only 27% of the guns had been stored in a safe and 13% were being carried in a holster. The rest were stored, for example, in cupboards or cabinets, on beds, in drawers, in briefcases and in cars. The study is discussed in Chetty (2000).
However, while the police must be encouraged in these important efforts, we need to acknowledge that their operations deal with the immediate problem and cannot address the root causes of crime and violence (Masuku, 2002). This chapter has shown that gun violence is complex and pervasive, and requires a holistic approach on the part of government and civil society.

It is imperative that diverse government departments (especially the Departments of Health, Education and Welfare) adopt sectoral strategies for addressing gun violence - including broad public awareness campaigns and more narrowly targeted projects - and that these strategies be geared towards national, provincial and local action.

Moreover, they must be run in close partnership with civil society organisations, not only to achieve local buy-in, but also to ensure that we change mindsets which fuel the escalation of gun ownership and gun violence in our communities. This is critical if we are to respond effectively to the challenge that guns pose in our society.

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Current perspectives on suicidal behaviour in South Africa

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SUICIDAL BEHAVIOUR WITHIN A GLOBAL CONTEXT
Suicidal behaviour remains a serious problem globally (Hawton & Van Heeringen, 2000; Lester, 2000; Wasserman, 2001; WHO, 1999a). The World Health Organisation (WHO) estimated that in the year 2000, approximately one million people worldwide would have died from suicide (WHO, 1999a). According to the same report (WHO, 1999a) there were about 10 to 20 times more non-fatal suicides estimated for that year, although in some regions non-fatal suicides could have been up to 40 times more frequent than fatal ones. The estimated fatal to non-fatal suicide ratio therefore ranged from 10:1 to 40:1. These figures represented one death every 40 seconds and one attempt every three seconds. On average, these statistics point to more people dying from suicide than from war, or in some instances than from other causes of death such as traffic accidents.

The WHO (1999a) figures further show that globally an increase has been observed in suicide rates, from 10.1 per 100 000 to 16 per 100 000 population between 1950 and 1995. This constitutes almost a 60% increase in 45 years, although researchers are alerted to the fact that the available data must be interpreted with caution because of variations in the reporting rates of the countries surveyed and the hidden burden of suicidal behaviour. Also, in countries with small populations a numerically small number of suicides can greatly modify reported rates, thus giving an inflated impression of increases or decreases in suicidal behaviour. Nevertheless, the trend reported in the increase of suicidal behaviour is not an artefact, and is observed in both ‘developed’ and ‘developing’ countries (Schlebusch & Bosch, 2000; WHO, 1999a, 1999b).

According to the WHO (1999a), during the 45 years noted above the highest fatal suicide rates have moved from the elderly towards younger people. Fifty-seven per cent of suicides are committed by people in the 35- to 44-year age group, for both males and females. This downward trend in the age of clinical populations in both absolute and relative terms has resulted in suicide being among the top five causes of death for both men and women in the younger age groups. During the same 45-year period the predominance of male over female suicide rates seems to have remained relatively constant, with only a minor increase from 3.2:1 (in 1950) to 3.6:1.

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(in 1995). An exception to this is in rural China, where the female rates are on average 1.3 times higher than those in males.

The WHO (1999a) figures also show that the highest suicide prevalence rates (i.e. over 30/100 000 of the population) occur in countries in the Baltic region. This region has more than twice the average global suicide prevalence rate of 16/100 000. Furthermore, the highest rates in the regions of Africa, the Americas, South-East Asia and the West Pacific are found in island countries, namely Mauritius, Cuba, Sri Lanka and Japan respectively. The exact meaning of these findings is unclear and requires further research. Interestingly, according to the WHO (1999a) figures, it is striking that one-quarter of all suicides in the world are committed in two countries only, namely China and India. In China alone, 20% of all suicides in the world are committed. This probably also reflects the size of the respective populations of these two countries (WHO, 1999a).

SUICIDAL BEHAVIOUR WITHIN THE SOUTH AFRICAN CONTEXT

Suicidal behaviour in South Africa is also inordinately high (Schlebusch & Bosch, 2000). Unfortunately, there are no past reliable data on the real dimension of the burden of suicidal behaviour in South Africa and indeed for the whole Africa region. The known figures may well record a bias because of under-reporting. Therefore, research-based limitations in terms of clinical and epidemiological trends prevent accurate analysis of such data (WHO, 1999b). As a result, in the Africa world region and in countries such as South Africa only general trend analyses are possible (Schlebusch, 2000a; WHO, 1999a).

Some research-based data on fatal suicides in South Africa are available from the South African National Injury Mortality Surveillance System (NIMSS). Information for this system is collated from existing investigative procedures at mortuaries, state forensic laboratories and courts. It is a collaborative effort between different research groups and government bodies in South Africa. The third NIMSS annual report was published recently (Matzopoulos, 2002), and contains information on deaths in 2001 which was gathered from 32 mortuaries in 6 provinces (Prinsloo, 2002a).

Earlier research (Schlebusch, 1988a, 1992a, 1995a) reveals remarkably divergent reported suicidal behaviour prevalence rates in South Africa. This is due to several reasons, including inconsistent and inadequate reporting of suicidal behaviour, as well as major historical socio-political and economic events that affected collection of accurate statistics on suicidal behaviour. This research included figures based on work influenced by pre-1994 apartheid policies (such as the legal segregation of ethnic groups). Nevertheless, available data do show that suicidal behaviour remains an area of significant public health concern in South Africa. As a result, research and service delivery in this area have attracted considerable interest for many decades. However, it needs to be emphasised that because of different sample sizes reported in research and for the years surveyed, results are not that readily comparable.
Schlebusch (2000a) noted that South African suicide rates have in the past been reported to range from 6/100 000 to 19/100 000 population, with an estimated non-fatal to fatal suicide ratio of between 8:1 and 20:1 (Schlebusch, 2000a), depending on when and where the sampling was done and which ethnic or other group was surveyed. In some groups the figures are higher - such as in the South African Police Services, with rates of 4/10 000. The South African ratio of fatal versus non-fatal suicides is thought to be 20:1 or higher, comparable to the WHO’s (1999a) globally reported ratios.

Lerer, Knobel and Matzopoulos (1995) found that approximately 7% of all non-natural deaths in Cape Town in 1993/4 were due to suicide, which is consistent with present national figures. In this study the suicide rate for whites was 20/100 000, while rates in blacks and coloured people were below comparable American baseline rates of 13/100 000. About two-thirds of all suicide cases were younger than 34. In comparison, a study on suicide patterns in the Pietermaritzburg area (KwaZulu-Natal province) found suicide rates for black South Africans to be 14/100 000 population (Wassenaar, Pillay, Descoins, Goltman & Naidoo, 2000). This study also dispels the myth that suicide is rare among black South Africans, presenting data for this group which are considerably higher than earlier studies cited.

Studies quoted by the WHO (1999b) show that in South Africa in 1990 the overall suicide rate was 17.2/100 000 population, which is higher than the WHO’s (1999a) reported world average of 16/100 000. This WHO report (1999b) also indicated that at the time in South Africa suicide accounted for about 8% of all non-natural deaths; whereas more recent NIMSS figures show that suicide accounted for about 10% of all non-natural deaths in South Africa (Prinsloo, 2002b). According to the above WHO report (1999b), at the time males predominated (79.2%) and the ethnic distribution was 43.3% blacks, 38.4% whites, 15.9% coloureds and 2% Asians (Indians). The average age of people who committed suicide was 36.3 years, consistent with the global situation of a shift from the elderly towards younger people (WHO, 1999a).

Research data extracted from the NIMSS for 1999-2000 (Burrows, Vaez, Butchart & Laflamme, 2003) shows that for Asians, blacks and coloureds, suicide was the third major contributor to deaths after homicide and unintentional causes, and that for whites suicide was the second leading cause of death after unintentional causes. The same study reports that during the period researched, suicide varied considerably across races and age groups; it was twice as high for whites as for Asians, and four times as high in whites as for coloureds and blacks. For all races suicides tended to occur in the younger age groups (15 to 34 years), except for in whites, who had fewer suicides in the 15- to 24-year age group and a fairly even spread across the rest of the age spectrum. A further breakdown by age is discussed in the section ‘Methods used in suicidal behaviour in South Africa’ below.

Available figures show that in South Africa whites are more likely to commit suicide than to be murdered. According to the NIMSS report (Matzopoulos, 2002), in 2001 26.7% of non-natural deaths reported for whites were due to suicide; 18.3% of those were due to homicide. Of those who die violent deaths, 80.5% are males, the majority being black (Padayachee, 2003; Prinsloo, 2002b). Overall, nearly five times more males than females commit suicide, the male/female ratio being 4.7:1 (Donson & Van Niekerk, 2002).
In 1994 the reported overall average crude South African death rate was about 4.9/1000 of the population per annum (Ntuli, Crisp, Clarke & Barron, 2000). For 2000 the non-natural deaths were estimated to be between 68 930 and 80 000 per annum (Prinsloo, 2002a). If we consider the fact that between 8% and 10% of all South African non-natural deaths were due to suicides, it means a significant loss of lives as a result of suicides in relation to the approximate population of the country, which in 2000 was 43 291 441 (Matzopoulos, 2002; Ntuli et al., 2000). This tragic situation excludes figures based on non-fatal suicides, for which no accurate statistics are available since there has been no systematic collection of data, and information concerning this self-destructive phenomenon is mostly derived from ad hoc studies (Schlebusch & Bosch, 2000). However, the picture is equally alarming, since for every fatal suicide it is estimated that there are at least 20 (sometimes more) non-fatal suicides (Schlebusch, 2000a).

Studies show that between 10% (Deonarain & Pillay, 2000) and 12% (Bosch, McGille & Noor Mohamed, 1995) of patients referred for psychological/psychiatric help are non-fatal suicides. Given the high fatal suicide prevalence rate of at least 17.2/1000 (possibly more), and the equally high fatal:non-fatal suicide ratio, the South African situation has clearly reached serious proportions. According to the data mentioned here, and based on the most recent figure of 10% of non-natural deaths being fatal suicides, it can be estimated then that between 6893 and 8000 South Africans die of suicide annually, and that between 137 860 and 160 000 or more engage in non-fatal suicidal behaviour annually. This represents up to: (a) 667 deaths by suicide every month, 154 per week, 22 every day and virtually 1 every hour; and (b) 13 333 non-fatal suicides every month, 3077 per week, 438 every day and 18 per hour in South Africa. These figures refer to all age groups and do not distinguish between adults and young people. What is alarming is that they are based on various national and regional samples in which suicidal behaviours were recorded, and most likely reflect only a tip of the iceberg. With an overall average household size of 4.4 in 1996 (Ntuli et al., 2000), it means that a vast number of South Africans are directly affected by suicidal behaviour. This excludes those who are indirectly affected, such as family members outside the nuclear family, friends, schoolmates and work colleagues, and the community at large.

This disturbing profile of suicidal behaviour in South Africa is exacerbated by the emerging realisation that data reflecting prevalence rates for suicidal behaviour based on earlier reported figures (Schlebusch, 1988a, 1992a, 1995a; Schlebusch & Bosch, 2000) are an under-representation, frequently largely based on academic hospital statistics and apartheid era research. For example, in the past suicidal behaviour was under-researched among the majority black population, for whom lower rates were reported compared to other ethnic groups (such as whites, colureds and Indians).

Such earlier findings are contradicted by contemporary research (Burrows et al., 2003; Schlebusch, Vawda & Bosch, 2003), which shows that suicidal behaviour among black South Africans is a neglected, serious problem that is increasing. It has also been argued that this increase should be viewed as a genuine escalation of the problem, rather than simply as a reflection of improved recording practices over recent years in post-apartheid South Africa (Mkize, 1992; Schlebusch & Bosch, 2000; Schlebusch et al., 2003). This is also demonstrated by other reports that in South Africa 43.3% of all fatal suicides are among blacks (WHO, 1999b). According to the most recent research (Schlebusch et al., 2003), in some centres non-fatal suicidal
behaviour among black South Africans has seen an increase of up to 58.1% over a 10-year period.

Research has also found that suicidal behaviour in patients with a life-threatening disease such as cancer is a significant but poorly researched area in South Africa (Noor Mahomed, Schlebusch & Bosch, 2003). This is an important consideration given the fact that one in four South Africans will develop cancer and one in two is likely to know someone who has cancer (Schlebusch, 1999b). Further, sub-Saharan Africa is experiencing an HIV/AIDS pandemic. This includes South Africa (Schlebusch, Schweitzer & Bosch, 1998). The prevalence of suicidal behaviour in this group in South Africa is unknown, but likely to be significant. An increased likelihood of suicidal behaviour in HIV/AIDS patients has been found, and some researchers have reported a 36 times higher risk for suicidal behaviour in these patients compared to the general population (Van Dyk, 2001). Another disturbing feature is a reported correlation between HIV testing and suicidal ideation before the test results are known (Van Dyk, 2001). One of the few hospital-based studies in this regard (Noor Mahomed & Karim, 2000) also found that there is a higher risk for suicidal behaviour in HIV-positive patients compared to the general population.

Regarding age in those with non-fatal suicidal behaviour, an earlier general hospital-based study (Bosch, McGill & Noor Mahomed, 1995) identified the peak age to be between 20 and 29 years (41%). More recently, Deonarain and Pillay (2000) reported a mean age of 25 years for non-fatal suicidal behaviour in a general hospital sample.

CHILD AND ADOLESCENT SUICIDAL BEHAVIOUR IN SOUTH AFRICA

As is the case for adults, it is difficult to obtain accurate, reliable statistics on child and adolescent suicidal behaviour for South Africa. One can only arrive at an informed estimate of prevalence rates based on available research findings.

Several studies reported at South African suicide conferences (Schlebusch, 1988a, 1992a, 1995a; Schlebusch & Bosch, 2000) have noted that up to about one-third of all non-fatal suicidal behaviours involve children and adolescents. Noor Mohamed, Selmer and Bosch (2000) found that in young children the age peaked at 9 years (age range studied being 4 to 12 years). The Durban Parasuicide Study (DPS) findings noted that the child and adolescent group was the second most at-risk age group for non-fatal suicidal behaviour, after young adults (the DPS, a multicentre research-based intervention programme for suicidal behaviour, is more fully discussed at the end of this chapter). This was further confirmed by more recent hospital-based research (Schlebusch et al., 2003), which noted a sharp rise in suicidal behaviour in black generally, but also noted that 24.5% of the total sample of suicidal behaviour patients admitted to the hospital where the study was undertaken were black youths aged 18 years and younger. These findings and a male to female ratio of 1:2 for the adolescent group were comparable to those of earlier studies. Such findings have important implications for school-based suicide prevention programmes, as discussed later.

South African non-hospital-based studies have reported figures ranging from 4% of school children who expressed suicidal ideation to their school counsellors (Pillay,
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1995a), to 7.8% (Fisher, Ziervogel, Chalton & Robertson, 1992) of school children who have attempted suicide. Research conducted among a high school sample of black youths in the Eastern Cape region found that up to 47% had suicidal ideation (thoughts of harming themselves). Of these, 18% reported definite plans to commit suicide, while 5% indicated that they would kill themselves if they could. A further 24% had thoughts of self-harm, but felt that they would not act on these (Mayekiso & Mkize, 1995). These cohorts represented a group not usually seen in hospitals but who seek help and utilise services at their schools.

According to the recent NIMSS findings (Donson & Van Niekerk, 2002), the youngest fatal suicides in 2001 were 10 years old, but more fatal suicides occurred in the 15- to 19-year age group than in the 10- to 14-year group. As in non-fatal suicides in young people in South Africa, fatal suicide rates also reflect that more females (12%) in the 10- to 19-year age group commit suicide than males (7%) (Bradshaw, Masiteng & Nannan, 2000). This means that on average 9.5% of deaths in young people in South Africa are because of suicides, which - disturbingly - is as high as the adult suicide rate. While the reported adult suicide rates reflect more male suicides, it is interesting to note that more females among the young people of South Africa commit suicide. These findings require further research.

Other causes of death in this young age group are injuries (the most common cause overall, but especially in the 15- to 19-year age group for males); infectious diseases (most common in the 10- to 14-year age group); tuberculosis (the most common disease, followed by AIDS, in young females); and epilepsy. Generally speaking, gender-based violence; sexual risk-taking behaviour; alcohol abuse and high levels of general violence are the most important aetiological factors that affect the health of South African youth (Bradshaw et al., 2000). This has significant implications for suicidal behaviour.

Given such research findings, one can understand the severity of the problem in young people in South Africa. Statistics reflecting death by suicide, as well as problems with other suicidal behaviours and/or ideation, appear to be inordinately high in this age group.

METHODS USED IN SUICIDAL BEHAVIOUR IN SOUTH AFRICA

Fatal suicide
In a comprehensive international review Lester (2000) quotes selected South African studies that found firearms, hanging and poison ingestion to be common methods in suicidal behaviour. Several ethnic differences were found in the past in non-fatal and fatal suicides in some of the DPS research studies (Lerer et al., 1995). The latter Cape Town study (Lerer et al., 1995) showed that firearms and hanging were the methods of choice in 68% of suicides, while another study (Lerer, 1992) also noted the link between suicide, homicide and high blood alcohol concentration (BAC) levels, especially among women.
More recently, according to the WHO (1999b), hanging is the most frequently employed method (36.2%) in South African suicides, closely followed by shooting (35%), poisoning (9.8%), gassing (6.5%) and burning (4.1%).

According to the most recent NIMSS findings (Donson & Van Niekerk, 2002), in 2001 hanging (42.3%) and firearms (29.4%) were the major methods used in suicides, while poisoning with drugs and pesticides was used by 13.6% of suicides, and gassing by 7.1%. Other methods included the use of sharp objects, asphyxia, electrocution, drowning and falls (jumping off high areas). According to the same report, seasonal trends indicated that the use of poison peaked in March (11.5%). Hanging as a method peaked around July (9.7%), while the use of firearms was highest in April (9.9%). Although there was a noticeable trough in May, suicide appeared to increase towards the end of 2001.

Analysis of sex distribution in the same report showed that males accounted for 82.4% of suicides, in whom hanging (46.4%) and firearms (31.4%) were the major choice of method. In females most suicides were as a result of poisoning (35.1%) and hanging (22.7%). Hanging was the method of choice in the largest percentage of suicides among Asians, blacks and coloureds, while in whites firearms accounted for the largest percentage. Among victims aged 10-54 years hangings predominated, whereas in the 30- to 34-year age group use of firearms was highest. In the 25- to 29-year age group the use of poisoning was most common. For those aged 40-44 years gassing peaked as a method, whereas the highest numbers of burns and jumping were found in the 25- to 29- year age group (Donson & Van Niekerk, 2002).

This latest NIMSS report also revealed that in terms of day of the week, 18.3% of male suicides and 16.1% of female suicides occurred on Mondays. However, more than 40% of suicides occurred over weekends, 43.5% of male and 43.7% of female suicides. In terms of time of the day, most suicides were committed between 07h00 and 20h00. Female suicides peaked at 08h00 and at 16h00, while most male suicides also occurred at 08h00. Suicide did not have any major seasonal variations over the year (Donson & Van Niekerk, 2002).

One of the few South African studies (Cassimjee & Pillay, 2000) on suicidal behaviour in family practice found that the most common method used was substance overdose (63.63%), followed by fatal hanging (21.21%), firearms (9.09%) (fatal except in one case) and lacerations of the wrists (6.06%). Of the overdose patients, 60.06% used medication as their method of choice. A further breakdown showed that 30.3% used over-the-counter substances and 30.3% used prescription-only substances.

Non-fatal suicide

The findings from a large DPS study (Bosch et al., 1995) are in keeping with other studies, which found that overdosing on medication is one of the most common methods used in young people who present with non-fatal suicidal behaviour. It was emphasised by the authors that patients probably used the substances as a result of availability. This has also been noted in another South African investigation, which implicated availability in the choice of method; almost three-quarters of a sample of young self-poisoners used medicines belonging to family members in the same household (Pillay, 1988).
Collectively the DPS research showed that overall choice of method in non-fatal suicide behaviour is overdosing (90% of cases), followed by other forms of self-injury (10%). In the case of overdosing a wide variety of substances are ingested, but over-the-counter analgesics (painkillers), and prescription-only benzodiazepines (tranquillisers) and anti-depressants are most commonly used. Schlebusch (1987, 1992b, 1995b) argued strongly for better control of over-the-counter analgesics, which are common substances of abuse in South Africa. They feature in suicidal behaviour as well as in a variety of neuropsychological problems and serious diseases, such as analgesic nephropathy resulting in end-stage renal disease (Schlebusch, Lasich & Wessels, 1985).

In a recent cohort of hospital-based patients studied by members of the DPS group (Schlebusch et al., 2003), certain common non-fatal suicide methods emerged as a cause for concern, especially among blacks. These methods included self-poisoning by means of household utility liquids such as paraffin and various poisons in 40.4% of the patients seen. The same study reported that other potentially lethal methods such as hanging and lacerations to the throat accounted for 7.5% of suicide methods.

The choice of method used most frequently in all age groups, namely medicinal substances and poisons, is strongly influenced by a number of factors, including: (a) accessibility; (b) knowledge or lack thereof; (c) experience and familiarity; (d) meaning, symbolism and cultural influence; and (e) the potential suicidal person’s state of mind and level of intent.

The DPS research also supported the views that: (a) with repeated attempts, more severe and lethal methods may be used; and (b) there appears to be more recklessness in terms of securing help as the ongoing non-fatal suicidal behaviour does not get the desired effect from significant others on whom the suicidal behaviour is supposed to impact.

AETIOLOGY OF SUICIDAL BEHAVIOUR IN SOUTH AFRICA

Many of the research studies quoted so far have noted the role of family dynamics in suicidal behaviour. For example, one of the DPS investigations (Pillay, 1995a) found a significantly higher prevalence of family conflict as a recent stressor among suicidal adolescents compared to control subjects. In Cassimjee and Pillay’s (2000) study involving suicidal patients seen in general practice, the following causes were the most prominent: interpersonal, marital and partner-relational problems, family problems, financial problems, stress, examination problems at school or university, mental illness and incest. Such findings are in keeping with other studies (Schlebusch & Bosch, 2000) that found family problems and interpersonal conflicts to be common reasons given for suicidal behaviours. A frequent problem involves feelings of loss of support because of family change caused by parental separation, divorce and remarriage, and adverse parent-child interactions. Du Plessis and Schlebusch (1992) found that parental loss through divorce, and especially through parental bereavement, can be high risk factors in suicidal behaviour.
Other critical aetiological considerations are associated with family psychopathology (such as suicidal behaviour, substance abuse and other psychological disorders in the family), school-related and academic problems among young people, exposure to family violence, and child abuse (Noor Mahomed, Selmer & Bosch, 2000). Regarding sexual abuse, a study of university students with suicidal ideation and behaviours found that in 28.9% of those surveyed, 36.3% reported contact sexual abuse, and 63.7% reported non-contact sexual abuse such as exposure to exhibitionism and sexual requests (Collings, 1992). This study also identified other research that found a significant association between child sexual abuse and later self-destructive behaviour. From a cognitive behaviour therapy point of view it has long been known that dysfunctional cognitive schemata in children (i.e. more unhappy than happy memories) can lead to a vulnerability to depression and suicidal ideation and/or behaviour.

Pillay and Wassenaar (1997a) found pathological levels of inflexibility and cohesion in the family functioning of suicidal adolescents. Rigid problem-solving behaviour, over-controlling parenting styles, and a lack of tolerance for development or role changes were characteristic features of such families. Similarly, these families were found to be over-involved with and over-protective of their children, allowing little or no room for individuation and normal developmental progression. Another investigation by the same researchers found a significantly higher prevalence of family conflict as a recent stressor among suicidal adolescents compared to control subjects (Pillay & Wassenaar, 1997b). These authors found that the conflicts were ongoing stressors, with the suicidal behaviour occurring at a threshold point in the crisis build-up, indicating the young person's inability to continue in the conflict-ridden environment. Both these studies noted that the recognition of family risk factors for suicidal behaviour in young people is an essential feature in planning intervention and prevention programmes.

An interesting study involving black adolescents (Mayekiso, 1995) showed a relationship between self-punitive wishes and dissatisfaction with father-adolescent relationships, mother-adolescent relationships, family interaction and the degree of family acceptance. Researchers (Schlebusch, 1988a, 1992a, 1995a; Schlebusch & Bosch, 2000) have persistently cautioned: (a) that the prevalence of suicidal and other self-destructive behaviour can increase significantly during adolescence and early adulthood if risk factors are not timeously identified and addressed; (b) that young people's perceptions of suicidal behaviour may be a significant factor in such behaviour; (c) that interpersonal problems are major causative factors; (d) that the media can play a significant role in influencing perceptions about suicidal behaviour (because of the Werther or ‘copy-cat’ effect); and (e) that family problems are often perceived as one of the main causes of suicidal behaviour.

What is perhaps less known in South Africa is that reading impairment (one of the most prominently investigated learning disabilities internationally) has been associated with many psychopathological disorders, and can serve as a co-morbid factor in suicidal behaviour (Wood & Goldston, 2000). Identifying and treating such disabilities (especially problems in reading) can be powerful preventors of subsequent psychological disorders and potential suicidal behaviours.
Various authors have noted that suicidal people are often poor at solving interpersonal problems (Schlebusch, 1992a, 1995a; Williams & Pollock, 1993). It is in this context that suicidal behaviour has been viewed as an inappropriate method of communication and problem solving. Furthermore, research data from the DPS group (Schlebusch & Bosch, 2000; Schlebusch et al., 2003) provide support for the hypothesis that, as part of a process, non-fatal (low intent) suicidal behaviour is increasingly being employed as a first-line crisis management strategy by people (especially younger people) who would not always be considered to have particularly overt psychological morbidity. That is, they use it as an inappropriate problem-solving strategy.

Chronic and acute stress are critical to co-morbid aetiological considerations in suicidal behaviour (Pretorius & Roos, 1995; Schlebusch, 1995b). The role of dysfunctional perceptions in stress arousal associated with a range of psychological problems, including suicidal behaviour, has been well documented in South Africa (Schlebusch, 2000c). Wassenaar et al. (2000) also referred to the role of stress as precipitated by a conflict in social roles in young people from traditional backgrounds in the multicultural South African society; these young people have to cope with new roles and a more Western-orientated culture. Schlebusch et al. (2003) also emphasised the role of acculturation, socio-economic pressures, high crime and violence rates, a history of human rights violations with resultant trauma, and the process of transformation in creating high stress levels that can act as suicidal triggers. What is lacking is in-depth research on the causes of extended suicidal behaviour.

There is an escalation in 'crimes of passion' and family murders being witnessed in South Africa. Of the few studies in this regard, one (Schlebusch, 1988b) looked at the role of personality disorders (especially the dependent personality), and another (Graser, 1992) emphasised the distinction between 'murder-suicide' and extended suicide. In the case of 'murder-suicide', the family murder occurs primarily as an act of murder and secondarily as a suicidal act, whereas in the case of extended suicide, it is the other way around – i.e. the intention had been there all along to commit suicide after first killing the family as part of the extended suicidal act.

International research (Hawton & Van Heeringen, 2000; Wasserman, 2001) has clearly identified various psychopathological conditions (in particular mood disorders) as co-morbid factors in the aetiology of suicidal behaviour. This is also true for South Africa in all ethnic groups (Schlebusch, 1992a, 1995a; Schlebusch & Bosch, 2000; Schlebusch et al., 2003). In line with international studies, a recent study (Schlebusch et al., 2003) reported that mood disorders were the most common diagnosis among non-fatal suicidal black patients researched, being present in nearly two-thirds (63.9%) of them. Other diagnoses reported in the same study included substance abuse, schizophrenia and substance-induced psychosis.

A study on attitudes of black adolescents towards suicide and the prevalence of depression among adolescents in some areas (Mayekiso, 1995) also indicated a high incidence of depression in school children. Up to 38% of the sample was diagnosed as mildly depressed, 20% as moderately depressed, and 13% as severely depressed. Only 29% of the sample could be diagnosed as not being depressed. These findings are an increasing cause of concern, especially in view of national and international research predictions that stress and mood disorders (which have been shown to be
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associated with so many other somatic and mental health problems, as well as suicidal behaviour) constitute one of the greatest maladies of our time (Hawton & Van Heeringen, 2000; Schlebusch, 2000c; Wasserman, 2001).

At the same time, a history of prior suicidal behaviour and substance abuse (especially alcohol abuse) as co-morbid factors in suicidal behaviour remain another cause for disquiet because of their aetiological importance for future suicidal behaviour (Schlebusch, 1995a; 1998; Schlebusch & Bosch, 2000). As emphasised earlier, research (Schlebusch, 1987, 1998) has confirmed that alcohol, household poisons, over-the-counter substances (especially analgesics), benzodiazepines and anti-depressants are methods of choice in substance overdosing or abuse for adults and youngsters alike in their attempts to cope with the ravages of stress.

According to a WHO (1999b) report on suicide, 45% of fatal suicide victims had high levels of alcohol in their blood; that is, a mean BAC of 0.16 g/100 ml. In all, 15% of the deceased had a BAC of 0.2 g or more per 100 ml. The most recent NIMSS figures (Donson & Van Niekerk, 2002) show that alcohol was a factor in about one-third of all suicides; BACs were positive in 36.8%, and of that group 27% were at or above 0.05 g/100 ml (Sukhai & Van Niekerk, 2002). Another astonishing fact is that in almost 50% of South African non-natural deaths generally, due to homicide and motor vehicle collisions, BACs of 0.08 g/100 ml were present. In just over one-quarter of deaths from suicide or other ‘accidents’, BAC levels of 0.08 g/100 ml were present. In addition, 61% of non-fatal injury patients admitted to trauma units in several major South African centres had a mean BAC level of 0.12 g/100 ml. There is also a significant relationship between BAC and injured pedestrians, and research has shown that in instances of violence 74% of cases showed positive alcohol levels (Parry, 2000).

It is clear that South Africa’s anguished legacy of apartheid has not only severely traumatised its citizens because of human rights violations (Pillay & Schlebusch, 1997), but has left a heritage of stress-related psychological problems (Schlebusch & Bosch, 2002), with implications for potential suicide. Additional factors that combine to elevate stress levels, with a potential to affect suicidal behaviour, are: extremely high prevalence rates of violence and trauma (McKendrick & Hoffman, 1990; Schlebusch & Bosch, 2002); the influences of ‘First World’ forces in an internationally less isolated post-apartheid South Africa; socio-economic difficulties, including high unemployment levels; high expectations following political and other transformation, which are not always realised; and acculturation and economic pressures, which (if not timeously addressed) all combine to produce a breeding ground for potential suicidal behaviour (Schlebusch et al., 2003).

MANAGEMENT OF SUICIDAL BEHAVIOUR IN SOUTH AFRICA

It is generally recognised that suicidal behaviour is a highly complex phenomenon that cannot be readily attributed to a single cause since it involves intricate interactions between psychosocial and biological variables (Van Heeringen, Hawton & Williams, 2000; Schlebusch, 1990a). As such, we now know that suicidal behaviour is a process. Given this, family practitioners and primary health care workers who usually have ongoing contact with patients can play a critical role in the prevention and management of this problem (Cassimjee & Pillay, 2000). As long ago as 1985 it was
argued that South African health care practitioners (especially medical doctors) should be alert to suicidal intent in their patients, since a significant preponderance of their suicidal patients consult them (often with somatic symptoms and masked suicidal ideation) in the weeks preceding the suicidal act (Schlebusch, 1985a). As we move forward in the twenty-first century, little seems to have changed in this respect (Cassimjee & Pillay, 2000).

The need for an astute diagnosis of underlying psychopathology and its appropriate treatment (including medication and, where necessary, hospitalisation or referral for psychological/psychiatric help) by suitably trained health care professionals speaks for itself. Treatment guidelines for one of the most common co-morbid conditions (mood disorders) are regularly updated and made available (Lasich & Schlebusch, 1999; Schlebusch, 1990b). Suicidal individuals often appear to: (a) access limited ways of dealing with their problems (Kienhorst, de Wilde & Diekstra, 1995); and (b) tend to slip into a cognitive rut, whereby it is difficult for them to see alternatives (Schlebusch, Luiz, Bosch & Levin, 1986). Therefore, the central role of a perception in children (Pillay, 1995b) and adults especially of entrapment (i.e. being closed in with no escape) is an additional important factor to consider in the suicidal person’s feelings of hopelessness and suicidal risk profile (Van Heeringen et al., 2000). From a psychological perspective, treatment, rather than being based on an adventitious approach, can be more usefully designed around an ad rem organisational system (Schlebusch, 1990a, 1990b, 2000b) or structured psychotherapy, especially cognitive behaviour therapy, often lacking when suicidal patients are treated.

To further address the problem of management, it is essential to establish a protocol regarding the referral of suicidal patients. For example, the DPS research group did so in collaboration with the Professor and Head of the Department of Medicine at the medical school where it is based and in the affiliated relevant teaching hospitals (Schlebusch et al., 2003). This was done because of the significant demands these patients make on the Department of Medicine’s clinical service load and hospital bed occupancy. Initially all suicidal patients referred to these hospitals are admitted by the Department of Medicine and treated as a medical emergency by their staff. Once medically stabilised, these patients are referred for clinical psychological or psychiatric attention. It is now routine hospital policy in our teaching hospitals that all patients admitted with suicidal behaviour are seen by a mental health care professional once medically stable. This usually occurs within 24 to 48 hours after admission, and before discharge. As a result, patients and their families can be psychologically managed more effectively. It also serves to provide a substantial database for research designed to seek ways of preventing suicidal behaviour.

A more controversial point in management is the highly complex question of ethical and legal issues in suicidology. An international group of experts on suicidology that included South African representation critically examined issues such as standards of care, responsibility and failure of care, failing to diagnose appropriately, malpractice, euthanasia and assisted suicide (Leenaars et al., 2001; Leenaars, Betancourt et al., 2000; Leenaars, Cantor et al., 2000). Other international work (Snyder & Caplan, 2002) focused on providing a framework for a better understanding of assisted suicide (especially physician-assisted suicide) and its legal and ethical implications. Space does not allow for a detailed discussion of these considerations here, save to note
that they are being debated in medico-legal circles and suicidology in South Africa, where euthanasia ('mercy killing') and assisted suicide are not legal (McQuoid-Mason, 1995; Sneiderman & McQuoid-Mason, 2000).

Furthermore, there are currently various professional associations and support groups that assist with the treatment and prevention of suicidal behaviour, and that help those that have suffered psychologically because of such behaviour. These include the Survivors of Loved Ones of Suicide (SOLOS) (which operates in Durban), the South African Depression and Anxiety Support Group, Lifeline and Befrienders International. Such groups and organisations are valuable partners as part of prevention and treatment strategies.

**PREVENTION OF SUICIDAL BEHAVIOUR IN SOUTH AFRICA**

Prevention rather than cure is the best hope for combating persistent problems with suicidal behaviour (Schlebusch, 1999a). In the ‘new’ (post-apartheid, democratic) South Africa, the problems mentioned so far are important considerations in realising any efforts at establishing suicide prevention programmes, clear guidelines for which exist (Schlebusch, 2000b; WHO, 1999b). With the exception of the South African Police Services, there are no national suicide prevention programmes in place at present. This and the other issues discussed in this chapter, as well as the fact that research on suicide prevention has languished as a relatively minor endeavour in combating suicidal behaviour in South Africa, are not readily taken into account when explaining the high rates of suicidal behaviour in the country. The DPS research group’s present research track on stress and suicidal behaviour hopes to, in part, address this lacuna.

The WHO (1999b) emphasises that research has shown that preventative interventions are highly effective in reducing suicide rates. Some of these interventions, e.g. the early and effective diagnosis and treatment of individuals with stress-related problems, depression or other psychopathology who are at particularly high risk for suicidal behaviour, are cost-effective and can be integrated into primary health care programmes. As noted before, this is one of the primary thrusts of the current research of the DPS, along with early identification of stress and at-risk persons in working towards developing a national suicide prevention programme in South Africa.

Such a programme cannot be developed without the support and assistance of all interested parties in the community and the government. The WHO (1999b) has also recommended that the problem of prevention concerns society as a whole and that solutions should be sought with full participation of NGOs; that a national task force on suicide prevention should be established; that policies on pesticides should be reviewed because of the impact of pesticides on suicidal behaviour; that the training of health care workers should be tailored to specific local conditions; that assistance should be given to suicide support groups; and that media cooperation should be enlisted. The WHO has further provided resource booklets on the prevention of suicide for the media, general physicians, teachers and other school staff, primary health care workers, prison officials, other professionals, and survivor groups.
If we take into account the spiralling health care bill of South Africa, the need to prevent suicidal behaviour in all age groups is paramount. Suicidal behaviour results not only in much psychological anguish, but invariably leads to hospital admissions and attendant expensive procedures that further escalate already high health care costs, and result in more stress for those affected. This does not take into account costs incurred because of post-hospital treatment and the treatment of devastated family members or loved ones. Apart from the enormous cost in human suffering, health care planners and the government cannot continue to ignore the financial implications, loss of skills and psychological suffering resulting from suicide.

To achieve an improved situation, it needs to be recognised that the prediction, prevention and management of suicidal behaviour should be everyone’s responsibility. I have argued before that:

For too long we have focused on a health care system that is almost exclusively science and technology based with a consequent essential aim of treating the patient who presents with suicidal behaviour. Although health care scientists need to continue with their scientific research, increased concern with prevention of health-risk behaviour and promotion of healthful lifestyles must now be given top priority. In essence, that means a shift to a health behaviour based approach rather than a morbidity based health care approach. This obviously includes a healthy dose of both patient and health care workers' education. Clearly, the linchpin in this effort is no longer just the health care worker; it has to involve health care consumers as active participants in the process (Schlebusch, 1995a, pp. 1-2).

Preventing suicidal behaviour should start early in life. Studies have demonstrated the importance of the school, university, college and family as first levels of intervention and prevention, since these are obvious targets for identifying and preventing suicidal behaviour in all age groups, but especially among youngsters. Several of the studies quoted in this overview revealed that suicidal patients often use firearms or ingest medical substances and household poisons. These trends suggest that the availability of firearms and such substances influence the nature of the suicidal act (i.e. its lethality) and type of substance ingested, and that knowledge of lethality and availability do not always appear to be seriously considered. For example, a decade and a half ago already it was strongly argued (Schlebusch, 1987) that there is a *prima facie* case for considering the availability of substances as a major cause of concern in suicide prevention. Suitable school programmes, educating adults and in particular youngsters in this regard should be a priority in any suicide prevention programme. Of course, these findings are suggestive of several avenues of prevention, but particularly of continuing education regarding the dangers associated with access to lethal weapons, over-the-counter substances, medicine storage and accumulation, and issuing medical prescriptions to vulnerable patients. In this regard, Williams and Pollock (1993) emphasised that reducing the availability of lethal equipment and substances is one approach to prevention, but that this needs to be combined with knowledge about who is most vulnerable.

Pillay (1995a, 1995b) observed that to achieve even a modest chance of enduring success in preventing suicidal behaviour, programmes designed to reduce such behaviour must be directed at the level of the individual as well as at the family,
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school, workplace and, on a larger scale, at organisations and community levels. Pillay (1995a, 1995b) lamented the withdrawal of teacher-counsellors from schools as part of the rationalisation process that is taking place in South African education, and pointed out that in most cases these counsellors are now expected to teach mainstream subjects and are allowed only a few periods of “guidance”. These limited “guidance” periods are the only counselling services offered by many schools presently. It was noted that this situation has a negative impact on the mental health of school-going children, especially the cohort at risk for suicidal behaviour. Pillay (1995a, 1995b) recommended that liaison between the various clinical services and the education department is essential to prevent adolescent suicidal behaviour.

Considering the large numbers of learners with suicidal behaviour who are referred from school teachers, closer co-operation between educators and health care providers can effect more successful prevention of suicidal behaviour in young people. Teachers should be alerted to the fact that when assessing suicide risk factors in these learners, family background factors should also be assessed in conjunction with other factors such as relationships outside the family, relationships with siblings and changes in living conditions, and potential psychopathology, such as depression and stress.

Suicidal behaviour, then, remains one of the many psychological problems of childhood and adolescence, requiring intersectoral collaboration between the education and health departments. Considering the large numbers of referrals of patients with suicidal behaviour from school teachers, it is evident that closer co-operation between educators and health care providers is in children’s best interests. In this regard a proposal on child and adolescent mental health policy for South Africans recommended a multi-level system, with the first tier incorporating schools as one of the many service sites at the district level (Dawes et al., 1997).

Those at risk for suicidal behaviour need an empathetic ear during moments of crisis. This applies to all, but especially to the young, not only because of the high incidence of suicidal behaviour and/or ideation in school-going children (Flisher et al., 1992; Mayekiso & Mkize, 1995; Noor Mahomed et al., 2000; Pillay, 1995a, 1995b) and university students (Mayekiso & Ngcaba, 2000), but because all young people need help in developing crisis-resolution techniques. Given such findings, a school-based prevention programme (Wassenaar, Pillay, Burns & Davies, 1993) provided encouraging results. The programme was found to increase school teachers’ understanding of the problem; improve their attitudes and helpfulness to school children; and decrease school children’s inclinations towards viewing suicidal behaviour as an option. A time-series analysis of hospital records of attendance and admissions for the catchment area where the study was done showed a 58% reduction in youngsters who presented with suicidal behaviour during the six-month period following the programme. Mayekiso and Mkize (1995) also expressed the view that adolescents as a group (rather than just symptomatic suicidal individuals) could benefit from supportive intervention within the school context. Attempts to address the problem of young people’s suicidal behaviour should also reflect their attitudes and perceptions towards such behaviour.

It is essential to take note of this when designing suicide prevention programmes, since several studies presented at the four Southern African conferences on suicidology to date showed that adolescents and children as a group need help (or
training) in dealing with life stresses and conflict resolution. This implies a shift in prevention in the sense that there should not just be a focus on those with suicidal thoughts and suicidal behaviour, but that adults as well as school-going children and university or college students should be taught stress management and conflict resolution skills. Such programmes have been reviewed in the literature (Schlebusch, 2000c).

Further, the DPS research studies have shown that in many patients, traditional social role expectations are changing. This seems to have a significant impact on black South Africans, especially women. In this regard the DPS work group also emphasised the importance of more cross-cultural research within the ambit of suicidal behaviour (Schlebusch, 1995c). Researchers therefore need to examine more carefully the influential role of traditional health beliefs in shaping responses to health messages, subsequent role expectations and changes in health behaviour (Schlebusch & Ruggieri, 1996) as part of suicide prevention programmes. These issues, in part, also relate to the predicted shift from traditional cultural identification to more Western lifestyles, since they no doubt will accelerate the impact on at-risk individuals, with subsequent significant implications for suicide prevention programmes. To prevent suicidal behaviour one needs to examine its aetiology and co-morbid factors. Strategies should include life or social skills components, education programmes for adults and the youth (and more specifically for high-risk individuals and their families) on the various risks associated with suicide, including alcohol consumption.

**A RESEARCH-BASED INTEGRATED APPROACH: THE DURBAN PARASUICIDE STUDY**

To provide a better historical and current understanding of suicidal behaviour in South Africa, a research-based intervention and prevention model to deal with suicidal behaviour is presented here. The Department of Medically Applied Psychology, Nelson R Mandela School of Medicine, University of Natal, Durban, South Africa, and its affiliated teaching hospitals and community clinics have had an active interest in service delivery and research into suicidal behaviour in South Africa for the past quarter of a century. As mentioned earlier, these activities have been grouped into an ongoing programme known as the DPS, which is a multi-centre research-based intervention programme studying suicidal behaviour in South Africa which originated in 1978 under the leadership of the author. Since then, the DPS research group has generated considerable data. A brief review of some of the research findings over this period are presented against the backdrop of the concurrent rapid socio-political and economic changes in South Africa; changes which have also impacted on the suicidal behaviour catchment population during the period under review. Some of the crucial issues for health service delivery and policy development on suicidal behaviour into the next decade and beyond are also discussed. Conclusions are reached by contextualising research on suicidal behaviour and the various research themes which have been linked to the DPS, and proposals for future research on suicidal behaviour are outlined. This constitutes an adaptation and update of findings proposed as far back as 1992 (Du Preez & Schlebusch, 1992).
Origin and aims

The DPS originated following the appointment of the first full-time clinical psychologist (the author) to a university-affiliated general teaching hospital (Addington Hospital in Durban) - as opposed to a mental hospital - in the Province of KwaZulu-Natal in 1976, because of the significant numbers of suicidal patients referred to the hospital’s psychological services at the time. Much of the early work done by the DPS grew out of the establishment of formal consultation-liaison clinical psychology services, which were later extended to other principal general teaching hospitals in that province (Schlebusch, 1983). The ‘consultation’ aspect of these services refers to the health services rendered to patients and families, while the ‘liaison’ component refers to the assessment and management of services offered to referring physicians and medical departments throughout the hospital network referred to earlier.

The initial impetus of the original service at Addington Hospital came from a growing awareness by both the casualty or trauma units and the medical or surgical units of the various hospitals that only medical stabilisation was being provided to patients admitted because of some form of suicidal behaviour. A referral protocol was established, allowing all patients admitted for medical treatment after suicidal behaviour to be comprehensively assessed by a clinical psychologist.

The establishment of the DPS culminated in various early conference presentations (Schlebusch, 1978a) and the first publications on suicidal behaviour (Minnaar, 1978; Minnaar, Schlebusch & Levin, 1980; Schlebusch, 1978b, 1985a, 1985c, 1986; Schlebusch et al., 1986; Schlebusch & Minnaar, 1980) reflecting its initial work. The original attempt to draw together its work and the work of other researchers on suicidal behaviour in Southern Africa was realised in convening the First Southern African Conference on Suicidology (Schlebusch, 1988a). Two years later saw the publication of an academic text (Schlebusch, 1990a) which, inter alia, reflected contributions by members of the DPS to the field of medical psychology as related to suicidal and health-risk behaviour and medical problems in South Africa. At this point in the research programme it was possible to comment on suicidal and self-destructive behaviour in South Africa within a wide variety of medical and psychological contexts, including training in the prediction, management and prevention of suicidal behaviour. The convening of three subsequent Southern African Conferences on Suicidology every few years continued to offer a platform for further consolidation of research on suicidology in the Southern African region (Schlebusch, 1992a, 1995a; Schlebusch & Bosch, 2000).

Problem areas

Following the experience of the DPS research group over the past 25 years, a number of problem areas have been identified. These are probably applicable nationally, and include:

a) Identifying suicidal behaviours which are often masked by the patient and/or family, or by the method of note-taking of the attending medical practitioners. For example, although in the main it is a simple matter for emergency staff in the particular hospital where the patient is admitted to enter a note that states “intentional overdose”, it is apparent that with many patients who present in the emergency rooms “accidental overdose” is stated in the notes, or that the suicidal
behaviour or ideation is obscured by patient chart entry notes referring to “patient intoxication”, “belligerence” and/or other “non-suicidal” patient behaviours.

b) Identifying suicidal behaviour involving motor vehicle accidents, which is frequently recorded in patients’ records as “motor vehicle accidents (MVA)-drunken driving”, or “non-suicidal intentions”, while questions about potential sub-intentioned suicidal behaviour are not entertained.

c) Ensuring that any enquiry into suicidal behaviour should include data about previous suicidal behaviour when interviewing a patient. This type of enquiry is useful for identifying sub-intentioned suicidal behaviour, and for identifying previous suicidal behaviour which did not require medical attention (Schlebusch, 2000b).

d) Problems with data collection and storage, because teaching hospitals and associated medical academic departments are characterised by a large component of rotating and temporary personnel. Individual styles in conducting interviews and recording data become problematic when longitudinal or historical data are sought. Experience has shown that training in standardised interview formats and careful supervision of staff in training are essential in compiling appropriate data about suicidal behaviour, and that the use of a structured assessment is invaluable (Schlebusch, 2000b).

e) Problems relating to terminology and definitions of suicidal behaviour when varied terminology is used, such as: parasuicide, attempted suicide, sublethal suicide, sub-intentioned suicide, failed suicide, suicide gestures, etc. Some of these terms are mutually exclusive while others clearly overlap. Since this creates problems, a proposed classification in this regard has been developed to assist researchers and practitioners with the use of a common nomenclature in suicidal behaviour (Schlebusch, 1992b, 2000b).

f) The fact that problems are further compounded by individual suicidal patients’ knowledge or lack of knowledge of the lethality of the particular method of suicide chosen and/or accessibility to such method(s).

g) The fact that most data and statistics to date have been based on samples drawn from academic hospital and/or mortuary settings. With a few exceptions that involve community studies, data on patients receiving treatment from private practitioners, private facilities and occupational health services are often missing, as are data on non-fatal suicides based on community surveys, because they are not systematically reported or recorded. It is generally agreed in both the local and international literature that prevalence data in suicidal behaviour are under-reported and frequently lack generalisability to the general population. This is particularly true for South Africa.

h) The fact that a general overview of the literature on suicidal behaviour research in South Africa reveals various methodological problems and a diversity of research designs, sampling procedures and methods of analyses. There is frequently a heavy preponderance of retrospective data reported and post hoc style research, with a concurrent significant paucity of replicated (or potentially replicable), well-controlled, prospective studies. In short, this simply reveals that too many researchers are still historically confined to the phase of merely ‘describing the problem’, or ‘counting heads’. There is a poignant need to move beyond this to a research level of managing and/or ‘preventing the problem’ as part of a more effective strategy. This is, in fact, one of the primary aims of the DPS.
The lack of an appropriate national prevention programme which, according to the WHO (1999b), also places major obstacles in the way of obtaining reliable and useful national data.

A CONCEPTUAL MODEL FOR THE FUTURE

The motivation for continuing to develop a conceptual model to deal with suicidal behaviour in South Africa springs from the early work undertaken by the DPS (Du Preez & Schlebusch, 1992). Historically, the tremendous changes associated with sociopolitical, and socio-economic factors, increased violence and related issues as witnessed in South Africa in the last decade, have tended to elevate stress in South Africans (Schlebusch & Bosch, 2002). This has also impacted on the catchment population served by suicide researchers in the country. For example, in its timeframe the DPS research group has experienced the birth and decline of a racially segregated health services administration, which had its associated replication of services and inequalities in South Africa.

Since becoming a respected democracy, there is little doubt that the country is on the threshold of a new era in health service management and provision, with a major drive towards primary health care and preventative strategies. Nevertheless, the call remains for the development of relevant and contextualised services for the present and future. In this process, cost-effectiveness will be an essential factor, determining the nature and practises of health service delivery in the future. In addition, these interventions need to take cognisance of the significant increase of violence in South Africa, which includes suicidal behaviour (WHO, 1999b) and trauma-producing behaviours (Schlebusch & Bosch, 2002) with potential associated suicidal risk factors.

Given the abovementioned concerns regarding suicidal behaviour in South Africa, it becomes imperative on a national basis to:

a) Examine the existing database and to develop programmes for gathering more reliable statistics;
b) Identify current demographic and epidemiological trends;
c) Evaluate the existing services in the light of these trends;
d) Identify groups or areas of special concern that can lend themselves to the development of more proactive service strategies that are relevant to these groups;
e) Develop more refined criteria for describing what constitutes suicidal behaviour;
f) Differentiate between various forms of suicidal behaviours;
g) Highlight the role of substance-taking and health-risk behaviour (including alcohol consumption and driving behaviour) (Matzopoulos, 2002; Hooper-Box, 2003) in the context of suicidal behaviour;
h) Refine existing models of guidelines for the management of health risk behaviour (Schlebusch, 1990a);
i) Further promote educational guidelines for use in primary health settings for both patients and health practitioners, regarding non-compliance (non-adherence behaviour), medicine-taking behaviour, control of medicines in the home, and the storage and disposal of medicines and household and other poisonous substances, given that guidelines for the management of non-compliance or non-adherence behaviour have been developed (Schlebusch, 1990a);
j) Focus on health care professional-relationships and promote cost-effectiveness of existing and future service developments, given that guidelines for effective health care professional-patient communication have been developed (Schlebusch, 1990a);

k) Utilise an appropriate model for contextualising research programmes on suicidal behaviour, such as the biopsychosocial model (based on systems theory), which can be utilised as an anchor point because of its robustness and its demonstrated usefulness in a variety of health care contexts (Schlebusch, 1990a);

l) Focus on cognate dimensions associated with the different applicable variables related to people who display suicidal behaviour, the methods used in suicidal behaviour, and the context in which suicidal behaviour occurs;

m) Look at future needs; and

n) Reflect on where the DPS and other suicidal behaviour research tracks in South Africa now feature in relation to national and international suicide research activities and needs.

Finally, the DPS has facilitated the gathering of detailed data on suicidal patient demographic and biological characteristics; methods employed in suicidal behaviour; psychiatric and psychological diagnostic data of patients who display suicidal behaviour; and on the psychological/psychiatric treatment of these patients. The research work of the DPS is ongoing. It hopes to further extend its research activities into a national and international programme by inviting participation from other groups researching suicidal behaviour. This has partly been achieved internationally; new data obtained from the DPS are currently being incorporated into a database being established for an international WHO suicide research prevention programme. With regard to broadening the work of the DPS, the author would like to take this opportunity to invite wider research collaboration with South African researchers on suicidal behaviour.

**CONCLUSION**

Thanks to the expertise of many researchers, there have been significant developments in trying to understand the phenomenon of suicidal behaviour in South Africa. However, much research remains to be done. In particular, there is an urgent need to address the problem of suicidal behaviour on a collective national basis in South Africa. Suicidal behaviour, a mordant tragedy that should and can be avoided, is an increasingly critical issue facing the government, health care professionals, other professionals, employers, administrators, health care and cognate organisations, and the public.

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Injuries, and particularly road traffic injuries (RTIs), constitute a serious public health challenge. Besides the physical consequences of trauma, disablement and death, many victims and families may be predisposed to psychosocial trauma and other health consequences, such as alcohol and illicit drug abuse. The impact also extends to communities and society at large, since RTIs are a drain on scarce resources, hamper economic development and further perpetuate poverty.

Globally, injuries account for more than 5 million deaths each year, of which more than one-fifth are attributable to RTIs (Murray & Lopez, 1996). A conservative estimate of the number of associated injuries is 10 million (World Bank Group, undated). Estimates for 1998 indicate that RTIs are the ninth leading cause of all disability adjusted life years (DALYs) lost and account for 2.8% of global disability. By 2020 it is expected that RTIs will be the third leading cause of all DALYs lost worldwide (Murray, Lopez, Mathers & Stein, 2001). Low- and middle-income countries experience a disproportionately higher burden and account for about 85% of the deaths and 90% of the DALY's lost globally (Krug, Sharma & Lozano, 2000). The cost of these injuries to the economy is enormous - crude estimates indicate that the cost as a percentage of a country's GDP ranges from 1% in 'developing' countries to 2% in 'highly motorised' countries (Jacobs, Aaron-Thomas & Astrop, 2000).

In South Africa injuries accounted for 12% of all deaths in 2000 (Bradshaw et al., 2003). The MRC-UNISA National Injury Mortality Surveillance System (NIMSS) revealed that in 2001 approximately one-quarter (27%) of all injury-related deaths occurred as a result of road traffic accidents (Matzopoulos, 2002). Compared globally, South Africa's road traffic death rate of 11.7 per 100 million kilometres travelled is the fifth highest in the world (International Road Federation, 1991). The National

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1 To whom correspondence should be addressed.
2 The National Injury Mortality Surveillance System (NIMSS) produces and disseminates descriptive epidemiological information that is readily available from documentation that arises from medico-legal post-mortem investigations. In 2001, 32 mortuaries in 6 different provinces contributed their data to this system. These cases accounted for between 32% and 39% of all non-natural mortality in South Africa. In 2001, a total of 25 361 cases were included in the system, of which 6454 were traffic-related.
Department of Transport (NDoT) indicated that in 2001 the South African traffic burden translated to 512 000 crashes, which resulted in 7900 road traffic deaths and 150 000 injuries (NDoT, 2002; NDoT, 2003a). The cost of this carnage to the South African economy was estimated at approximately R13.8 billion (NDoT, 2002).

In terms of cost of traffic crashes to the economy, the KwaZulu-Natal province (KZN) rated among the highest in the world. Using the “human capital” method, KZN’s cost of traffic crashes to the economy was 4.5% of the GNP, which was similar to that of the USA (Jacobs, Aaron-Thomas & Astrop, 2000). In South Africa the disability burden is also massive. Road traffic collisions were ranked as the fourth highest cause of premature mortality, accounting for 489 979 years of life lost (YLL) in 2000 (Bradshaw et al., 2003).

An overview of the epidemiology of RTIs in the South African context is presented using data from the MRC-UNISA Crime, Violence and Injury Lead Programme (CVILP), the University of Natal Interdisciplinary Accident Research Centre (UNIARC) and the NDoT. Information on populations at risk, temporal and spatial characteristics, vehicles and their associated challenges, and high-risk driving behaviours are presented. Based on this overview, general and focused public health intervention strategies are discussed.

**POPULATIONS AT RISK**

In 2001 the NIMSS revealed that pedestrians accounted for the largest percentage of traffic-related deaths (40%), followed by about one-quarter ‘unspecified’ traffic deaths and nearly one-fifth passenger deaths (Figure 1). The distributions by gender, age and ‘race’ are presented below. The overall distributions for these variables among the motorist population were not available and population risks are therefore not presented.

![Traffic-related deaths by user category, NIMSS, 2001 (N=6454)](image)

There were 3.2 male road traffic deaths for every female death; further breakdown by user category and gender showed that the highest male to female ratio occurred.

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1 See Selected Glossary for definition.
among cyclists (16.3:1) and the lowest among passengers (1.7:1). The male to female ratio among drivers was 8.6:1.

The age distribution by user category for 2001 showed that pedestrian deaths peaked among the 30- to 34-year age group. Furthermore, more than one-third (39.5%) of infant (<1 year) and more than half (56.4%) of childhood (1 to 14 years) traffic-related deaths were the result of pedestrian injuries. Passenger deaths were almost equally as high in all age groups from 20 to 34 years, but among children the 5- to 9-year group was most at risk. Driver deaths peaked in the 25- to 29-year age group and cyclist deaths peaked equally among the 15- to 19- and 20- to 24-year age groups.

The highest percentage of pedestrian deaths was recorded among coloureds and blacks (55% and 44.3% respectively), while the highest percentage of cyclist and driver deaths was among whites (11.7% and 38.6% respectively). Driver, passenger and unspecified cases were equally distributed among Asians, each accounting for about one-quarter of their deaths.

**TEMPORALITY**

Results from the NIMSS showed that when the time and day of death was known, cases peaked between 17h00 and 22h00 and the highest percentages were recorded on Saturdays (22.9%), followed by Sundays (18.1%) and Fridays (16.1%). Furthermore, significantly more deaths occurred on Saturdays than on Sundays ($\chi^2=45.35, p<0.001$). These results should, however, be interpreted with caution since they reflect the time and day of death rather than that of the actual injury. Nonetheless, when the nature of medical treatment was known (in 4349 cases), only about one-third (36.0%) were transported to a treatment facility, which may suggest that most deaths were almost instantaneous. The data on time and day of death therefore provide a relatively reliable proxy for the actual time of injury.

Overall, traffic deaths peaked during June (9.9%) followed by September (9.1%) and March (8.9%). However, deaths in June were not significantly different from September ($\chi^2=2.34, p=0.12$). Figure 2 shows that in 2001, pedestrian deaths peaked in March, June, September and October. Passenger deaths peaked in June and low percentages
were recorded in July and November. Driver deaths declined from February to April and from June to August, after which they increased to a peak in November. The highest percentage of cyclist deaths was recorded in May, and unspecified traffic cases in June.

**INTER-CITY AND PROVINCIAL COMPARISONS**

For 2001 the NIMSS allowed for fatal traffic rates to be calculated for five cities, in which full coverage was achieved. These cities were Durban, Cape Town, Port Elizabeth, East London and Pretoria. Pretoria had the highest traffic fatality rate of 42 deaths per 100 000 population, followed by Durban and East London (both at 39 deaths per 100 000 population). Based on the source data for the rate calculations, the difference between Pretoria and Durban was statistically significant ($\chi^2 = 4.34, p=0.04$), while the rates for Pretoria and East London were similar ($\chi^2 = 1.60, p=0.21$). The highest pedestrian fatality rate was recorded for Cape Town (22 deaths per 100 000 population) followed by Durban (15 deaths per 100 000 population), and the difference was statistically significant ($\chi^2 = 38.40, p<0.001$). With driver deaths, Pretoria had the highest rate (7/100 000 population) followed by East London (5/100 000 population) and the difference was not statistically significant ($\chi^2 = 2.05, p=0.15$).

Figure 3 shows the total number of injuries for both fatal and non-fatal cases by province for 2001 (NDoT, 2003a). Gauteng had the highest number of injuries followed by KZN and Western Cape. However, Gauteng had the lowest percentage of fatal cases (3.8%). The highest percentage of fatal cases was recorded in Mpumulanga (8.4%), followed by Northern Cape (7.7%) and Free State (7.3%). The difference between Gauteng and Mpumulanga in the proportion of fatal cases was statistically significant ($\chi^2 = 402.06, p<0.001$) but for Mpumulanga and the Northern Cape the proportion was not statistically different ($\chi^2 = 2.05, p=0.15$).

![Figure 3. Total injuries (fatal and non-fatal) by province, Arrive Alive, 2001 (N=159 949)](data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAAEAAAABCAYAAAAfFcSJAAAA...
CHALLENGES

Current estimates are that there are approximately 6 million licensed drivers and about 6.73 million licensed and registered vehicles on South Africa’s roads. The vehicle types include 57.4% passenger vehicles, 17.8% light commercial vehicles, 3.8% minibus taxis, 3.4% heavy commercial vehicles and 0.4% buses (NDoT, 2002). However, estimates in 1992 for the number of collisions per vehicle type per 100 million kilometres travelled include a staggering 1106 for minibus taxis followed by 916 for passenger vehicles, 571 for buses, 429 for heavy commercial vehicles and 396 for light commercial vehicles (NDoT, 1998a). However, the figures above should be viewed with caution since they do not indicate a vehicle’s contribution to the collision and generally the recording of traffic collisions is subject to reporting bias, including underreporting, duplication and misclassification. Estimates for 1998 showed that minibuses and buses had the highest number of fatalities per 100 million vehicle kilometres travelled (17 and 11 respectively) (NDoT, 2002). This is mainly because of the larger number of occupants that are transported in these vehicles. However, these rates do not take into account the relatively larger number of collateral deaths that occur among persons in other vehicles and pedestrians, as is typical with heavy vehicle collisions. Some of the key challenges posed by these vehicle types are discussed below.

Minibus taxis

The minibus industry constitutes the bulk of public transport and is often characterised by substandard vehicles, overloading and other high-risk driving behaviour, such as speeding and ‘reckless driving’. Generally, the contribution of substandard vehicles to traffic collisions is debatable since drivers may drive with greater caution. But when substandard vehicles are overloaded and travel at excessive speeds, it can be expected that the risk of collision and injury would increase. Increasing growth of the minibus taxi industry and greater competition further exacerbates the situation. Most commuters rely heavily on this mode of transport and are therefore at increased risk of injury and death.

The Minibus Taxi Recapitalisation Project is a current initiative (started in 1996) to formalise the South African minibus taxi industry. However, the project is yet to be implemented.

Heavy commercial vehicles

In 1996, 58 904 heavy commercial vehicles were weighed at weighbridges in South Africa. One-third were found to be overloaded (NDoT, 1998b). The present pattern does not seem much different, since in KZN alone 42 291 (29%) were found to be overloaded in 2001 (NDoT, 2003b). It is estimated that these illegally overloaded heavy vehicles are responsible for 60% of the damage to the road network in South Africa, which costs the taxpayer some R550 million per year (NDoT, 1998b). Although human behaviour plays the largest role in traffic collisions, deteriorating and hazardous road conditions caused mainly by illegal overloading also compromises road safety. The enormous cost to the economy of repairing road networks adds to the drain on available resources for road safety initiatives.

Compliance with safety regulations is also a problem among this sector. An amended Road Traffic Act of 1996 compels operators to display retro-reflective materials on
Road traffic injury

all heavy commercial vehicles within certain specifications. A UNIARC survey was conducted to gauge compliance with these regulations at three of the country's toll plazas and one heavy-vehicle checkpoint. These sites were selected to be representative of the heavy vehicle sector in the country using different highways, and represented the three major cities of Cape Town, Pretoria and Durban. Results indicated that of 1000 heavy commercial vehicles, 57.9% were in breach of these regulations (Haarhof, 2002).

**HIGH-RISK TRAFFIC BEHAVIOUR**

The crash process is often complex and multifactorial and may be viewed as a combination of various human, vehicle and environmental risk factors that interact to produce the event. In the South African context the contribution of driver, vehicle and road environment factors towards traffic collisions has been reported to be between 80% and 90%, 10% and 30%, and 5% and 15% respectively (NDoT, 2002). In the driver category, excessive speed and alcohol intoxication are most often implicated.

**Alcohol and illicit drugs**

In 2001 the NIMSS indicated that overall, more than half (53.6%) of all fatal traffic cases were alcohol-related and the mean blood alcohol concentration (BAC) was nearly four times the legal driving limit of 0.05 g/100 ml (Table 1). Pedestrians constituted the highest percentage of cases that tested positive for alcohol (62.5%). They also had the highest mean level of consumption at 0.20 g/100 ml. More than half (51.8%) of the drivers tested were positive for alcohol and the mean level of consumption was 0.17 g/100 ml.

Driving under the influence of alcohol is strongly associated with the risk of injury and death. A study in the USA showed that the relative risk of fatal crash involvement among adult drivers was 5-6 at 0.05 g/100 ml (the legal driving limit) and more than 80 at 0.15 g/100 ml (which was the approximate mean BAC of the NIMSS driver sample) (Zador, Krawchuk & Voas, 2000).

The use of illicit drugs among traffic users is also a serious and growing problem. Analysis of aggregate data (1999 to 2001 and including three cities) from the MRC-

<table>
<thead>
<tr>
<th>BAC (g/100 ml)</th>
<th>Pedestrian %</th>
<th>Passenger %</th>
<th>Driver %</th>
<th>Unspec. MVC %</th>
<th>Cyclist %</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0.25</td>
<td>202.247</td>
<td>14.30</td>
<td>33.95</td>
<td>45.12.3</td>
<td>6.65</td>
<td>361.15.7</td>
</tr>
<tr>
<td>0.15-0.24</td>
<td>218.205</td>
<td>38.13.7</td>
<td>67.18.0</td>
<td>94.17.4</td>
<td>13.14.0</td>
<td>400.19.5</td>
</tr>
<tr>
<td>0.05-0.14</td>
<td>127.12.0</td>
<td>39.14.0</td>
<td>65.18.2</td>
<td>43.11.7</td>
<td>14.15.1</td>
<td>288.13.4</td>
</tr>
<tr>
<td>0.01-0.04</td>
<td>57.5.4</td>
<td>13.4.7</td>
<td>19.5.3</td>
<td>15.4.1</td>
<td>3.3.2</td>
<td>107.5.0</td>
</tr>
<tr>
<td>Zero</td>
<td>108.17.5</td>
<td>174.62.6</td>
<td>172.48.2</td>
<td>200.54.5</td>
<td>57.61.3</td>
<td>1001.45.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1062.100</td>
<td>279.130</td>
<td>357.100</td>
<td>367.100</td>
<td>93.100</td>
<td>2157.100</td>
</tr>
<tr>
<td>Mean pos. BAC (±SD)</td>
<td>0.20 (±0.10)</td>
<td>0.15 (±0.09)</td>
<td>0.17 (±0.10)</td>
<td>0.18 (±0.10)</td>
<td>0.16 (±0.09)</td>
<td>0.19 (±0.10)</td>
</tr>
</tbody>
</table>

MVC = motor vehicle collision
UNISA Trauma and Drug study⁴ (TADS) showed that of all RTI cases tested, 35.0% were associated with at least one illicit drug and 22.1% used both alcohol and an illicit drug in combination. The drug used most often was cannabis (29.6% of all RTI cases tested). The highest drug-relatedness was found among pedestrians (47.1%), followed by drivers (31.8%) and passengers (24.8%). However, further research is needed on the role of illicit drugs in contributing to traffic collisions when the drugs are consumed in isolation and in combination with alcohol.

**Excessive speed**
Excessive speed for prevailing circumstances plays a role in approximately 30% of all crashes and about 50% in the case of heavy commercial and public passenger vehicles (NDoT, 2002). Furthermore, vulnerable road users are also exposed to a greater risk of being involved in a collision and in being injured. Besides increasing the probability of a collision occurring, resultant injuries are expected to be more severe with higher speeds. For example, studies undertaken internationally indicate that a reduction of average vehicle speed by 1 km/hr would result in a reduction of injury and crashes by about 3% (Finch, Kompfer, Lockwood & Maycock, 1994; Nilsson, 1981).

**Driver aggression**
Excessive speed and alcohol intoxication are the major contributors to road traffic collisions in South Africa (NDoT, 2002) and these high-risk behaviours are also related to aggressive tendencies behind the wheel, as found in a study on driver aggression and other high-risk driving behaviour in South Africa (Sukhai, 2003). This was a cross-sectional descriptive study undertaken among a representative sample of motorists in the Durban Metropolitan Area with a total sample size of 1006 participants. Driver aggression was categorised into four subscales, with Group 1 constituting the mildest forms of aggressive behaviours and Group 4 the extreme behaviours, including rage and direct confrontation. Based on self-reporting, the prevalence of at least one aggressive driving behaviour that was experienced as a victim per aggression group ranged from 24% (Group 4) to 95% (Groups 2 and 3). From the perspective of perpetrating these behaviours, the prevalence ranged from 10% in Group 4 to 87% in Group 1.

Furthermore, just more than half of the motorists reported driving above the posted speed limits half the time that they had the opportunity to do so. About one-tenth of motorists acknowledged driving under the influence of alcohol and about half reported becoming more aggressive when they drove under the influence of alcohol. Relationships were established between driver aggression and other high-risk driving behaviours. All groups of driver aggression were positively related with driving above the speed limit (p<0.001, p=0.01, p=0.03 and p=0.001 respectively driver aggression Groups 1 to 4). However, only Group 1 behaviours were predicted by driving above the legal blood alcohol limit (p<0.001).

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⁴ The Trauma and Drug study (TADS) monitors substance abuse at sentinel trauma units throughout the country. A total of 1935 patients were included in the study from 1999 to 2001 from five sentinel sites in three cities, viz. Durban, Cape Town and Port Elizabeth. The TADS is discussed in further detail in chapter 8.
DISCUSSION AND IMPLICATIONS FOR INTERVENTION

Historically, in South Africa as in many other countries traffic injuries have been viewed as ‘accidents’, which conferred a large degree of inevitability upon these incidents. Injury control (or containment of injuries after they occur) was prioritised, and much less attention was afforded to primary prevention (or pre-event action) and the upstream or root causes of these incidents. Consequently, these cases were not of priority on the public health agenda and injury prevention efforts suffered.

South Africa as a context for traffic trauma also influences the disproportionately high traffic statistics. Rapid urbanisation results in environments with high population densities and inadequate separation of people and vehicles. Informal developments create a particular challenge where immigrants are forced to cross roadways that do not have safe crossings and they may also be unfamiliar with ‘modernised’ traffic behaviour. High levels of crime and violence, increasing levels of motorisation and long travelling distances also contribute to this challenge. Hence it is imperative that injury prevention initiatives include general socio-economic and environmental upliftment, particularly among the low-income sector. Importantly, road safety planning needs to be well integrated into the initial stages of all town planning and other civil engineering projects.

The universal public health approach to interventions is applied specifically to some of the previously identified high-risk factors (substance abuse and speeding) and the high-risk pedestrian group. Generally, passive intervention strategies (environmental modification and engineering) allow for creating ‘forgiving’ transportation systems and are also advocated as being more successful than the active measures (education and enforcement).

PRIORITY AREAS FOR INTERVENTION

Alcohol and illicit drugs

Results from the NIMSS indicated that in 2001 more than half of all fatal traffic cases were alcohol-related, and that the mean levels of alcohol consumption were extremely high at nearly four times the legal driving limit. The obvious intervention strategy is to increase enforcement based on the epidemiological data previously presented. Generally, however, South Africa is criticised for implementing first-class legislation (for example, our new driving under the influence laws) but with inadequate enforcement of such legislation (Van der Spuy, 2000). Roadside testing for alcohol is generally concentrated only during the popular holiday seasons and besides, testing is conducted only on drivers showing more overt signs of intoxication. This was also confirmed by a UNIARC survey on drinking and driving habits. The study was conducted among 600 participants at bars, clubs and shebeens in the Durban Metropolitan Area and results indicated that 61% of respondents had not seen a roadblock for the entire year of 2000 (Watson, 2000). International experience such as in Australia has shown that alcohol screening among motorists should be frequent, routine and random in order to be effective (Homel, 1990). While the probability of getting caught should be higher to increase the effectiveness of laws, importantly the public need evidence to appreciate that the funds generated are being used for the benefit of the public, such as for road safety projects and not merely as a ‘revenue-raising’ initiative.
However, to effectively address high-risk traffic behaviours, education and awareness initiatives need to be integrated with behavioural science approaches (Sleet & Lonero, 2002). With impaired driving, an important component would be to provide reasonable good practice alternatives. Alternatives to driving while impaired include spending the night at one's destination, designating a sober driver or using a safe ride home. The concepts of designated driver and safe ride programmes are popular among high-income countries, but unfortunately these are relatively unexplored among South African motorists. Although these programmes propagate the concepts of sensible drinking and harm reduction, the aim is not to accept and condone the consumption of alcohol. People are first encouraged not to drink and drive, and if they do drink, they should be reminded to limit their intake to within legal limits and are encouraged to designate a sober driver or to use a safe ride home. Besides providing alternatives to making informed choices, promotion of these concepts is very influential in reducing alcohol-impaired driving. When the US Department of Transportation launched the ‘Friends don’t let friends drive drunk’ campaign, nearly 80% took action to prevent a friend or loved one from driving drunk and 25% reported that they stopped drinking and driving as a result of the campaign (NHTSA, undated). Therefore such campaigns affect not only individuals but mobilise communities to take action against impaired driving. A new social norm is promoted - that drinking and driving is unacceptable, and this also helps to ‘legitimise’ the non-drinking option.

The TADS study indicated that a high percentage of traffic injuries were related to illicit drug use; also of concern was that many used illicit substances in combination with alcohol. The Drug Expert Recognition programme was developed by the Los Angeles Police Department with support from the Southern California Research Institute and was validated to show an accuracy of over 90% in determining impairment and also in correctly identifying the type of drug involved (Mynhardt & Van der Spuy, 2000). This programme was also piloted for use in the South African setting by the Council for Scientific and Industrial Research (CSIR) and South African Police Services (SAPS). Participants in the study were 54 detainees, and results indicated that 63% tested as impaired by alcohol, 54% by dagga, 30% by mandrax, 2% by LSD and 6% by opiates (NDoT, 2002). Full implementation of the South African Drug Expert Recognition Programme needs to proceed with urgency in order to detect and prosecute offenders and hence reduce the incidence of substance abuse in the traffic environment.

Besides the prosecution of alcohol- and drug-impaired road users, rehabilitation efforts are required at patient care facilities or upon prosecution to allow for early identification and treatment of substance abuse and to help prevent the recurrence of traffic collisions related to substance abuse. Furthermore, creating a safe and efficient public transport system together with formalising illegal drinking establishments, which will allow for people to drink closer to their homes, will go a long way in keeping intoxicated drivers and pedestrians off the road network (Watson, 2000).

**Excessive speed**

Here too, enforcement needs to be frequent and routine to deter potential offenders, and the public should be persuaded of the dangers of excessive speed. However, vehicle and road design are equally important. Community-wide traffic-calming
measures are needed, and application of relevant speed-limiting devices to all vehicles needs to be investigated. As far as possible, motorised and non-motorised vehicles, as well as vehicles with varying speeds need to be separated using appropriate engineering measures. Visibility and reaction times are seriously compromised at night and the need for lower speed limits should be investigated. Excessive speed was also shown to be positively related to driver aggression (Sukhai, 2003).

The psychological and emotional aspects of driving may need to be incorporated in the learner licensing process or in a potential graduated licensing system to address driver aggression and other hazardous driving behaviours. The graduated licensing system, which is used internationally, requires young drivers to demonstrate responsible driving behaviour in several phases before obtaining a final unrestricted licence. Such a system will also provide the necessary time-frame to address issues around stress and anger in the traffic environment.

**Pedestrians**

As in other developing countries (Afukaar, Antwi & Ofosu-Amaah, 2003; Khayesi, 1997; Odero, 1995), the hallmark of South Africa’s road traffic epidemiology is the disproportionately large pedestrian component. The NIMSS indicated that most pedestrian deaths were among the disadvantaged African and coloured populations, were higher among males, and peaked in the 30- to 34-year age group. The loss of males, especially in the economically active age group, means an increase in widows and orphans, which has great social and economic consequences for poor households and further perpetuates their poverty.

The NIMSS also revealed strong temporal patterns to pedestrian injuries. These occurred mainly in the evenings and during the winter months, which indicates that decreased visibility over these periods may be a significant factor in fatal road traffic crashes. A current initiative is being undertaken by the CVILP together with the CSIR, 3M and Drive Alive to pilot and evaluate the use of reflectorisation among child pedestrians.

Historically, road planning that was more relevant to industrial countries and which had a large focus on increasing mobility has been deployed in developing countries, resulting in scant attention to basic accessibility and to the pedestrian group (Wasike, 2001). A National Pedestrian Action Plan, which proposes a variety of pedestrian safety education and hazardous location upgrade programmes, has been developed as part of South Africa’s Road to Safety 2001 to 2005 strategy. It is hoped that these interventions will materialise and that child and adult pedestrians will receive due attention.

Furthermore, biomechanics and crash engineering have focused largely on protecting vehicle occupants, with little attention to injuries sustained by pedestrians (Crandall, Bhalla & Madeley, 2002). Recently European automotive manufacturers have proposed safer car fronts to protect pedestrians in crashes; these include pop-up bonnets and windscreen airbags to soften the head impact and energy-absorbing bumpers to minimise lower-limb trauma (Crandall, Bhalla & Madeley, 2002). It is reported that pedestrian fatalities could be reduced by 20% if vehicles are required to comply with these recommendations.
A systematic review which included 15 controlled trials showed that safety education among child pedestrians can improve their knowledge of the road-crossing task and can change observed road-crossing behaviour, but there is no conclusive evidence that this reduces the risk of pedestrian-motor vehicle collisions (Duperrex, Bunn & Roberts, 2002). Furthermore, we cannot rely on pedestrians to always make the safest decisions in the traffic environment, particularly not children who have many physical and cognitive limitations. Hence, passive pedestrian protection is advocated. With rapid urbanisation the biggest challenge lies in providing adequate separation of people and vehicles, especially in the context of informal developments that often lie close to major roads. Good practice measures, for example, on the use of physical barriers and convenient overpasses and underpasses in such a setting, are urgently required to optimise the safety of all road users in these areas.

Importantly, a culture that accepts pedestrians as equal users of the traffic environment needs to be fostered. This will afford pedestrians greater respect and priority from other road users, and from the various disciplines that are instrumental in enhancing road traffic safety.

**POLICY AND LEGISLATION**

Road to Safety 2001 to 2005 is a current and promising strategy by the South African Department of Transport aimed at addressing the carnage on the country’s roads (NDoT, 2002). The strategic objective is to reduce crashes, deaths and injuries on South Africa’s roads by 5% year-on-year until 2005. The main focal areas identified by the five flagship programmes are: inefficiency; fraud and corruption in the driver licensing system and vehicle registration systems; the development of an operator code of conduct and fleet safety management system; combating overloading by freight and public passenger transport operators; and implementing community-driven pedestrian safety education and hazardous location upgrade programmes.

Although important, the above factors should not be overrated since there is no evidence that these issues have a major influence on traffic crash rates. Furthermore, greater urgency is required with other priority initiatives which, among others, include creating a safe and reliable public transport network, formalising appropriate laws to regulate the liquor industry, and the development of a graduated driver licensing system. The benefits of these measures are discussed above. Additionally, rail transportation needs to be promoted and reorganised in order to relieve the road network of congestion, large speed differentials and damage.

**RESEARCH**

The World Health Organisation’s 5-year strategy for RTI prevention identified poor-quality data as a major obstacle to improving road safety globally (Peden et al., 2001). South African traffic research is largely fragmented and therefore ‘champions’ are needed to initiate an integrated approach to road traffic safety. Optimal surveillance systems are crucial to provide good epidemiological data on the nature and extent of priority issues and to identify risk factors, trends and emerging priorities. This information will be vital to inform prevention and evaluation programmes, and policy initiatives.
In South Africa the under-reporting of traffic statistics is of serious concern. The NIMSS presently records 32% to 39% of the country’s non-natural mortality. However, during 2001, 6859 traffic cases were recorded, which represents 87% of that recorded by the NDoT. This indicates that there may be gross under-reporting of the country’s already inflated traffic statistics.

**CONCLUSION**

South Africa’s unacceptably high levels of RTIs suggest that road safety should be prioritised at all levels and especially on the public health agenda. As a basis, good quality data for informing intervention and policy initiatives, together with an acknowledgement of the magnitude of the problem by all role-players are required. Hence, a multidisciplinary response with interagency partnerships needs to be fostered to pool expertise and help develop a coordinated and integrated response to this challenge. People at grassroots level should be empowered and mobilised since they also have a valuable role to play.

Importantly, the upstream determinants in the South African context need to be prioritised to ensure that we move beyond addressing just the ‘symptoms’ of the traffic burden. The platform will then be set to influence value systems and foster a culture of responsible road usage that will challenge irresponsible traffic behaviour, and the ideology that these incidents are inevitable.

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Since the early 1990s, with changing market conditions and the opening up of its borders and markets to global tourism, commerce and trade, South Africa has become an attractive market for long-distance drug trafficking and has seen an increase in the activities of international drug syndicates. In general, the Southern African region became exposed to drugs previously rarely available on the market, ranging from cocaine and opiates to synthetics like MDMA. Notwithstanding, alcohol and the locally produced illicit cannabis remain by far the most widely used drugs in the region. In fact, alcohol abuse alone is seen as a major cause of health and social problems in the region (MacDonald, 1996).

The above-mentioned situation has increased the need for reliable systems to monitor the use of alcohol and other illicit substances as well as their associated consequences in South Africa and the Southern African region. There has been increasing pressure from local organisations (e.g. the Drug Advisory Board), regional organisations (e.g. the Southern African Development Community, SADC), and international bodies (e.g. the United Nations Drug Control Program) to provide accurate information on substance use trends (Parry, Bhana & Bayley, 1997).

In addition to establishing trends, accurate and timely information is also needed to develop programmes and policy and to monitor the impact and efficacy of intervention programmes.

To answer to this need, the Medical Research Council (MRC) and the University of Durban-Westville established the South African Community Epidemiology Network on Drug Use (SACENDU) in 1996. The SACENDU network consists of researchers, practitioners and policy-makers from five sentinel sites in South Africa. These sites include three large port cities (Cape Town, Durban and Port Elizabeth) and two provinces (Gauteng - largely urban, and Mpumalanga - mostly rural).
A multi-source and multi-method sentinel approach to data collection is favoured above conducting national surveys since the former is seen to be more cost-effective, sensitive to location-specific differences, and therefore more suited to conditions in developing countries. The most important data sources for SACENDU include treatment data collected from specialist alcohol and other drug (AOD) treatment centres, substance abuse-related admissions or discharge diagnoses reported by psychiatric facilities, and AOD-related trauma unit admission data as well as other data, including the findings of studies on risky behaviour among teenagers (Parry et al., 2002).

More recently, the SADC Epidemiology Network on Drug Use (SENDU), coordinated by the MRC in collaboration with the SADC, has been established. This network supports the development of substance abuse surveillance systems in each of the 14 SADC member states over the next 5 years.

SACENDU and SENDU host biannual meetings bringing together representatives from each sentinel site to network and share information. They support numerous spin-off projects, foster research capacity building and disseminate information to be used by policy makers and planners (Oyemade Bailey, Morojele & Tsetsane, 2001; Parry, Plüddeman & Strydom, in press).

THE ALCOHOL AND DRUG SCENE IN SOUTH AFRICA

There is a paucity of recent statistical information on national trends for drug or alcohol use in South Africa (Parry, 2000). Some information on alcohol use patterns does exist, but less is known about other drugs. The National Department of Health’s 5-yearly Demographic Health Survey contains information on alcohol consumption patterns. The first of these surveys, completed in 1998, indicated that 45% of men and 17% of women of 15 years and older reported that they currently drank alcohol. Rates differ substantially according to population group and gender. One-third of current drinkers drink at risky levels over weekends (South African Demographic Health Survey [SADHS], 2001). The SADHS was repeated in 2003.

Information is also available on a national level on the alcohol-relatedness of deaths due to injuries. The MRC’s National Injury Surveillance System (NIMSS) was established in 1998 and collects mortuary data on an ongoing basis. Blood alcohol concentrations are found to be particularly high in people killed by firearms and sharp instruments, as well as in pedestrians and drivers who died in motor vehicle crashes (Matzopoulos, 2002).

In addition to the above, information from a variety of sources on alcohol and other drugs is monitored by SACENDU. Findings collected since its inception in 1996 to 2003 show the following trends:

a) Alcohol remains the dominant substance of abuse across sites.
b) Alcohol is associated with risky behaviours, such as sexual relations with multiple partners and dangerous driving.
c) The use of cannabis and Mandrax alone or in combination continues to be high.
d) The demand for treatment for cocaine-related problems has levelled off, but
e) 15-18% of patients in treatment in Cape Town and Gauteng indicated that cocaine is a primary drug of abuse or that cocaine is abused in conjunction with other drugs.
f) Over time, there has been an increase in treatment demand for heroin as a primary drug of abuse in Cape Town and Gauteng, but this trend has levelled off. Between 8% and 9% of patients in treatment in Cape Town and Gauteng indicated that heroin is a primary drug of abuse or that heroin is abused in conjunction with other drugs (Parry et al., 2003).

The TADS, the first of its kind in South Africa, monitored alcohol and other drug use in trauma patients (the Trauma and Drug Study that formed part of the National Injury and Violence Surveillance initiative at the MRC). Information from this study feeds into SACENDU (Peden & Butchart, 1999). A discussion of the findings of this study and how alcohol and other drug usage relates to injury causation in particular will form the core of this chapter.

**TADS AS SOURCE OF INFORMATION**

A 3-year MRC Trauma and Drug Study (TADS) was conducted on trauma patients at five health care facilities in three sentinel sites (Cape Town, Durban and Port Elizabeth) between 1999 and 2001. The aim of the study was to measure and monitor substance abuse and trauma trends in these sentinel sites. Alcohol and illicit drug use in trauma patients adds an interesting dimension to the overall picture of monitoring substance abuse trends in a community or region, because of claims around the association between substance abuse and injuries in general, as well as between substance abuse and violence in particular.

**Substance abuse and injuries**

Alcohol and drug use have been implicated as contributing factors to, or a main associated factor in nearly all types of trauma. The prevalence of substance use in victims of motor vehicle crashes, homicides, suicides and interpersonal violence has been reported in numerous studies as between 39% and 89% (Madan, Yu & Beech, 1999; Van der Spuy, 2000). The increased risk as well as risk-taking behaviour associated with both alcohol consumption and illicit drug use in various types of injuries have also been highlighted (Lipsey, Wilson, Cohen & Derzon, 1997; Peden & Van der Spuy, 1996; Scott et al., 2002). It has also been found that multiple attendances at trauma facilities are higher among patients testing positive for alcohol (Marais, 2002).

Substance use appears to play a role in trauma because it has a number of important effects (Madan et al., 1999). The most prevalent effect in both acute alcohol and drug ingestion is an altered level of sensory perception, impaired judgement and psychomotor performance. Alcohol intoxication has been associated with central nervous system depression, which may manifest in belligerence, incoherence, impaired intellectual and motor performance, loss of inhibitions and exaggerated self-confidence (Madan et al., 1999; Peden & Van der Spuy, 1996). The consequences can

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1SACENDU data, i.e. data from multiple sources, was recently used to sketch trends in adolescent and other drug use over the period 1997-2001 for Cape Town, Durban and the Gauteng Province (Parry et al., in press).
be seen especially with motor vehicle crashes where coordination and judgement play a role in reaction time. The neurophysiological effects of substance use may render people vulnerable to assaults as a result of decreasing ability of an intoxicated person to defend him or herself.

Less seems to be known about the effects of drugs other than alcohol. Although it may be assumed that drugs will affect, for instance, driving performance and increase the risk for injuries, there is insufficient scientific evidence to prove an increased risk for collisions in particular (Peden & Van der Spuy, 1996). Altered sensory perception, a sense of euphoria and a diminished sensitivity to pain perception that may accompany the use of illicit drugs have been found to lead to injuries in studies of emergency room trauma (Madan et al., 1999).

The association between trauma and substance abuse is multifactorial. More research needs to be done to indicate whether there is a causal relationship between trauma and substance abuse, and what the nature of this relationship might be (Lipsey et al., 1997).

**Substance abuse and violence**

The connection between substance abuse and violence is even more complex. Although some studies have shown a close association between alcohol intoxication and fatal violent crimes (Madan et al., 1999), information on causality remains inconclusive.

Observations and measurements regarding, for instance, the effects of alcohol use and the likelihood of violence as a consequence, may incorporate several distinctly different aspects (Lipsey et al., 1997). Firstly, there is the measurable blood alcohol concentration; then factors such as psychological variables (i.e. personality traits) can have their own effects. In addition, drinking is generally embedded in a social context involving a mix of circumstances, locations, companions and the like that may or may not influence the likelihood of violence.

Two important aspects to the question of causality between alcohol consumption and violence usually explored by researchers are whether persons who consume alcohol have a higher probability of engaging in violent behaviour than essentially similar persons in essentially similar circumstances. Another important variable is age. The probability of violent behaviour can change with age or can change from situation to situation in certain age groups, such as in adolescents. For instance, White, Loeber, Stouthamer-Loeber and Farrington (1999) found that the association between substance use and violence in adolescence is assumed to be tangential rather than causal or associational. The second important aspect concerning violence and substance abuse is the belief that causal effects come essentially in the form of an alcohol/drug × person × situation interaction; in other words, that alcohol consumption increases the probability of violent behaviour only for some persons in some situations (Bennett, Campillo, Chandrashekar & Gureje, 1998). It is important to keep in mind that the reverse may also be true. It is difficult to determine whether substance use is a response to violence exposure, or precedes violent behaviour (Vermeiren, Schwab-Stone, Deboutte, Leckman & Ruchkin, 2003). The methodological challenges inherent in studying this complex relationship are evident.
The question concerning the generalisability of findings on substance use and risk of injury from those attending emergency rooms to the general population is important. Some studies have found patients in emergency room settings to be more frequent heavy drinkers and to report more alcohol-related problems than the general population, whereas other studies have not found such an association (Cherpitel, 1999). Possible reasons for this over-representation of substance-use problems in some clinical settings may partly be due to the socio-demographic characteristics of those using the facility under study. For instance, results from studies conducted at primary care facilities may differ from those at hospital-based facilities because the patient populations are different and represent different groups in the community. Similarly, results may be different between private and public health facilities for the same reasons (Cherpitel, 1999). Again, findings like these show that interpretations, generalisations and comparisons should be made with caution.

Nevertheless, monitoring alcohol and drug use trends at trauma facilities provides some indication of trends in the usage of these substances in the broader population if these data are combined with data from other sources. In a study where three different sources of data were used as information for the epidemiology of illicit and abused drugs, i.e. self-reported drug usage in the general population, drug-related data from trauma patients and drug-related information from arrestees, it was found that, given the different samples and methodologies of data collection, any similarities in drug trends may be considered more reliable indicators of actual drug patterns than any one data system (Rouse, 1996).

This chapter is limited to a discussion of the findings of one study, i.e. the MRC TADS study and its value for the bigger picture of drug use in Southern Africa. Some recommendations are suggested that may have policy implications.

**METHODOLOGY**

The MRC TADS study formed part of a bigger national injury surveillance system for South Africa started in 1999, and was initially funded by the Department of Arts, Culture, Science and Technology. The aim was to monitor substance abuse and establish trends among trauma patients by assessing the proportion of patients with fresh trauma who were alcohol-positive at the time of their injury; assessing the proportion of patients with fresh trauma who had used an illicit drug prior to their injury; and assessing, by means of the CAGE questionnaire (Ewing, 1984), what proportion of trauma patients were chronic alcoholics.

Between 1999 and 2001 annual, cross-sectional, descriptive studies were conducted at five facilities in three cities, namely, two hospitals in Cape Town, one hospital in Durban, and two hospitals in Port Elizabeth (one hospital in Umtata was included for the first year of the study, but due to logistical problems surveys were discontinued at this site). Three harbour cities were chosen to monitor possible drug imports via seaports. For the sampling framework the concept of an ‘ideal week’ was used at the trauma unit. Each day of a week was divided into four 6-hour shifts and one shift was randomly selected per day, i.e. over 4 weeks the 24-hour period for each day of a week was covered. All patients of 14 years and older with fresh trauma attending
during these times were included in the studies, provided that they gave written consent for this. For those younger than 18 years of age, permission was requested from a parent or guardian. The injury-to-presentation time was set at a maximum of 6 hours.

The following instruments were used and procedures followed. Each patient was interviewed by a fieldworker using a specially constructed interview sheet. Alcohol usage was assessed using self-reporting, a breath alcohol test and the CAGE questionnaire. Self-reports were obtained by either asking the patients whether they had consumed alcohol prior to their injury or by using clinical judgement in unconscious or uncooperative patients. Breath alcohol concentration – BrAC, measured in gr/100ml – levels were assessed by means of the Lion Alcolmeter SD2, the use of which has previously been validated in a study in Cape Town (Peden, 1997). The CAGE questionnaire was included to assess chronic alcohol usage. The CAGE is a four-item screening tool for problem drinking consisting of questions on Cutting down, Annoyance and criticism, Guilty feelings and use of Eye-openers. A score of two or more positive answers is considered a positive CAGE and indicative of problem drinking.

Self-reporting was also used to assess drug usage among patients. Furthermore, a urine specimen was taken from the patient. A portion was used to screen for five drugs, namelyamphetamine, cannabis (THC), morphine, cocaine and methamphetamine, using a multi-drug kit. The Multi-Drug Test kit is a dip-type lateral flow test in a panel format that detects drugs and drug metabolites in urine. It is used on site and the results are easily interpreted. The card is dipped into a sample of urine, placed on a flat surface, and results are ready within 5 minutes.

A formal chemical analysis (to test for cannabis and methaqualone [Mandrax]) was conducted on the rest of the urine specimen by the Department of Pharmacology, University of Cape Town.

The data were checked, coded and cleaned before being entered into Epi-Info Version 6.02. Epi-Info was also used to analyse the basic descriptive data presented in this chapter. The Student’s t-test and Chi-square tests were used to test for significance.

**MAIN FINDINGS: ANNUAL TRENDS**

A total of 1935 patients were included in the study from the five sentinel sites in the three cities over the 3-year period 1999-2001 (Table 1). The following section presents aggregated data for these sentinel sites. Importantly, these results cannot be

<table>
<thead>
<tr>
<th>Hospital</th>
<th>City</th>
<th>Year 1999</th>
<th>Year 2000</th>
<th>Year 2001</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>G. F. Jooste</td>
<td>Cape Town</td>
<td>121</td>
<td>115</td>
<td>86</td>
<td>322</td>
</tr>
<tr>
<td>Groote Schuur</td>
<td>Cape Town</td>
<td>112</td>
<td>116</td>
<td>99</td>
<td>327</td>
</tr>
<tr>
<td>Livingstone</td>
<td>Port Elizabeth</td>
<td>189</td>
<td>118</td>
<td>146</td>
<td>453</td>
</tr>
<tr>
<td>Provincial</td>
<td>Port Elizabeth</td>
<td>84</td>
<td>114</td>
<td>63</td>
<td>261</td>
</tr>
<tr>
<td>Addington</td>
<td>Durban</td>
<td>205</td>
<td>179</td>
<td>188</td>
<td>572</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>711</strong></td>
<td><strong>642</strong></td>
<td><strong>582</strong></td>
<td><strong>1935</strong></td>
</tr>
</tbody>
</table>
generalised to the whole of South Africa, but provide some indication of trends across these sentinel sites for the period 1999-2001.

For each year of the study, nearly three-quarters of all injuries occurred among males and the mean age across time periods was around 32 years. Table 2 shows that for all 3 years, approximately 60% of all injuries resulted from violence. Between 1999 and 2001 there was a significant increase in the number of violence-related injuries ($\chi^2 = 5.06, p = 0.02$). Although transport and other unintentional injuries decreased during this time period, these decreases were not statistically significant ($\chi^2 = 1.69, p = 0.20$, and $\chi^2 = 2.19, p = 0.14$).

There was very little variation in the proportion of injuries for each of the above general causes of injury during 1999-2001. Consistently for each year, sharp objects accounted for about half of all violence-related injuries, while passengers accounted for about half of all transport-related injuries. Falls accounted for about 43% of all other unintentional injuries. Patients aged between 12 and 54 years were more likely to sustain an injury due to violence involving a sharp object, while patients aged 55 years and older were more likely to be injured due to falls.

### Alcohol

Most of those who could be interviewed (52.0%) (114 patients could not be interviewed because of the severity of their injuries) acknowledged that they had consumed alcohol prior to being injured. Of the 1900 patients that were tested, 54.7% tested positive for alcohol (see Figure 1). With a sensitivity of 85.4% (true positive rate of those that acknowledged alcohol usage versus those that tested positive), self-reported alcohol usage was found to be relatively reliable.

Of the positive cases, 74.4% had blood alcohol levels at or above 0.05 g/100 ml (a

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**Table 2.** Overall cause of injury, 1999 to 2001, $N = 1935$

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violence</td>
<td>412 (57.9)</td>
<td>378 (58.9)</td>
<td>373 (64.1)</td>
<td>1163 (60.1)</td>
</tr>
<tr>
<td>Transport</td>
<td>159 (22.4)</td>
<td>122 (19.0)</td>
<td>113 (19.4)</td>
<td>394 (20.4)</td>
</tr>
<tr>
<td>Other Unintentional Injury</td>
<td>140 (19.7)</td>
<td>142 (22.1)</td>
<td>96 (16.5)</td>
<td>378 (19.5)</td>
</tr>
</tbody>
</table>

---

**Figure 1.** Alcohol levels in injured patients, 1999 to 2001, N=1900
Monitoring alcohol and other substance use

proxy level that may suggest impaired judgement. The overall mean for the alcohol-positive cases was 0.10 (± 0.07) g/100 ml. Nearly 60% of patients were alcohol-positive in 1999, compared to about half in 2001. This decrease was statistically significant ($\chi^2=7.17, p=0.007$). The mean blood alcohol level showed a decrease from 0.10 g/100 ml in 1999 to 0.09 g/100 ml in 2001. This decrease was not statistically significant ($t =1.27, p>0.05$).

To test for chronic alcoholism, 1507 patients were interviewed using the four-question CAGE questionnaire (a number of patients were excluded because of the severity of their injuries or because they were too intoxicated to answer the questions). Of the 1507 patients interviewed, 605 (40.1%) had a total CAGE score of two or more, indicating problem drinking or possible alcohol dependence (Table 3). Patients with a total CAGE score of two or more decreased significantly from 1999 to 2001 (47.8%, 37.5%, and 32.7% for each year respectively) ($\chi^2=22.83, p<0.001$).

### Illicit drugs

A total of 1770 patients could be interviewed with regard to the use of illicit drugs prior to their injury. Only 187 (10.6%) acknowledged that they had used such a substance. As expected, the sensitivity of self-reporting (true positive rate of cases that acknowledged using an illicit drug versus the cases that tested positive for any illicit drug using drug-screening or pharmacology) was very low (25.9%). The low reporting rate is probably due to the illicit nature of drugs and a fear of prosecution and/or victimisation.

A total of 1565 patients were tested using the multi-drug kit. Table 4 shows that cannabis was most often found in patients’ urine for each of the 3 years. The highest percentage of cannabis-positive patients was recorded in 2001 (40%), while the highest percentage of cocaine- and opiate-positive patients was reported in 2000 (7% and 8% respectively). The test for opiates, however, should be viewed with caution since pre-hospital analgesia and even over-the-counter pain medications may also yield positive results.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Problem drinking or alcohol dependence, 1999 to 2001, N = 1507</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CAGE = 0 (%)</td>
</tr>
<tr>
<td>Violence</td>
<td>1999 (N = 344)</td>
</tr>
<tr>
<td></td>
<td>2000 (N = 314)</td>
</tr>
<tr>
<td></td>
<td>2001 (N = 267)</td>
</tr>
<tr>
<td>Transport</td>
<td>1999 (N = 117)</td>
</tr>
<tr>
<td></td>
<td>2000 (N = 90)</td>
</tr>
<tr>
<td></td>
<td>2001 (N = 74)</td>
</tr>
<tr>
<td>Other</td>
<td>1999 (N = 116)</td>
</tr>
<tr>
<td></td>
<td>2000 (N = 110)</td>
</tr>
<tr>
<td></td>
<td>2001 (N = 75)</td>
</tr>
</tbody>
</table>
Monitoring alcohol and other substance use

The presence of cannabis and methaqualone were also assessed using a conventional wet analysis (Table 5). Overall, 35% of the cases were found to have cannabis in their urine and 15% had methaqualone metabolites. The proportions of cannabis, methaqualone and 'white pipe' smoking (use of cannabis and methaqualone concurrently) were fairly stable across all 3 years.

Substance abuse and injury

Unfortunately, because of the long half-life of substances such as cannabis in the body, these results only indicate drug usage and cannot be associated with injury causation.

Table 4. Analysis of urine for illicit drugs using a multi-drug kit, 1999 to 2001, \((N = 1565)\)

<table>
<thead>
<tr>
<th></th>
<th>1999 No. (%)</th>
<th>1999 (%)</th>
<th>2000 No. (%)</th>
<th>2000 (%)</th>
<th>2001 No. (%)</th>
<th>2001 (%)</th>
<th>TOTAL No. (%)</th>
<th>TOTAL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamine</td>
<td>0</td>
<td>0</td>
<td>3 (0.5)</td>
<td>156 (28.2)</td>
<td>163 (40.4)</td>
<td>11 (2.7)</td>
<td>10 (0.6)</td>
<td>539 (34.4)</td>
</tr>
<tr>
<td>Cannabis</td>
<td>220 (36.2)</td>
<td>37.0</td>
<td>156 (28.2)</td>
<td>44 (7.9)</td>
<td>163 (40.4)</td>
<td>11 (2.7)</td>
<td>0</td>
<td>82 (5.2)</td>
</tr>
<tr>
<td>Opiates</td>
<td>23 (3.8)</td>
<td>3.8</td>
<td>44 (7.9)</td>
<td>38 (6.9)</td>
<td>163 (40.4)</td>
<td>11 (2.7)</td>
<td>10 (0.6)</td>
<td>60 (3.8)</td>
</tr>
<tr>
<td>Cocaine</td>
<td>11 (1.8)</td>
<td>1.8</td>
<td>1 (0.2)</td>
<td>3 (0.4)</td>
<td>0</td>
<td>0</td>
<td>3 (0.2)</td>
<td>1565</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>1 (0.2)</td>
<td>0.2</td>
<td>2 (0.4)</td>
<td>554</td>
<td>4</td>
<td>403</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL TESTS</td>
<td>608</td>
<td>100.0</td>
<td>554</td>
<td>403</td>
<td>1565</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Analysis of urine for cannabis and methaqualone using conventional wet analysis, 1999 to 2001

<table>
<thead>
<tr>
<th></th>
<th>1999 No. (%)</th>
<th>1999 (%)</th>
<th>2000 No. (%)</th>
<th>2000 (%)</th>
<th>2001 No. (%)</th>
<th>2001 (%)</th>
<th>TOTAL No. (%)</th>
<th>TOTAL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannabis</td>
<td>225 (37.0)</td>
<td>37.0</td>
<td>176 (31.8)</td>
<td>73 (13.2)</td>
<td>152 (37.7)</td>
<td>65 (16.1)</td>
<td>553 (35.3)</td>
<td>234 (15.0)</td>
</tr>
<tr>
<td>Methaqualone</td>
<td>96 (15.8)</td>
<td>15.8</td>
<td>73 (13.2)</td>
<td>38 (6.9)</td>
<td>65 (16.1)</td>
<td>403</td>
<td>220 (14.1)</td>
<td>1565</td>
</tr>
<tr>
<td>‘White pipe’</td>
<td>92 (15.1)</td>
<td>15.1</td>
<td>67 (12.1)</td>
<td>554</td>
<td>61 (15.1)</td>
<td>403</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(cannabis +</td>
<td>608</td>
<td>100.0</td>
<td>554</td>
<td>403</td>
<td>1565</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>methaqualone)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>TOTAL TESTS</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table 6. Substance abuse by cause of injury, 1999 to 2001

<table>
<thead>
<tr>
<th></th>
<th>Alcohol or illicit drug No. (%)</th>
<th>Alcohol or illicit drug (%)</th>
<th>Cannabis No. (%)</th>
<th>White Pipe No. (%)</th>
<th>Alcohol No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violence</td>
<td>902 (83.5)</td>
<td>902 (83.5)</td>
<td>389 (39.6)</td>
<td>162 (15.5)</td>
<td>758 (66.5)</td>
</tr>
<tr>
<td>Transport</td>
<td>201 (66.6)</td>
<td>103 (36.3)</td>
<td>87 (30.6)</td>
<td>27 (9.5)</td>
<td>163 (42.1)</td>
</tr>
<tr>
<td>Other Un-</td>
<td>185 (58.4)</td>
<td>107 (35.8)</td>
<td>77 (25.8)</td>
<td>31 (10.4)</td>
<td>118 (31.6)</td>
</tr>
<tr>
<td>intentional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The percentages are of the total cases tested for that substance per cause category.
Table 6 shows that patients who were injured as a result of violence were more likely to have consumed alcohol as well as other drugs prior to their injury than those who were injured in transport collisions or who had other unintentional injuries.

Table 7 shows the alcohol-relatedness of the different general causes of injury by year. Between 1999 and 2001 violence- and transport-related injuries showed a statistically significant decrease in alcohol-relatedness ($\chi^2=4.31, p=0.04$). While the alcohol-relatedness of other unintentional injuries also decreased, this was not statistically significant.

### Table 7. Alcohol-relatedness by cause of injury: 1999-2001 ($N=1039$)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Violence</td>
<td>286 (71.0)</td>
<td>248 (66.3)</td>
<td>224 (61.9)</td>
<td>0.11 (0.08)</td>
<td>0.10 (0.07)</td>
<td>0.09 (0.06)</td>
</tr>
<tr>
<td>Transport</td>
<td>79 (51.3)</td>
<td>46 (37.7)</td>
<td>38 (34.2)</td>
<td>0.09 (0.07)</td>
<td>0.08 (0.06)</td>
<td>0.10 (0.07)</td>
</tr>
<tr>
<td>Other Unintentional Injury</td>
<td>41 (29.7)</td>
<td>50 (35.5)</td>
<td>27 (28.4)</td>
<td>0.08 (0.07)</td>
<td>0.10 (0.08)</td>
<td>0.09 (0.05)</td>
</tr>
</tbody>
</table>

**Violence**

Figure 2 shows that patients who were injured with sharp instruments such as knives were more likely to be alcohol-positive (70.1%) than those who were injured as a result of blunt force (65.1%) or by a firearm (56.6%).

Furthermore, patients injured with sharp objects were more often classified as problem drinkers (50.2%), compared to patients injured by blunt objects (42.8%) or firearms (28.1%). In contrast, patients injured in firearm-related violence were more likely to have used an illicit drug prior to their injury (50.6%), compared to those injured by sharp objects (44.0%), blunt objects (42.9%) or by other means (47.1%).
Transport

Among patients injured in transport collisions, about half the drivers and pedestrians were alcohol-positive, compared to one-third of passengers (Figure 3).

Overall, just less than one-third (31.7%) of the transport victims could be classified (according to the CAGE results) as problem drinkers. Problem drinking was more common among pedestrians (42.2%) than among drivers (30.0%) or passengers (23.0%). The average levels of alcohol consumption were the same for all categories at 0.09 g/100 ml. It was noted that 67.9% of the drivers who were alcohol-positive were over the legal alcohol limit of 0.05 g/100 ml for driving. Pedestrians were also more likely to have used illicit drugs (48.7%) than passengers (25.4%) or drivers (34.1%).

Other unintentional injury

Falls accounted for just under half of all other unintentional injuries. About one-third (36.3%) of these cases tested positive for alcohol and 29.4% tested positive for an illicit drug. Overall, about one-quarter (23.2%) of all other unintentional injury cases had a total CAGE score of two or more.

Substance abuse and gender

Table 8 shows that higher percentages of males than females were alcohol- and drug-positive. These differences were statistically significant ($\chi^2=56.72$, $p<0.001$ and $\chi^2=114.99$, $p<0.001$ respectively). The average levels of alcohol consumption for both groups were the same (0.10 g/100 ml).

Table 8. Substance abuse by gender, 1999 to 2001

<table>
<thead>
<tr>
<th>Substance tested positive</th>
<th>Male ($N = 1378$)</th>
<th>Female ($N = 520$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol positive</td>
<td>60.0</td>
<td>40.7</td>
</tr>
<tr>
<td>Mean positive BrAC (± S.D)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.10 (0.07)</td>
<td>0.10 (0.07)</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illicit drug positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male ($N = 1163$)</td>
<td>49.6</td>
<td></td>
</tr>
<tr>
<td>Female ($N = 400$)</td>
<td>19.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Substance abuse by transport user category

Overall, just less than one-third (31.7%) of the transport victims could be classified (according to the CAGE results) as problem drinkers. Problem drinking was more common among pedestrians (42.2%) than among drivers (30.0%) or passengers (23.0%). The average levels of alcohol consumption were the same for all categories at 0.09 g/100 ml. It was noted that 67.9% of the drivers who were alcohol-positive were over the legal alcohol limit of 0.05 g/100 ml for driving. Pedestrians were also more likely to have used illicit drugs (48.7%) than passengers (25.4%) or drivers (34.1%).

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</tr>
</tbody>
</table>
Substance abuse and severity of injury

Figure 4 shows that patients who sustained moderate to serious injuries (New Injury Severity Score [NISS] > 9) were more likely to be alcohol-positive than patients who sustained minor injuries. This difference was statistically significant ($\chi^2=6.48, p=0.01$).

Figure 4. Injury severity by alcohol usage

MAIN FINDINGS: INTER-CITY DIFFERENCES

Generally, the main strength of sentinel surveillance lies in detecting temporal trends and emerging problems at a sentinel site in order to provide a basis for intervention, evaluation and policy initiatives. However, aggregate data (3 years combined) were compiled for each of the three TADS sentinel sites (trauma centres in Durban, Cape Town and Port Elizabeth) in order to profile the general characteristics of the trauma population as well as to create a profile of the substances abused. The fact that convenience sampling was used means that the sample was not representative of the trauma population of the city or the catchment area of the sentinel sites. Hence, comparisons between sites should be interpreted with caution. Furthermore, statistical analysis is also restricted due to the lack of representivity. The three sentinel sites are located at the major port cities in the country, which are possible entry-points for drug trafficking from outside the region. It is assumed that this trafficking may also have a strong influence on substance abuse and trauma among the local populations.

Demographics and cause of injury

The mean age of participants across the three sentinel sites ranged between 30.8 years and 33.2 years, and the highest mean age was found in the Port Elizabeth sample. Males accounted for more than two-thirds of the sample population at each of the three sentinel sites, and the highest percentage of males was in Cape Town (76.4%). Violence was the dominant cause of injury across all sites; the highest percentage of these cases was recorded in Port Elizabeth (64.1%).
Temporality and scene of injury

Although most injuries across all three sites occurred after office hours, Durban and Cape Town had a similar proportion with about two-thirds of the sample occurring then compared to only 56% in the Port Elizabeth sample. Generally, most injuries occurred over weekends (Friday to Sunday) and particularly on Saturdays. While Cape Town and Port Elizabeth recorded similar percentages of injuries on Saturdays (28.5% and 29.6% respectively) and over weekends (63.2% and 64.7% respectively), Durban showed the least variability, with 23.6% of cases on Saturdays and 57.7% over weekends. Patients in Port Elizabeth were most often injured in and around the home (51.3%), while the road or pavement was the dominant scene of injury among patients in Durban and Cape Town (52.8% and 43.4% respectively).

Clinical data

The average NISS was similar for Durban and Port Elizabeth (4.7 and 4.6 respectively). Cape Town had a higher mean of 7.2, which was largely due to higher NISS values (indicative of fatal cases) recorded at this site. On average, patients in Cape Town were hospitalised for longer (median length of stay 5 days) compared to Durban and Port Elizabeth (median length of stay 4 days each).

Table 9 shows the substances abused among trauma populations at each sentinel site by cause of injury. Overall, more than three-quarters of all cases across all three sites had taken at least one substance (alcohol or illicit drug) prior to being injured.

Table 9. Substance abuse by cause of injury and city

<table>
<thead>
<tr>
<th>Substance abused</th>
<th>Violence</th>
<th>Transport-related</th>
<th>Other unintentional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol positive</td>
<td>189 CT</td>
<td>238 PE</td>
<td>101 CT</td>
<td>326 CT</td>
</tr>
<tr>
<td>Alcohol negative</td>
<td>208 CT</td>
<td>136 PE</td>
<td>33 CT</td>
<td>277 CT</td>
</tr>
<tr>
<td>Meth positive B=0.1</td>
<td>6.06</td>
<td>0.91</td>
<td>0.12</td>
<td>0.06</td>
</tr>
<tr>
<td>Meth positive B=1</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
<td>0.06</td>
</tr>
<tr>
<td>Total patients (alcohol)</td>
<td>294</td>
<td>450</td>
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<td>294</td>
<td>450</td>
<td>133</td>
<td>123</td>
</tr>
<tr>
<td>Alcohol positive</td>
<td>218 CT</td>
<td>257 PE</td>
<td>101 CT</td>
<td>376 CT</td>
</tr>
<tr>
<td>Alcohol negative</td>
<td>208 CT</td>
<td>136 PE</td>
<td>33 CT</td>
<td>277 CT</td>
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<td>294</td>
<td>450</td>
<td>133</td>
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</tr>
</tbody>
</table>

NOTE: The table shows the number of cases and the percentages of positive cases for substances abused by cause and sentinel site using aggregate data from 1999 to 2001. Percentages were calculated using the total cases tested for that substance in each cause category. The total causes category per site only includes those cases where the general cause of injury was known.
Alcohol
Overall, Port Elizabeth recorded the highest percentage of alcohol-positive cases (69%), also having the highest mean level of consumption of 0.12 g/100 ml. The alcohol positivity and levels of alcohol consumption for Port Elizabeth were also consistently the highest for each cause of injury. Across all sites, patients injured as a result of violence were most likely to test positive for alcohol, ranging from 54% of cases in Durban to 79% in Port Elizabeth.

Illicit drugs
Overall, the highest percentage of cases testing positive for at least one illicit drug was found among patients in Cape Town (46%), and the drug used most often was cannabis (39%). The highest percentage of 'white pipe' smoking was also found among patients in Cape Town (19.6%). While the highest overall drug positivity was found among violence-related injuries for Durban and Cape Town (49% and 46% respectively), Port Elizabeth had an almost equal distribution among the different causes of injury.

For violence-related injuries, the highest percentage of positive cases for overall illicit drug and cannabis use was found among patients in Durban (49% and 44% respectively) while for 'white pipe' smoking the highest percentage was recorded in Cape Town (23%). With transport-related injuries, Cape Town had the highest percentages of positive tests for overall drug use, cannabis and 'white pipe' smoking (46%, 38%, and 15% respectively). For other unintentional injuries, the highest percentage of positive cases for overall drug use was recorded among the Durban trauma population (40%). While for other unintentional injury cannabis was almost equally distributed across the sites, 'white pipe' smoking was highest in Cape Town and Port Elizabeth (both about 15%).

Alcohol and illicit drugs
Overall, about one-fifth of the trauma population in Durban, one-quarter in Cape Town, and close to one-third in Port Elizabeth had used alcohol and an illicit drug in combination. Across all three sites the highest percentage was found among violence-related cases, ranging from 28% in Durban to 32% in both Cape Town and Port Elizabeth.

Other illicit drugs
Across all sites very small numbers of 'club' drugs (amphetamine and methamphetamine) were detected among the cases included in the study. These results are therefore not presented. Tables 4 and 5 show that cannabis followed by methaqualone were the illicit drugs that were most often abused, and these were followed by opiates and cocaine. Overall, the highest percentage of opiate use was found in Cape Town (8%), and Cape Town recorded the highest percentages among violence- (7%) and transport-related injury cases (12%). The highest overall percentage for cocaine use was in Port Elizabeth (5%), which also recorded the highest percentages for cocaine use among people with transport-related injuries (4%) and other unintentional injuries (8%).
CONCLUSION

Findings from the TADS study feed into and make an important contribution to the ongoing monitoring of alcohol and other substance use in South and Southern Africa. The SACENDU network plays a crucial role in the collection, collation and dissemination of information to stakeholders, including policy makers. Information from this network is used, for instance, to inform the implementation of the National Drug Master Plan, South Africa’s core document of substance policy approved by Cabinet in 1999.

Furthermore, the TADS study confirms and adds to our understanding of the nexus between alcohol and illicit substance use and injuries in general, and also injuries due to violence for patients attending emergency care services. Emergency room survey data are, however, limited to only victims that sustain injuries. No information is collected at present on the perpetrator, the involvement of the victim, or the circumstances under which alcohol and/or illicit substances were used in the injury episode. Further research at emergency rooms should be aimed at collecting more comprehensive data on the perpetrator/victim interaction and circumstances leading to the injury. Some studies have been done on substance abuse among perpetrators (Leggett, 2002), but more information is needed on abuse patterns in the general population in comparison to specific populations such as trauma unit attenders.

Although the TADS study is the first of its kind in South Africa, findings from the study cannot be generalised. Follow-up studies should include a more representative sentinel site surveillance methodology.

As far as recommendations for prevention strategies are concerned, the following suggestions need urgent attention in South Africa. Alcohol screening and early interventions in emergency rooms is a neglected field and should receive much more attention than it has up to the present. Law enforcement in respect of alcohol abuse among road users is an essential step towards the prevention of motor crashes and pedestrian injuries and deaths (intoxicated pedestrians on public roads is especially problematic). However, preventative and educative initiatives at a primary prevention level should be initiated on a larger scale. Lastly, well-designed, dedicated and ongoing violence prevention programmes should be aimed at children at primary school level and not later when these behaviours are already established (Van der Spuy, 2000).

REFERENCES


developments in alcoholism (Vol.13), Alcoholism and violence (pp. 245-282). New York: Plenum Press.


9 Childhood burn injury: Epidemiological, management and emerging injury prevention studies

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Reports have indicated that burn injuries are dangerous and often result in fatalities among young children in low-income contexts. Burn injuries in childhood are often severe events resulting in painful long-term effects. Apart from causing death, thermal injuries may cause disabling scars not only to the skin or body of the child, but also to her or his psyche. Psychological, educational and social adjustment to the injury and its physical consequences may be complicated by a range of factors, including the site of the injury, and the child’s personality and social relationships. In terms of economic impact, the younger the child at the point of injury, the greater the loss in productive years. In low- and middle-income countries these problems are likely to be exacerbated by the unavailability of specialised staff and medical technologies (Barss, Smith, Baker & Mohan, 1998).

In the last decade a steady stream of medical, epidemiological and psychological research on childhood injuries in South Africa has emerged. These studies all indicate that burns are an important cause of mortality, injury, disability and psychosocial trauma in young children, especially those aged between one and five years. In this chapter we report in more detail on this recent research, providing:

a) An outline of the emerging prominence of childhood burn injury as a priority global, African and South African public health threat;

1To whom correspondence should be addressed.
b) Core definitions of childhood burn injury that inform research and injury prevention interventions in South Africa;

c) A review of recent epidemiological studies on injury distribution, the affected populations, and determinants;

d) A review of current educational, infrastructural, product and legislative interventions; and

e) Recommendations for future epidemiological and injury prevention interventions.

**A GLOBAL AND NATIONAL CHILD HEALTH PRIORITY**

The majority of burn deaths due to fires, scalds, chemicals and electricity occur in low- to middle-income countries. Burns fatalities and injuries affect mainly children and the elderly. Burns are the leading cause of the global burden of disease and injury (based on deaths and disability) among children aged between 5 and 14 years (World Health Organisation [WHO], 2003). Most burn injuries occur in and around the home, particularly among children and women. Remarkable differences in burn outcomes can be observed between high-income and low- or middle-income countries. This is probably related to differences in the provision of adequate burn care in severe cases and the resulting sequelae (WHO, 2003).

In South Africa burn injuries due to scalding, open flames and other causes constitute one of the leading causes of non-natural death in children aged 14 years and younger (Burrows, Bowman, Matzopoulos & Van Niekerk, 2001). The increasing epidemiological recognition of childhood burn injuries in South Africa (Burrows et al., 2001; Godwin, Hudson & Bloch, 1996; Hudson & Duminy, 1995; Kibel, Bass & Cywes, 1990; Peden, 1997; Zwi et al., 1995) indicates that burn injuries are a leading cause of injury in young children, especially those aged between one and five years. These recent studies have indicated that the majority of injuries are due to scalding, with some variation depending on urban or rural location. These injuries often result from hot fluids from kettles, pots and baths (Child Accident Prevention Foundation of Southern Africa [CAPFSA], 1999). A further significant proportion of injuries are due to open flames. In South Africa flame injuries are reported to be especially dangerous, and result in more severe injuries and fatalities (Burrows et al., 2001; CAPFSA, 1999). Childhood burn injuries usually occur in the late afternoons, often after school hours, and in the evenings. The majority of these injuries occur to male children, to their heads, necks and upper bodies (Burrows et al., 2001; CAPFSA, 1999).

**DEFINITIONS AND CLASSIFICATION SYSTEMS**

A burn or thermal injury occurs when some or all of the different layers of cells in the skin are destroyed by hot liquid (scalds), a hot solid (contact burns), or a flame (flame burns). Injuries due to electricity, chemicals, ultraviolet radiation and radioactivity, as well as respiratory damage due to smoke inhalation are also defined as burn or thermal injuries (WHO, 2003).
The international and South African public health sector has tended to focus on the demographic profiles, physiopathological sequelae and increasingly in recent years, on the prevention aspects of moderate to severe burn injuries. In general, these injuries are classified according to two major factors that influence management and prognosis: the extent of the injury, and the depth of the burn. The extent of the injury is expressed as a percentage of the total body surface area (TBSA), which is calculated according to the injured individual’s age (see Figure 1).

**Figure 1.** Total body surface area (%) according to age

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>0</th>
<th>1</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/D head</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>B/E thigh</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>C/F leg</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Rode, Mills, Van der Riet & Cynnes (1999)
The depth of the burn is expressed either as a partial-thickness or full-thickness injury. Partial-thickness burns involve the epidermis and may extend into the dermis. They are red, wet, soft, and pliable, with blisters. Sensation is usually present, making them extremely painful. Full-thickness burns involve the epidermis, dermis, and all the deep dermal elements, such as the nerve endings, sweat glands and hair follicles. They appear brown, grey, or white, are firm and without blisters or sensation (see Figures 2 and 3). In practice, most burns are a combination of both types (Rode, Millar, Van der Riet & Cywes, 1989).

For the purpose of referral, burns are classified as minor, or moderate to severe. Minor burns are partial-thickness injuries of less than 10% of the TBSA, in a child older than a year. Moderate-severe burns are partial-thickness burns of greater than
10% of the TBSA, full-thickness burns of greater than 3% of the TBSA, all burns involving the hands, feet, face, eyes, ears, and perineum, all inhalation injuries, circumferential injuries, electrical injuries, neonatal burns, or those affecting children with serious pre-existing illness. Special attention should always be provided for burns occurring on the face, hands and perineum. Burns in these areas are often referred to as "special burns", since the management of these takes priority over other burns. Mismanagement of these burns can interfere greatly with the physical and psychological functioning of the injured child (Rode et al., 1989).

SOUTH AFRICAN BURN RESEARCH
Recent South African research has tended to focus on the clinical profile and management of burn injuries, initial descriptions of the epidemiology of burn injuries, among some adults, but mostly among children, and preliminary discussions around injury prevention (for example, Burrows et al., 2001; Du Toit, 1999; Goodwin & Wood, 1998; Hudson & Duminy, 1995; Kibel, Bass & Cywes, 1990; Peden, 1997; Rode, Millar, Le, Van der Riet & Cywes, 1989). Despite the increasing scientific interest in these injuries, there remains a dearth of systematic national epidemiological information, considered vital for the development of prevention interventions. Recent research in the sector has taken two approaches, namely: (a) the exploration of diagnostic and management protocols, with the aim of reducing long-term morbidity and mortality; and (b) the exploration of public health schemes, with the aim of reducing the incidence and risks of thermal injury.

Burn injury diagnosis, management and mortality reduction
Mortality in serious thermal injury in children is predominantly determined by the TBSA burned and often-unrecognised inhalation injury. A number of recent Southern African studies have examined diagnostic efficacy and the relationship to mortality or hospitalisation times. Whitelock-Jones, Bass, Millar and Rode (1999) undertook a retrospective review of thermal injuries over a 10-year period to examine more fully the impact of inhalation injury. They found the incidence of inhalation injury to be around 2.2%, although they conceded that this was probably an underestimation caused by the low pick-up rates among clinicians. Inhalation injuries were most likely to occur following fire burns, and were uncommon in scalds or steam inhalation due to the swallowing reflex and the rapid dissolution of heat by the hypopharynx. Delay in diagnosis was a common feature, especially in scald injuries when inhalation injury was not anticipated. The most reliable clinical signs were stridor and respiratory distress, and it was stated that there should be a low threshold to performing a diagnostic endoscopy on the day of admission. Of 4451 children included in the study, there was 1.8% mortality overall, but nearly 50% mortality in the subset of children identified with inhalation injury. The conclusions of the study stated that inhalation burns were often not recognised, could present late and usually had significant consequences. It is postulated that earlier clinical diagnosis, supported by endoscopic findings, would improve mortality rates.

A widespread study on the factors contributing to mortality rates after admission was recently undertaken in Zimbabwe (Muguti & Mazabane, 1997). Between January 1990 and December 1993, 49 patients died from burns at Mpilo Central Hospital. The main factors contributing to death were septicaemia, pneumonia and acute renal failure. The study concludes that the key to survival for burns patients is early
Childhood burn injury presentation and active resuscitation, followed by the successful management of complications. Despite this, some patients with severe burns will die regardless of optimal management.

A general review of paediatric burns in a rural South African hospital found that a delay in presentation was associated with a longer length of hospital stay (Chopra, Kettle, Wilkinson & Stirling, 1997). The average time from sustaining the injury to presentation was 42 hours. Children presenting within 24 hours had a mean length of stay of 12.8 days, while those presenting after 24 hours had a mean length of stay of 25.2 days. Delay in presentation has been attributed to several reasons, including self-treatment at home, consultation with traditional healers and transport costs (Chopra et al., 1997).

Public health interventions: Identifying the nature, extent and scope of the problem

In South Africa a number of public health studies have reported on the occurrence of burn injuries among children nationally (Bradshaw, Schneider, Laubscher & Nojilana, 2002; Burrows et al., 2001), and in specific communities in Gauteng and the Western Cape (Peden, 1997; Zwi et al., 1995). Since 1999 the National Injury Mortality Surveillance System (NIMSS) has produced information on injury fatalities. The NIMSS constitutes the beginnings of what is hoped will become a national mortuary-based system. In 2001 NIMSS recorded the details of 18 876 non-natural deaths (approximately 24% of the estimated 80 000 fatal injuries nationwide). Of these, 806 deaths were due to burns, of which 122 occurred in children younger than 14 years. Burns were the leading cause of non-natural death in infants and children younger than 5 years, and the fourth major cause in children aged 5 to 9 years (Burrows et al., 2001). The database is non-representative and still relatively small. Consequently, it does not allow for extrapolations to the national population.

The Red Cross War Memorial Children’s Hospital located in Cape Town has also registered moderately to severely burned children since 1992. Between 1992 and 2001 a total of 7241 patients presented with burns, of which 72.1% were fluid burns and 11.7% flame burns. Of 54 unconscious patients, 44.4% had flame burns (Du Toit, Dragosavac, Van As & Rode, 2001). Fluid burns are often due to hot fluid from kettles, baths, pots and hot tea and coffee. Flame burns are a particular problem in informal settlements, where house fires begin easily with the drop of a match or candle, and spread quickly, destroying many homes (CAPFSA, 2001).

The vast majority of burns occur in the home of the patient. Burn injuries also largely occur in the late afternoon and evenings, perhaps once children are home from school, and when there are more activities and distractions around the home (CAPFSA, 2001). In addition, most children suffer head and neck and upper-body burns as their primary cause of injury. This could be related to their small size and the cause of the burn. When examined in the context of most burns being caused by hot liquids, this is consistent with children pulling on kettle cords, pot handles, and tablecloths, all of which could lead to burns on the head, neck, and upper body (CAPFSA, 2001). The NIMSS and CAPFSA findings are supported by a number of earlier studies (Peden, 1997; Zwi et al., 1995).
Childhood burn injury risk factors

Despite the increasing epidemiological attention to the South African occurrence of burn injury, there remains a scarcity of controlled empirical studies identifying the mechanisms underlying the occurrence of these injuries. The available South African burn injury studies have tended to examine the associations between burn injuries and sociodemographic variables, such as age, gender, and geographical location. Less attention, if any, has been directed towards the impact of the more transient and modifiable individual, household, familial, and neighbourhood factors and circumstances. It is assumed that the absence of comprehensive burn risk research has limited the impact of burn injury prevention and control initiatives. In order to facilitate the development of effective injury prevention and control interventions, it is therefore proposed that the epidemiological work on burn injuries utilises information about both permanent and transient risk factors (Roberts, 2000; Rossi et al., 1998).

Although the need for such research is generally accepted, globally very few if any empirically controlled burn injury risk studies had been identified prior to 1989 (Van Rijn, Bouter & Meertens, 1989). A handful of more rigorous studies have emerged in recent years, particularly in Ghana (for example, Furjuoh, Guyer & Smith, 1995; Furjuoh, Guyer, Strobin, Keyl, Diener-West & Smith, 1995), Nigeria (Iregbulem & Nnabuko, 1993), Bangladesh (Daisy, Mostaque, Bari, Khan, Karim & Quamruzzaman, 2001), Greece (Petridou et al., 1998), Brazil (Delgado et al., 2002; Werneck & Reichenheim, 1997), and the Netherlands (van Rijn et al., 1989).

This emerging international body of burn injury risk studies largely recognises that a complex interaction between individual, social, environmental, and injury-inducing agent factors may contribute to the occurrence of burn injuries. Factors related to childhood burn injury include age, gender, pre-existing physical impairments, poor living conditions, overcrowding, and maternal illiteracy or educational level. A number of other factors have generated either less or conflicting support from the limited epidemiological research. These include activity levels, parity, and history of burns in siblings. Much less is known about the contribution of environmental conditions, home construction, the use of various fuels for heating and cooking, and the use of various heating and cooking appliances. Information on these and other risk factors are argued to be critical for the development of environmental and product-related interventions. However, as indicated by others in the sector, scientific conclusions about risk factors can only be drawn if the presence of these factors in persons with injuries is compared with that in persons from a control group without burns (Van Rijn et al., 1989). Few such studies had been identified prior to 1989 (Van Rijn et al., 1989), with none before or since from South Africa.

PREVENTION INTERVENTIONS

Systematic and rigorously collected epidemiological data on burn injury incidence, patterns, causes, medical care and costs are necessary for the design of effective prevention and advocacy programmes (Liao & Rossignol, 2000). Burn prevention programmes have been implemented and evaluated in America, Australasia, India and Europe, and have demonstrated significant reductions in burn morbidity and mortality (Liao & Rossignol, 2000). Passive measures, protecting the public through product modification, environmental redesign or control and legislation, have generally been more effective in preventing burn injuries than have active measures.
that require persistent, long-term behavioural or lifestyle change (Linares & Linares, 1990). Many of the more effective international burn prevention programmes have been multi-pronged, including both active and passive measures, and have incorporated one or more of three main strategies. These are education, which is primarily an active measure requiring behavioural or lifestyle change, product design or environmental modification, and the enforcement and regulation of legislation, the latter being primarily passive measures. These strategies and their overall contributions to burn injury prevention are briefly described.

**Environmental and product modifications**

Environmental and product modification strategies include the design of products or environmental changes that reduce the potential for burn injuries and death. Passive strategies directed at the home environment, such as smoke detectors, reducing water temperature, fire-safe cigarettes and reduced flammability of clothing products, have all received significant support in the international literature (Liao & Rossignol, 2000). Other potential interventions that may be significant in the South African context include the development of safe housing and safe housing standards, firebreaks between informal housing, access to water in informal settlements, and fireguards. The electrification of houses, undoubtedly, will also have some impact on the reduction of fire-related burns.

**Education**

There is little evidence that interventions based solely on educational strategies can prevent burns. Often vulnerable groups, such as the very young, are difficult to reach with educational messages, or are less able to adopt safe practices, even if they are exposed to educational messages (McLoughlin, 1995). Publicity campaigns, teaching, children's television programmes, and other educational strategies may have a short-term impact, but this is unlikely to be sustained without repetition (Liao & Rossignol, 2000). Older children may be more amenable to school education programmes, although inclusion of prevention materials in the school curriculum may on its own not be sufficient for burn reduction. Successful educational interventions, typically the more focused ones, have had some success in lowering burn incidents and their severity. Successful interventions have been developed around “stop, drop and roll”, “apply cool water to burn injury”, and “crawl low under smoke” messages (Liao & Rossignol, 2000).

An important target group for educational strategies are also those who are responsible for policies relating to our physical, social and economic environment. Traditionally, education in the injury prevention field has been utilised in an excessively narrow way (Towner, 1995). Critics of the effectiveness of this approach have proposed a focus that still concentrates on changing individual decision-making, but uses prevention education to encompass a broader range of recipients, including professionals, practitioners, policy-makers and the targeted children and families themselves. This type of education also shapes a local safety culture by developing the pro-safety beliefs and attitudes of the general public, which in turn, may stimulate governments to act.

**Legislation and enforcement**

The implementation and enforcement of regulations can be used to reinforce safe practices. Regulatory interventions include legislation controlling clothing and
cigarette flammability, stove design, lowering tap water thermostat settings and others. In an Australian study over a 25-year period a legislative approach is reported to have resulted in a substantial decline in burn admissions (Streeton & Nolan, 1997). The reduction was primarily attributed to mandating and enforcing legislative standards for sleepwear and water-heating devices. Supplementary public burn prevention education campaigns, especially those directed towards the control of hot water and flame burns among young children, were also reported to contribute to this success (Streeton & Nolan, 1997).

Towards good practices
So what are we doing? In South Africa there is minimal documentation of burn prevention initiatives and even fewer systematic evaluations of successful prevention interventions. Some South African organisations such as CAPFSA, the Paraffin Safety Association of South Africa (PASASA), some local municipalities, hospitals and clinics have initiated programmes that are designed to reduce the incidence or risk of sustaining burn injuries.

CAPFSA. This organisation has implemented various burn prevention education campaigns. These campaigns and programmes are targeted at adults, children and professionals. The methods used by CAPFSA to educate communities on burn prevention are extensive use of the media, the development and distribution of educational resources (posters, pamphlets, videos), workshops, lectures, training courses and exhibitions targeting specific vulnerable communities. In response to the scant resources for educators to cover injury prevention in the school curriculum, CAPFSA and the Western Cape Education Department have recently compiled a life-orientation pack for Foundation Phase learners. The pack focuses on childhood injury prevention and contains a burn prevention module. This project is currently in the pilot stage.

PASASA. This organisation has also developed educational resources that facilitate especially paraffin-related burn prevention. PASASA plays an important watchdog role since it encourages all producers of illuminating paraffin to conform to established safety standards, and ensures that paraffin remains uncontaminated while under their care. PASASA also targets the identification and dissemination of better practices for the handling of illuminating paraffin and supports the development of legislation consistent with the South African Bureau of Standards (SABS) appliance standard (PASASA, 2003).

Emergency services. A number of the emergency services departments of local municipalities, especially in the Gauteng and Western Cape Provinces, conduct Fire and Life Safety Educators’ Courses. These courses target fire service personnel and other safety practitioners who are required to present fire and injury prevention programmes. The trained educators then structure their own intervention strategies appropriate to the requirements and concerns of those communities at risk. From this course the “learn not to burn” campaign was initiated. This campaign is hosted by the City of Cape Town. It is currently run by a group of volunteers from emergency services who have been trained to teach children what to do in the event of a fire and how to avoid burn injuries.
**Children of Fire Trust.** The Trust conducts various burn prevention educational programmes with a specific focus on the secondary and tertiary levels of burn prevention. Various hospitals and clinics in the country run their own burn prevention educational campaigns. One example is the "stop burns" campaign that was implemented at the Chris Hani Baragwanath Hospital in Soweto, Johannesburg. The success of this programme was measured by the drop in burn admissions to this hospital during the implementation stage of the campaign.

**Ukuvuka Operation Fire Stop.** This four-year campaign started as a direct result of the January 2000 fires that ravaged the Cape Peninsula and thereafter the regular fires in various informal settlements, such as occurred in the Joe Slovo neighbourhood. This campaign is a joint initiative between the National Government of South Africa (represented by the Working for Water Programme), the Western Cape Provincial Government, the City of Cape Town and the South African National Parks (Ukuvuka, 2003).

Many of the interventions by CAPFSA, PASASA, Ukuvuka, the Children of Fire Trust, and various emergency services have documented encouraging or positive results, but unfortunately with little scientific evidence to support these. The majority of these interventions do not report any systematic external evaluation, mainly because of a lack of resources, insufficient time or personnel, or because of limited technical skills (Du Toit, 1999). It therefore remains difficult to assess how effective these initiatives really are.

**PRIORITY RECOMMENDATIONS**

Recent South African research has identified childhood burn injuries as a priority concern. A number of specific research, management and prevention priorities are identified in this chapter.

A key research priority includes the ongoing surveillance of both fatal and non-fatal injury data, an essential monitoring and evaluation tool for prevention. The development, analysis and dissemination of the findings produced by the National Injury Mortality Surveillance System (NIMSS), and sentinel burn injury surveillance sites such as those located at the Red Cross Children’s Hospital and elsewhere, constitute a critical information base for further analysis, and ultimately to stimulate and monitor interventions in the sector. In addition, it is proposed that expansion of the current fatal and non-fatal injury data sources includes information on permanent disfigurement and disability suffered by survivors, imperative for a more complete determination of burn prevention priorities (Liao & Rossignol, 2000). Finally, the identification of aetiological patterns peculiar to South African conditions is essential for understanding the multiple and often complex occurrences of childhood burn injury. Identification of individual, familial, household and community risks specific to the local occurrence of childhood burn injuries implies the implementation of specifically focused studies, although risk patterns, to some extent, may also be derived from current databases.
Recent international and South African research supports the prioritisation of public health interventions, especially preventative efforts. However, most local burn prevention projects are largely scientifically untested. Key recommendations for the South African sector therefore include the identification, evaluation and dissemination of good burn injury prevention practices which explicitly benefit children who may be vulnerable to burn injury, such as those aged 1 to 6 years. To assist in the evaluation of current interventions, it is proposed that appropriate evaluation protocols be utilised or developed for use in local injury prevention projects. This review also specifically supports the evaluation and implementation of primarily passive environmental, product and legislative injury prevention interventions; the development of mandatory specifications on high-risk products, including children’s clothing, portable stove construction, and cigarette flammability; the promotion of electricity and other safe forms of home energy consumption; and the implementation and evaluation of targeted safety education, especially for health professionals, children and parents (via the school curriculum), and policy-makers.

We also identified a number of key recommendations in terms of diagnosis, management and reduction of inpatient mortality, namely the early identification and appropriate referral of patients with moderate to severe burn injuries, especially inhalation burns; and the effective management of complications, especially sepsicaemia, pneumonia and acute renal failure.

In conclusion, a number of reports have indicated that burn injuries are especially dangerous and often result in fatal injuries amongst young children. Despite increasing epidemiological attention to the occurrence of burn injury, there remains a paucity of empirical studies identifying the incidence, extent, and contributory mechanisms underlying these injuries. Similarly, there is a lack of systematic investigation into burn injury prevention practices in South Africa. Despite these limitations, there remains considerable public interest in and support for childhood burn injury prevention initiatives.

REFERENCES


Paraffin ingestion

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Of the different external causes of death from unintentional injury among children between the ages of 1 to 14 years in 2000/2001, poisonings ranked fourth after road traffic accidents, fires and drowning (Taft, Paul, Consunji & Miller, 2002). Paraffin (known as kerosene in some countries) poisoning by ingestion is known to be the most common cause of acute unintentional poisoning in the South African black paediatric population (De Wet et al., 1994; Ellis, Krug, Robertson, Hay & MacIntyre, 1994; Joubert, 1990).

This chapter provides a review of the literature on unintentional paraffin ingestion. It discusses the clinical features of paraffin poisoning, management of paraffin ingestion, incidence of paraffin ingestion, risk factors, and current paraffin ingestion intervention and prevention strategies. The chapter concludes with recommendations for future research in the field.

CLINICAL FEATURES OF PARAFFIN POISONING

The ingestion of paraffin may cause minor or no harm. However, if there are complications, it may result in poisoning and could be lethal (Stones, Van Niekerk & Cilliers, 1987). Chemical pneumonitis, an inflammation of the lungs or breathing difficulty caused by inhalation of the noxious chemical, is the most serious complication following paraffin ingestion. It is largely due to aspiration of the paraffin and refluxed gastric contents. According to the South African Medicines Formulary (SAMF) (undated), chemical pneumonitis reportedly occurs in 12% to 40% of cases. The low viscosity of paraffin renders the chemical a major aspiration hazard. There are reports indicating that a small amount (as little as 1 ml) can result in chemical pneumonitis (SAMF, undated).

The clinical presentation of paraffin ingestion may include respiratory symptoms (cough, tachypnoea, cyanosis and grunting), gastro-intestinal symptoms (vomiting, abdominal pain), fever, and neurological manifestations (restlessness and drowsiness) (National Department of Health, 1998; Reed & Conradie, 1997; SAMF, undated). Respiratory symptoms and signs are common and have been reported in 51% to 80% of paraffin ingestion cases at two rural hospitals (Ellis et al., 1994; Reed & Conradie, 1997). The respiratory symptoms and signs usually appear within 30 to 60 minutes after ingestion, but may be delayed for up to 8 hours (SAMF, undated).

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According to the SAMF, the clinical presentation usually deteriorates over the first 24 hours.

The presence of a fever 24 to 48 hours after ingestion may be suggestive of secondary infection (SAMF, undated). Two studies conducted in South Africa (Reed & Conradie, 1997; Simmank, Wagstaff, Sullivan, Filteau & Tomkins, 1998) found that secondary infection in the acute stage is very uncommon. However, Simmank et al. (1998) reported that complications might result when poor socio-economic circumstances and nutritional deficits are present and particularly when there is an underlying respiratory illness. This was highlighted by the cases of two children with clinical signs of AIDS who developed severe pneumonia and required prolonged hospitalisation following paraffin ingestion. With correct management most children recover (Reed & Conradie, 1997; Simmank et al., 1998). Pneumatoceles may be an uncommon development during the recovery period of pneumonitis (Simmank et al., 1998; Stones et al., 1987). While the pneumatoceles may resolve spontaneously, the children who develop them are more clinically ill and are hospitalised for longer (Stones et al., 1987).

**MANAGEMENT OF PARAFFIN INGESTION**

The management of paraffin ingestion generally consists of observation, prevention or the early treatment of complications and supportive therapy (National Department of Health, 1998). The specific care given to victims of poisoning is usually determined by the symptoms. Accurate assessment of the patient is therefore essential.

Asymptomatic patients should undergo a physical examination, a chest X-ray is recommended 5-6 hours after the ingestion, and the patient should be observed for 8 hours (SAMF, undated). The standard treatment guideline at the paediatric hospital level promotes a 12- to 24-hour period of observation (National Department of Health, 1998). The patient can be discharged if she or he is asymptomatic after the observation period and if the chest X-ray proves to be normal.

Symptomatic patients require an X-ray on admission to the hospital. A careful assessment of the respiratory and central nervous systems should be undertaken in patients with pulmonary involvement, and arterial blood gases and electrolytes should be assessed where possible. Patients displaying signs and symptoms of chemical pneumonitis should be provided with oxygen therapy. Specific antimicrobial therapy is required in the presence of a secondary infection (SAMF, undated).

The use of any substance that may induce vomiting is contraindicated. While there does not seem to be any conclusive evidence with regard to the impact of vomiting on the clinical features of paraffin poisoning (Reed & Conradie, 1997; Simmank et al., 1998), induced emesis or gastric lavage is contraindicated since it reportedly increases the risk of aspiration and chemical pneumonitis (SAMF, undated). Corticosteroid therapy is also not recommended since it has been shown to increase the risk of secondary bacterial infection. Finally, the SAMF does not advocate the use of antibiotics prophylactically in hydrocarbon pneumonitis, although it is acknowledged that some experts do.
INCIDENCE OF PARAFFIN INGESTION

Reliable and accurate information or statistics concerning ingestion of and/or poisoning caused by paraffin are lacking in South Africa. Nevertheless, we have tried to make sense of the various estimates reported in the literature. To supplement this information we have solicited inputs from various key informants in the field (see Appendix A).

The literature shows that paraffin ingestion accounted for a considerable proportion of all paediatric admissions at state hospitals, ranging from 5.5% to 16.5% of all admissions (U. MacIntyre, personal communication, 2003; Reed & Conradie, 1997; Violari & Levenstein, 1991). At Ga-Rankuwa Hospital just north of Pretoria paraffin poisoning accounted for 78% of acute accidental poisoning in 1992 (Ellis et al., 1994), while at Red Cross Children’s Hospital and Tygerberg Hospital in the Western Cape paraffin poisoning accounted for 22-30% of all poisonings between 1999 and 2001 (Child Accident Prevention Foundation of South Africa, 2002; Marks, 2001). The higher rates of paraffin poisoning at Ga-Rankuwa can be explained by the hospital serving a mainly peri-urban black community, who rely extensively on paraffin as a source of cheap fuel. The ingestion rate in rural areas is reportedly three times higher than in urban areas (Yach, 1994).

There are two methods for estimating the national incidence of paraffin ingestion, namely household surveys and the review of hospital databases, neither of which are entirely reliable. A national survey conducted by Markinor in 2001 indicated that there were 145,000 cases of child poisoning by paraffin ingestion annually (Biggs & Greyling, 2001). Although the small sample size resulted in a wide confidence interval of 84,600 to 169,200 ingestions, the results confirmed that there were considerably more ingestions than there were hospitalisations.

There are several reasons why the study may have overestimated the true incidence of ingestion. Markinor defined the recall period as 1 year, although respondents may have included events from before this period. Furthermore, paraffin usage for cooking among Markinor’s sample of black and coloured households was 48% (Biggs & Greyling, 2001), whereas paraffin usage in black and coloured households was reported as only 28% and 10% respectively by Statistics South Africa (2002). If we deduce that the Markinor sample over-reported general paraffin usage to the same extent as paraffin usage for cooking (and assuming that the Statistics South Africa data are in fact accurate), paraffin usage in South African households was only 55% of that reported in the Markinor study. By extension, the annual number of paraffin ingestions would also be 55% of the Markinor estimate, i.e. 79,750 ingestions per annum, with an interval estimate of 46,530 to 93,060 ingestions per annum.

Yach (1994) provides a frequently quoted estimate for paraffin ingestion of at least 16,000 children per annum based on hospitalisations. The data are apparently extrapolated from Ellis et al. (1994), De Wet et al. (1994), and from other previous studies, but Yach (1994) does not explain how the estimate was calculated. Yach’s estimate implied that there were at least 30 children hospitalised each year for every million litres of paraffin sold, and that another way of expressing the impact of paraffin poisoning on health was to “use litres sold as the denominator of the rate” (Yach, 1994, p. 717). Using Yach’s estimate of 30 hospitalised cases per million litres
Paraffin ingestion sold, the current paraffin sales volumes of 745 million litres in 2002 (South African Petroleum Industry Association, 2003) would imply that there were approximately 22 350 hospitalised cases in 2002.

This estimate provided by Yach may be an overestimation of the incidence of paraffin poisoning. However, there are several indications that Yach's estimate under-reports the true incidence of ingestion. Firstly, there is some uncertainty as to the reliability of injury data recorded from hospitals, particularly with regard to poisoning data. Hospitals typically collect data for curative or secondary prevention, i.e. to prioritise and plan resource allocation for curative services. Diagnosis rather than the cause of injury or illness is more useful for these purposes, and when patients and their records are referred to tertiary facilities for treatment the external cause of the injury is not always noted. Since many of the ingestion cases at large secondary and tertiary hospitals are referred from primary health care facilities in rural areas, paraffin ingestion cases are often recorded according to their diagnosis, which in many cases will be pneumonia, pneumonitis, or other respiratory-related ailments. Secondly, even if hospital data were 100% accurate, Yach's estimate would exclude the large number of children who do not reach state hospitals. Markinor showed that only 50% of paraffin ingestion cases were referred to clinics and hospital (Biggs & Greyling, 2001). This finding implies that doubling the number of hospitalised paraffin ingestion cases would provide a more realistic estimate of the actual incidence of ingestion.

Based on the available information we have attempted to replicate Yach's (1994) national hospital caseload estimate for paraffin ingestions. In our review of the medical literature and hospital caseload reports from various hospital data sources, we recorded caseload figures for between 30 and 40 facilities over a 20-year period and estimated that there are more than 24 000 hospitalisations due to paraffin ingestion per annum (Carolissen & Matzopoulos, 2003). Doubling the number of hospitalised cases implies that there were more than 48 000 ingestion cases per annum.

However, even a cursory examination of the available data reveals several obvious deficiencies. Firstly, the data are not routinely recorded or reported and only three hospitals (all in the Western Cape) reported more than 2 years of caseload estimates. For this reason, we assumed that the rate of paraffin ingestion had remained constant over the 20-year period. Secondly, the data were concentrated in certain provinces. The Western Cape and Limpopo were over-represented, while there were limited data from the Eastern Cape, North West Province and Free State, the three provinces with the highest per capita paraffin usage (Statistics South Africa, 1996). Therefore, the current estimate for hospitalised cases should not be seen as definitive and additional hospital information needs to be taken into account as it becomes available.

Nevertheless, the current estimate for ingestions based on hospitalised cases (48 000 ingestions per annum) falls within the re-estimated Markinor range estimate of 46 530 to 93 060 ingestions per annum. The inclusion of additional hospital caseload information from under-represented high paraffin usage areas may bring the two estimates closer together. Therefore, we believe that the true incidence of paraffin ingestion in South Africa lies somewhere between 46 530 and 93 060 cases per annum.
Hospital case fatality rates from paraffin ingestion of 0.72% to 2.1% have been reported in South Africa (Crisp, 1986; Joubert, 1990; Krug, Ellis, Hay, Mokgabudi & Robertson, 1994; Simmank et al., 1998). While the fatality rates appear to be low, one study showed that paraffin ingestion was responsible for 26.7% of all deaths at Ga-Rankuwa Hospital (Joubert, 1990).

Based on an estimate of 16 000 hospitalised cases per annum, Van Horen (1996) estimated 208 deaths per annum (range 75-490 deaths). Since this estimate is based on hospitalised cases only, it may be an underestimate since many cases of paraffin poisoning do not reach hospital, particularly in the rural areas. Using the hospital case fatality rates (Crisp, 1986; Joubert, 1990; Krug et al., 1994; Simmank et al., 1998) and the updated hospitalisation estimate of 24 000, we estimate that between 171 and 498 children die of paraffin poisoning in South African state hospitals every year. If we assume that the case fatality rate for the 50% of ingestion cases that do not reach hospitals is the same, we could surmise that there are between 342 and 996 fatal paraffin ingestions in South Africa annually (see Carolissen & Matzopoulos, 2003, for the method of extrapolation).

RISK FACTORS FOR PARAFFIN INGESTION

Paraffin ingestion mainly affects children below the age of 5 years, with a peak incidence between the ages of 1 and 2 years (Crisp, 1986; Freedman & Norzi, 1987; Joubert, 1990; Krug et al., 1994) and 1 and 3 years reported (De Wet et al., 1994). With regard to gender, the incidence of paraffin ingestion has been shown to be greater among males than females, with reported ratios of 1.3:1 (Ellis et al., 1994) and 1.7:1 (De Wet et al., 1994). It has been said that the underdeveloped sense of smell and taste of toddlers makes it impossible for them to discern between paraffin and other liquids. It has also been proposed that children in this age group are orally orientated and very inquisitive and are therefore more vulnerable to ingesting poisons (Korb & Young, 1985). The greater incidence of paraffin ingestion among males can perhaps be explained by the gender differentiation in socialisation. There may be a greater parental tolerance of male toddlers engaging in risky exploratory behaviour.

None of the studies specifically investigated risk factors for paraffin ingestion, although several risk factors are alluded to. The most obvious risk factor for ingestion is the presence of paraffin in the domestic environment. Paraffin is the most frequently used source of energy for cooking, after electricity. In some provinces it is the dominant source of energy for cooking (Statistics South Africa, 2001). Secondly, the absence of safe packaging legislation results in the distribution of paraffin in indistinct and unlabelled containers. Paraffin is frequently stored in cooldrink, milk and juice bottles or other containers, which children associate with beverages (Abrahams, 1994; Ellis et al., 1994; Krug et al., 1994). Children may also drink paraffin from intermediate containers such as cups, which are used for refilling appliances (Caelers, 2001; Krug et al., 1994). Drinkable substances stored in child-resistant containers (CRCs) may also contribute to the risk of unintentional poisoning since children may associate hazardous substance containers with those used to store drinkable substances (K. Venter, personal communication, 2003).
The unsafe storage of paraffin, i.e. within reach of children, has been identified as a risk factor for paraffin ingestion (Ellis et al., 1994; Krug et al., 1994; Reed & Conradie, 1997). According to Reed and Conradie (1997), 78% of caregivers in their study of 110 children did not store paraffin above ground level. The study by Krug et al. (1994) showed that 75% of children in the study had access to the paraffin containers, which has been attributed to overcrowding and limited storage space (Ellis et al., 1994).

In addition to the risk factors already mentioned, lack of parental supervision is a frequently mentioned risk factor for poisoning. Krug et al. (1994) found that a minority of children (12%-25%) were under adult supervision when paraffin ingestion occurred. Reed and Conradie (1997) and Krug et al. (1994) also found that in 19% to 33% of cases, poisoning occurred when a child was left in the care of another child. This implies that adult supervision may be necessary to prevent poisonings.

Summer is the season of greatest risk to children (De Wet et al., 1994; Ellis et al., 1994; Krug et al., 1994). Most authors have highlighted increased thirst due to the warmer weather as a risk factor (Ellis et al., 1994; Krug et al., 1994), but Korb and Young (1985) provided other explanations, such as school holidays resulting in children being left in the care of an older child or being left unattended. The authors also noted that parents or siblings may have been less alert to accidents during this period, and particularly during the festive season due to the atmosphere of merriment and carelessness, which may also have seen increased attention-seeking behaviour by younger children.

INTERVENTION: PREVENTION OF PARAFFIN INGESTION

The importance of intervention and preventative strategies to reduce and prevent paraffin poisoning has been recognised by government (Department of Minerals and Energy, 1998) and petroleum companies, who established the Paraffin Safety Association of South Africa (PASASA) in 1996 with the primary objective of communicating product safety and distributing safety resources to users of paraffin.

PASASA has implemented various interventions for reducing the incidence of paraffin-related injuries, including the distribution of safety tops or closures (i.e. not including the containers due to their prohibitively high cost) with safety information. The safety tops, which fitted a variety of commonly used bottles, were distributed free of charge via clinics and schools, traders, community workshops and even Ster Kinekor mobile cinemas. A problem with this strategy was that safety tops applied to the wrong bottles were neither child-resistant nor airtight, and were often discarded. Furthermore, the distribution of free resources was not seen as being sustainable and the safety tops were not always valued by the users (J. Bopape, personal communication, 2002).

In order to ensure that child-resistant containers (CRCs) were valued and maintained by the users, and also to increase the effectiveness of the child-resistant safety tops, PASASA started to sell CRCs (containers with safety tops). Several projects were piloted in Limpopo and Mpumalanga with traders and schools, who sold the CRCs at R2 for
a 2-litre container and R5 for a 5-litre container. The participating traders and schools also received safety education and incentives. Although people who purchased the containers were invariably satisfied with their purchases, the low sales figures meant that project implementation on a national basis was not viable. Since the containers were sold empty, another problem was that they were used to store several other substances, including petrol, liquor, clean water (a precious commodity in some areas) and even holy water.

It was clear that another strategy was required, and in 2001 PASASA piloted a small filling site with the South African Black Hawkers and Micro Business Association (SABHIBA) at Daveyton (Gauteng). Paraffin was pre-packed by a manual filling system at the SABHIBA site and sold via a network of traders on a deposit basis. Paraffin was supplied by Total and marketed under the Kleen Paraffin brand name, which was developed by PASASA. Implementation was successful and SABHIBA continues to sell 15 000 to 20 000 litres of pre-packed paraffin per month. In 2001 a rural site was piloted in Mathathiele (KwaZulu-Natal) in partnership with the Caba Mdeni Community Co-operative and Shell, who supplied the paraffin, again marketed under the Kleen Paraffin brand name.

After implementation of their pre-packaging sites at Daveyton and Mathathiele, the Department of Minerals and Energy (DME) requested that PASASA assist in implementing pre-packaging sites at integrated energy centres (IeCs) in collaboration with Total and the community co-operatives. DME identified developmental nodes for the implementation of IeCs, which will be run as co-operatives, part-owned by the government and the participating communities. The IeCs will provide a variety of energy services and will assist in providing the safest, cheapest, and most efficient integrated energy packages at a household level.

The DME and PASASA’s vision is that communities will be supplied with pre-packed paraffin free of contaminants and fitted with child-resistant closures at the same price as unpackaged paraffin. The paraffin will be packed at the IeCs and distributed through a network of affiliated village vendors, who trade the paraffin bottles on a deposit basis. Training programmes coordinated by the IeC stakeholders will incorporate all aspects of safe energy usage, including paraffin, electricity and gas. Although these programmes will primarily be aimed at members of the cooperatives, knowledge will reportedly be passed on to the communities through the village vendors and traders. PASASA community workers will also coordinate safety workshops about paraffin, specifically at clinics and schools, and will be supported by various media and promotional materials (Matzopoulos & Methvin, 2002).

Paraffin ingestion seems to result from the interplay between a variety of factors, including individual, social and economic factors. A comprehensive approach to prevention is therefore imperative. The increasing use of paraffin among the black population (Statistics South Africa, 2002) also suggests that there is an urgent need for preventative strategies.
The need to implement child-resistant packaging\(^2\) as a preventative strategy has been acknowledged by several authors (Carolissen & Matzopoulos, 2003; Crisp, 1986; De Wet et al., 1994; Joubert, 1990; Korb & Young, 1985; Krug et al., 1994; Lloyd, Rukato & Swanepoel, 2000; Violari & Levenstein, 1991; Yach, 1994). The study conducted in South Africa's rural North West Province by Krug et al. (1994) showed that CRCs significantly reduced the incidence of accidental paraffin ingestion by 47.4\% over a period of 14 months. The study clearly showed that CRCs effectively reduced paraffin poisoning in the study area and it was recommended that all paraffin be sold in CRCs. However, the CRC used for the Krug study (a 2 litre plastic container designed according to the recommendations of the British Safety Standards Authorities, with a child-resistant cap, usage instructions and a health educational message in English and the local language of the study and control area) reportedly was not ideal since it tended to break. A more durable (Krug et al., 1994), effective and low-cost CRC that is easy to pour from and that is distributed via petroleum companies and/or paraffin distributors (Ellis et al., 1994) has been recommended. The container should be used exclusively for paraffin, and the CRC should conform to standards that have been proven to be effective in reducing paraffin poisoning in South Africa.

To avoid consumers using the container for drinkable substances, it has been recommended that the containers should be tamperproof, i.e. “reusable by the industry (petroleum refineries), but not reusable by the consumer, e.g. a one-way valve preventing refill (reuse) by the consumer, needing a special tool or equipment for refilling, only available to refineries” (K. Venter, personal communication, 2003). Venter has also recommended the pre-packaging of paraffin in small quantities (for household use) at petroleum refineries only.

Although it has been shown that CRCs are an effective intervention for reducing accidental childhood paraffin poisoning, the residual rates of paraffin poisoning in the study by Krug et al. (1994) remained high. Therefore improved health education with a focus on (a) the role of intermediate containers in paraffin poisoning, (b) the safe storage of paraffin containers out of reach of children, (c) home visits aimed at the implementation of advice and the empowerment of the mother, and (d) health education stressing that children should not be left unsupervised, in combination with CRCs, have been recommended. Increasing the awareness of health care workers, administrators and paraffin distributors regarding the dangers of paraffin was also considered important (Ellis et al., 1994). In addition, education should be targeted at all paraffin-using communities, taking into account the social background of the target group.

While the importance of education with a focus on prevention has been emphasised by other authors (De Wet et al., 1994; Ellis et al., 1994; Reed & Conradie, 1997), educational campaigns as a paraffin safety intervention on their own have not had a significant impact in terms of reducing the incidence of paraffin ingestion in South

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Africa (Donald, Bezuidenhout & Cameron, 1991). The study by Krug et al. (1994) also indicated that the type of health education given to the control group did not lower the incidence of paraffin poisoning.

A possible solution to the health hazards associated with paraffin is the use of an alternative energy source. The electrification of all households has been recommended as a long-term solution (Community Health Research Group, undated; Ellis et al., 1994). While electrification is expected to reduce the incidence of paraffin poisoning significantly, it does not ensure a complete shift to electricity (Lloyd et al., 2000). Low-income households may continue to use paraffin because it is cheaper than electricity. Others have suggested the use of liquid petroleum gas (LPG) as an alternative source of fuel to paraffin (Lloyd, 2002). Although LPG is more expensive than paraffin, it is reported to be safer, and Lloyd (2002) has indicated that the distribution of the fuel can be rationalised to meet the needs of communities.

In addition to the above recommendations, the introduction of legislation that institutes pre-packaging of small quantities of paraffin (for household use) at petroleum refineries only has been recommended (K. Venter, personal communication, 2003). Venter and other authors also recommended legislation enforcing the retailing of small quantities of paraffin in CRCs (De Wet et al., 1994; Ellis et al., 1994; Yach, 1994). Venter highlighted the use of dedicated paraffin CRCs.

The South African Bureau of Standards (SABS) (1999) has set standards for the classification and labelling of dangerous substances and preparations for sale and handling; however, these standards are not enforceable by law. South Africa can draw on international experience that has shown a significant reduction in the incidence of poisoning after the introduction of legislation that enforced the use of child-resistant packaging (Clarke & Walton, 1979; US Consumer Product Safety Commission, 2001; Walton, 1982).

Finally, the lack of reliable statistics compromises the monitoring of any preventative strategy. Legislation should therefore be introduced that makes paraffin poisoning a notifiable condition. Notification of the condition will contribute towards obtaining reliable and relatively accurate information concerning paraffin poisoning and identifying high-risk geographical areas. This information is important for the development of prevention strategies as well as the evaluation thereof.

**IMPLICATIONS FOR FORMULATION AND DEVELOPMENT OF RESEARCH**

It is important to keep abreast of the incidence of paraffin poisoning since this information may serve as baseline data from which to evaluate various interventions. To this effect, additional hospital caseload information should be collected on an ongoing basis and the current estimate for paraffin ingestion should be reviewed and updated annually, based on the method of estimation described in Carolissen and Matzopoulos (2003). Alternatively, a national household survey focusing on high paraffin usage areas should be conducted to determine the extent of the problem.
With a focus on the prevention of paraffin ingestion, controlled risk factor research should be a priority. Further research on the design and ease of use of CRCs should also be a priority, together with rigorous experimentation with package and label designs to determine their effectiveness in reducing children’s attraction to harmful substances. An intervention programme which includes CRCs and a combination of the complementary interventions should also be evaluated in order to determine the most effective strategy for reducing childhood paraffin ingestion.

In conclusion, due to the paucity of empirical studies on paraffin ingestion, this chapter has relied extensively on personal communications (see Appendix A), unpublished material, and undated and outdated sources. While the prevention actions required to reduce childhood ingestion are relatively clear, there is still a need to improve data collection systems to monitor their effectiveness, and to conduct further empirical research as highlighted previously.

REFERENCES


APPENDIX A
PERSONAL COMMUNICATIONS WITH KEY INFORMANTS

10 Paraffin ingestion

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Of the different external causes of death from unintentional injury among children between the ages of 1 to 14 years in 2000/2001, poisonings ranked fourth after road traffic accidents, fires and drowning (Taft, Paul, Consunji & Miller, 2002). Paraffin (known as kerosene in some countries) poisoning by ingestion is known to be the most common cause of acute unintentional poisoning in the South African black paediatric population (De Wet et al., 1994; Ellis, Krug, Robertson, Hay & MacIntyre, 1994; Joubert, 1990).

This chapter provides a review of the literature on unintentional paraffin ingestion. It discusses the clinical features of paraffin poisoning, management of paraffin ingestion, incidence of paraffin ingestion, risk factors, and current paraffin ingestion intervention and prevention strategies. The chapter concludes with recommendations for future research in the field.

CLINICAL FEATURES OF PARAFFIN POISONING

The ingestion of paraffin may cause minor or no harm. However, if there are complications, it may result in poisoning and could be lethal (Stones, Van Niekerk & Cilliers, 1987). Chemical pneumonitis, an inflammation of the lungs or breathing difficulty caused by inhalation of the noxious chemical, is the most serious complication following paraffin ingestion. It is largely due to aspiration of the paraffin and refluxed gastric contents. According to the South African Medicines Formulary (SAMF) (undated), chemical pneumonitis reportedly occurs in 12% to 40% of cases. The low viscosity of paraffin renders the chemical a major aspiration hazard. There are reports indicating that a small amount (as little as 1 ml) can result in chemical pneumonitis (SAMF, undated).

The clinical presentation of paraffin ingestion may include respiratory symptoms (cough, tachypnoea, cyanosis and grunting), gastro-intestinal symptoms (vomiting, abdominal pain), fever, and neurological manifestations (restlessness and drowsiness) (National Department of Health, 1998; Reed & Conradie, 1997; SAMF, undated). Respiratory symptoms and signs are common and have been reported in 51% to 80% of paraffin ingestion cases at two rural hospitals (Ellis et al., 1994; Reed & Conradie, 1997). The respiratory symptoms and signs usually appear within 30 to 60 minutes after ingestion, but may be delayed for up to 8 hours (SAMF, undated).

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According to the SAMF, the clinical presentation usually deteriorates over the first 24 hours.

The presence of a fever 24 to 48 hours after ingestion may be suggestive of secondary infection (SAMF, undated). Two studies conducted in South Africa (Reed & Conradie, 1997; Simmank, Wagstaff, Sullivan, Filteau & Tomkins, 1998) found that secondary infection in the acute stage is very uncommon. However, Simmank et al. (1998) reported that complications might result when poor socio-economic circumstances and nutritional deficits are present and particularly when there is an underlying respiratory illness. This was highlighted by the cases of two children with clinical signs of AIDS who developed severe pneumonia and required prolonged hospitalisation following paraffin ingestion. With correct management most children recover (Reed & Conradie, 1997; Simmank et al., 1998). Pneumatoceles may be an uncommon development during the recovery period of pneumonitis (Simmank et al., 1998; Stones et al., 1987). While the pneumatoceles may resolve spontaneously, the children who develop them are more clinically ill and are hospitalised for longer (Stones et al., 1987).

**MANAGEMENT OF PARAFFIN INGESTION**

The management of paraffin ingestion generally consists of observation, prevention or the early treatment of complications and supportive therapy (National Department of Health, 1998). The specific care given to victims of poisoning is usually determined by the symptoms. Accurate assessment of the patient is therefore essential.

Asymptomatic patients should undergo a physical examination, a chest X-ray is recommended 5-6 hours after the ingestion, and the patient should be observed for 8 hours (SAMF, undated). The standard treatment guideline at the paediatric hospital level promotes a 12- to 24-hour period of observation (National Department of Health, 1998). The patient can be discharged if she or he is asymptomatic after the observation period and if the chest X-ray proves to be normal.

Symptomatic patients require an X-ray on admission to the hospital. A careful assessment of the respiratory and central nervous systems should be undertaken in patients with pulmonary involvement, and arterial blood gases and electrolytes should be assessed where possible. Patients displaying signs and symptoms of chemical pneumonitis should be provided with oxygen therapy. Specific antimicrobial therapy is required in the presence of a secondary infection (SAMF, undated).

The use of any substance that may induce vomiting is contraindicated. While there does not seem to be any conclusive evidence with regard to the impact of vomiting on the clinical features of paraffin poisoning (Reed & Conradie, 1997; Simmank et al., 1998), induced emesis or gastric lavage is contraindicated since it reportedly increases the risk of aspiration and chemical pneumonitis (SAMF, undated). Corticosteroid therapy is also not recommended since it has been shown to increase the risk of secondary bacterial infection. Finally, the SAMF does not advocate the use of antibiotics prophylactically in hydrocarbon pneumonitis, although it is acknowledged that some experts do.
INCIDENCE OF PARAFFIN INGESTION

Reliable and accurate information or statistics concerning ingestion of and/or poisoning caused by paraffin are lacking in South Africa. Nevertheless, we have tried to make sense of the various estimates reported in the literature. To supplement this information we have solicited inputs from various key informants in the field (see Appendix A).

The literature shows that paraffin ingestion accounted for a considerable proportion of all paediatric admissions at state hospitals, ranging from 5.5% to 16.5% of all admissions (U. MacIntyre, personal communication, 2003; Reed & Conradie, 1997; Violari & Levenstein, 1991). At Ga-Rankuwa Hospital just north of Pretoria paraffin poisoning accounted for 78% of acute accidental poisoning in 1992 (Ellis et al., 1994), while at Red Cross Children’s Hospital and Tygerberg Hospital in the Western Cape paraffin poisoning accounted for 22-30% of all poisonings between 1999 and 2001 (Child Accident Prevention Foundation of South Africa, 2002; Marks, 2001). The higher rates of paraffin poisoning at Ga-Rankuwa can be explained by the hospital serving a mainly peri-urban black community, who rely extensively on paraffin as a source of cheap fuel. The ingestion rate in rural areas is reportedly three times higher than in urban areas (Yach, 1994).

There are two methods for estimating the national incidence of paraffin ingestion, namely household surveys and the review of hospital databases, neither of which are entirely reliable. A national survey conducted by Markinor in 2001 indicated that there were 145 000 cases of child poisoning by paraffin ingestion annually (Biggs & Greyling, 2001). Although the small sample size resulted in a wide confidence interval of 84 600 to 169 200 ingestions, the results confirmed that there were considerably more ingestions than there were hospitalisations.

There are several reasons why the study may have overestimated the true incidence of ingestion. Markinor defined the recall period as 1 year, although respondents may have included events from before this period. Furthermore, paraffin usage for cooking among Markinor’s sample of black and coloured households was 48% (Biggs & Greyling, 2001), whereas paraffin usage in black and coloured households was reported as only 28% and 10% respectively by Statistics South Africa (2002). If we deduce that the Markinor sample over-reported general paraffin usage to the same extent as paraffin usage for cooking (and assuming that the Statistics South Africa data are in fact accurate), paraffin usage in South African households was only 55% of that reported in the Markinor study. By extension, the annual number of paraffin ingestions would also be 55% of the Markinor estimate, i.e. 79 750 ingestions per annum, with an interval estimate of 46 530 to 93 060 ingestions per annum.

Yach (1994) provides a frequently quoted estimate for paraffin ingestion of at least 16 000 children per annum based on hospitalisations. The data are apparently extrapolated from Ellis et al. (1994), De Wet et al. (1994), and from other previous studies, but Yach (1994) does not explain how the estimate was calculated. Yach’s estimate implied that there were at least 30 children hospitalised each year for every million litres of paraffin sold, and that another way of expressing the impact of paraffin poisoning on health was to “use litres sold as the denominator of the rate” (Yach, 1994, p. 717). Using Yach’s estimate of 30 hospitalised cases per million litres
sold, the current paraffin sales volumes of 745 million litres in 2002 (South African Petroleum Industry Association, 2003) would imply that there were approximately 22 350 hospitalised cases in 2002.

This estimate provided by Yach may be an overestimation of the incidence of paraffin poisoning. However, there are several indications that Yach’s estimate under-reports the true incidence of ingestion. Firstly, there is some uncertainty as to the reliability of injury data recorded from hospitals, particularly with regard to poisoning data. Hospitals typically collect data for curative or secondary prevention, i.e. to prioritise and plan resource allocation for curative services. Diagnosis rather than the cause of injury or illness is more useful for these purposes, and when patients and their records are referred to tertiary facilities for treatment the external cause of the injury is not always noted. Since many of the ingestion cases at large secondary and tertiary hospitals are referred from primary health care facilities in rural areas, paraffin ingestion cases are often recorded according to their diagnosis, which in many cases will be pneumonia, pneumonitis, or other respiratory-related ailments. Secondly, even if hospital data were 100% accurate, Yach’s estimate would exclude the large number of children who do not reach state hospitals. Markinor showed that only 50% of paraffin ingestion cases were referred to clinics and hospital (Biggs & Greyling, 2001). This finding implies that doubling the number of hospitalised paraffin ingestion cases would provide a more realistic estimate of the actual incidence of ingestion.

Based on the available information we have attempted to replicate Yach’s (1994) national hospital caseload estimate for paraffin ingestions. In our review of the medical literature and hospital caseload reports from various hospital data sources, we recorded caseload figures for between 30 and 40 facilities over a 20-year period and estimated that there are more than 24 000 hospitalisations due to paraffin ingestion per annum (Carolissen & Matzopoulos, 2003). Doubling the number of hospitalised cases implies that there were more than 48 000 ingestion cases per annum.

However, even a cursory examination of the available data reveals several obvious deficiencies. Firstly, the data are not routinely recorded or reported and only three hospitals (all in the Western Cape) reported more than 2 years of caseload estimates. For this reason, we assumed that the rate of paraffin ingestion had remained constant over the 20-year period. Secondly, the data were concentrated in certain provinces. The Western Cape and Limpopo were over-represented, while there were limited data from the Eastern Cape, North West Province and Free State, the three provinces with the highest per capita paraffin usage (Statistics South Africa, 1996). Therefore, the current estimate for hospitalised cases should not be seen as definitive and additional hospital information needs to be taken into account as it becomes available.

Nevertheless, the current estimate for ingestions based on hospitalised cases (48 000 ingestions per annum) falls within the re-estimated Markinor range estimate of 46 530 to 93 060 ingestions per annum. The inclusion of additional hospital caseload information from under-represented high paraffin usage areas may bring the two estimates closer together. Therefore, we believe that the true incidence of paraffin ingestion in South Africa lies somewhere between 46 530 and 93 060 cases per annum.
Hospital case fatality rates from paraffin ingestion of 0.72% to 2.1% have been reported in South Africa (Crisp, 1986; Joubert, 1990; Krug, Ellis, Hay, Mokgabudi & Robertson, 1994; Simmank et al., 1998). While the fatality rates appear to be low, one study showed that paraffin ingestion was responsible for 26.7% of all deaths at Ga-Rankuwa Hospital (Joubert, 1990).

Based on an estimate of 16 000 hospitalised cases per annum, Van Horen (1996) estimated 208 deaths per annum (range 75-490 deaths). Since this estimate is based on hospitalised cases only, it may be an underestimate since many cases of paraffin poisoning do not reach hospital, particularly in the rural areas. Using the hospital case fatality rates (Crisp, 1986; Joubert, 1990; Krug et al., 1994; Simmank et al., 1998) and the updated hospitalisation estimate of 24 000, we estimate that between 171 and 498 children die of paraffin poisoning in South African state hospitals every year. If we assume that the case fatality rate for the 50% of ingestion cases that do not reach hospitals is the same, we could surmise that there are between 342 and 996 fatal paraffin ingestions in South Africa annually (see Carolissen & Matzopoulos, 2003, for the method of extrapolation).

**RISK FACTORS FOR PARAFFIN INGESTION**

Paraffin ingestion mainly affects children below the age of 5 years, with a peak incidence between the ages of 1 and 2 years (Crisp, 1986; Freedman & Norzi, 1987; Joubert, 1990; Krug et al., 1994) and 1 and 3 years reported (De Wet et al., 1994). With regard to gender, the incidence of paraffin ingestion has been shown to be greater among males than females, with reported ratios of 1.3:1 (Ellis et al., 1994) and 1.7:1 (De Wet et al., 1994). It has been said that the underdeveloped sense of smell and taste of toddlers makes it impossible for them to discern between paraffin and other liquids. It has also been proposed that children in this age group are orally orientated and very inquisitive and are therefore more vulnerable to ingesting poisons (Korb & Young, 1985). The greater incidence of paraffin ingestion among males can perhaps be explained by the gender differentiation in socialisation. There may be a greater parental tolerance of male toddlers engaging in risky exploratory behaviour.

None of the studies specifically investigated risk factors for paraffin ingestion, although several risk factors are alluded to. The most obvious risk factor for ingestion is the presence of paraffin in the domestic environment. Paraffin is the most frequently used source of energy for cooking, after electricity. In some provinces it is the dominant source of energy for cooking (Statistics South Africa, 2001). Secondly, the absence of safe packaging legislation results in the distribution of paraffin in indistinct and unlabelled containers. Paraffin is frequently stored in cooldrink, milk and juice bottles or other containers, which children associate with beverages (Abrahams, 1994; Ellis et al., 1994; Krug et al., 1994). Children may also drink paraffin from intermediate containers such as cups, which are used for refilling appliances (Caelters, 2001; Krug et al., 1994). Drinkable substances stored in child-resistant containers (CRCs) may also contribute to the risk of unintentional poisoning since children may associate hazardous substance containers with those used to store drinkable substances (K. Venter, personal communication, 2003).
The unsafe storage of paraffin, i.e. within reach of children, has been identified as a risk factor for paraffin ingestion (Ellis et al., 1994; Krug et al., 1994; Reed & Conradie, 1997). According to Reed and Conradie (1997), 78% of caregivers in their study of 110 children did not store paraffin above ground level. The study by Krug et al. (1994) showed that 75% of children in the study had access to the paraffin containers, which has been attributed to overcrowding and limited storage space (Ellis et al., 1994).

In addition to the risk factors already mentioned, lack of parental supervision is a frequently mentioned risk factor for poisoning. Krug et al. (1994) found that a minority of children (12%-25%) were under adult supervision when paraffin ingestion occurred. Reed and Conradie (1997) and Krug et al. (1994) also found that in 19% to 33% of cases, poisoning occurred when a child was left in the care of another child. This implies that adult supervision may be necessary to prevent poisonings.

Summer is the season of greatest risk to children (De Wet et al., 1994; Ellis et al., 1994; Krug et al., 1994). Most authors have highlighted increased thirst due to the warmer weather as a risk factor (Ellis et al., 1994; Krug et al., 1994), but Korb and Young (1985) provided other explanations, such as school holidays resulting in children being left in the care of an older child or being left unattended. The authors also noted that parents or siblings may have been less alert to accidents during this period, and particularly during the festive season due to the atmosphere of merriment and carelessness, which may also have seen increased attention-seeking behaviour by younger children.

**INTERVENTION: PREVENTION OF PARAFFIN INGESTION**

The importance of intervention and preventative strategies to reduce and prevent paraffin poisoning has been recognised by government (Department of Minerals and Energy, 1998) and petroleum companies, who established the Paraffin Safety Association of South Africa (PASASA) in 1996 with the primary objective of communicating product safety and distributing safety resources to users of paraffin.

PASASA has implemented various interventions for reducing the incidence of paraffin-related injuries, including the distribution of safety tops or closures (i.e. not including the containers due to their prohibitively high cost) with safety information. The safety tops, which fitted a variety of commonly used bottles, were distributed free of charge via clinics and schools, traders, community workshops and even Ster Kinekor mobile cinemas. A problem with this strategy was that safety tops applied to the wrong bottles were neither child-resistant nor airtight, and were often discarded. Furthermore, the distribution of free resources was not seen as being sustainable and the safety tops were not always valued by the users (J. Bopape, personal communication, 2002).

In order to ensure that child-resistant containers (CRCs) were valued and maintained by the users, and also to increase the effectiveness of the child-resistant safety tops, PASASA started to sell CRCs (containers with safety tops). Several projects were piloted in Limpopo and Mpumalanga with traders and schools, who sold the CRCs at R2 for
Paraffin ingestion seems to result from the interplay between a variety of factors, including individual, social and economic factors. A comprehensive approach to prevention is therefore imperative. The increasing use of paraffin among the black population (Statistics South Africa, 2002) also suggests that there is an urgent need for preventative strategies.
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To avoid consumers using the container for drinkable substances, it has been recommended that the containers should be tamperproof, i.e. “reusable by the industry (petroleum refineries), but not reusable by the consumer, e.g. a one-way valve preventing refill (reuse) by the consumer, needing a special tool or equipment for refilling, only available to refineries” (K. Venter, personal communication, 2003). Venter has also recommended the pre-packaging of paraffin in small quantities (for household use) at petroleum refineries only.

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A possible solution to the health hazards associated with paraffin is the use of an alternative energy source. The electrification of all households has been recommended as a long-term solution (Community Health Research Group, undated; Ellis et al., 1994). While electrification is expected to reduce the incidence of paraffin poisoning significantly, it does not ensure a complete shift to electricity (Lloyd et al., 2000). Low-income households may continue to use paraffin because it is cheaper than electricity. Others have suggested the use of liquid petroleum gas (LPG) as an alternative source of fuel to paraffin (Lloyd, 2002). Although LPG is more expensive than paraffin, it is reported to be safer, and Lloyd (2002) has indicated that the distribution of the fuel can be rationalised to meet the needs of communities.

In addition to the above recommendations, the introduction of legislation that institutes pre-packaging of small quantities of paraffin (for household use) at petroleum refineries only has been recommended (K. Venter, personal communication, 2003). Venter and other authors also recommended legislation enforcing the retailing of small quantities of paraffin in CRCs (De Wet et al., 1994; Ellis et al., 1994; Yach, 1994). Venter highlighted the use of dedicated paraffin CRCs.

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REFERENCES


**APPENDIX A**
**PERSONAL COMMUNICATIONS WITH KEY INFORMANTS**
Injury costing in South Africa: The state of the sector

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It is estimated that approximately 5 million people worldwide die each year as a result of injuries (Mohan & Tiwari, 2000), with violence (as a form of intentional injury) accounting for approximately 1.6 million of these deaths (Krug, Dahlberg, Mercy, Zwi & Lozano, 2002). While these figures are staggering in themselves, they represent only the tip of the injury pyramid, with far greater numbers of people being survivors of non-fatal injuries. The forecasts for Africa are as alarming, with the expectation that by 2020 injury will be the second largest contributor to disability-adjusted life years (DALYs)². Sub-Saharan Africa is likely to be a significant role-player here due to the concentration of wars, interpersonal violence and motor vehicle crashes in this region (Murray & Lopez, 1996).

While accurate data on the exact contribution of injuries to total morbidity in South Africa are not available, injuries certainly account for a significant proportion of the mortality (Matzopoulos, 2002), and therefore contribute to the triple burden of disease³. The National Injury Mortality Surveillance System (NIMSS) indicates such contributions. Although NIMSS coverage is restricted to between 32% and 37% of all causes of national injury mortality, the system provides a quantified picture of the prevalence of deaths due to injury in South Africa. The system recorded 25 361 non-natural deaths during 2001 (Matzopoulos, 2002). Homicide accounted for 44% of these deaths. Transport-related fatalities accounted for 27% of all injury deaths in the database. These significant causes of death were jointly followed by suicide and unintentional injuries, accounting for 10% of the recorded South African non-natural mortalities respectively (Matzopoulos, 2002).

In addition, recent years have also witnessed the translation of these health burdens into economic burdens for national, regional and global economies (see, for example, Krug et al., 2002), in pursuit of what the World Health Organisation (WHO) terms the “new universalism” - a world health policy that embraces cost-effectiveness as a critical measure of the effective delivery of high-quality health services to everybody, rather than the provision of the most basic care to the poor (WHO, 2000).

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²The concept of the DALY is a burden of disease measure utilised in an attempt to overcome the shortcomings of mortality as the sole measure of ill-health impact on populations, and quantifies disability based on incidence, duration, severity of morbidity and complications associated with the disability (Murray & Lopez, 1996).
³This configuration of disease burden refers to the simultaneous and combined effects of infectious diseases related to poverty, emerging chronic diseases and injuries.
This has been an important development in the conversion of injury data into usable information for policy, resource allocation and health planning decision-makers, since it provides a fiscal perspective of this psychosocial priority area. Given that such decisions at a national level are frequently made with great consideration for the national fiscus, injury costing therefore not only has the potential to add value to these decision-making processes, but may also be utilised by safety promotion and injury prevention practitioners in their lobbying and advocacy initiatives.

While the historical tendency has been to address injuries as unavoidable ‘accidents’ that are beyond our control (Welander, Svanström & Ekman, 2000), or to respond to violence primarily from a criminal justice perspective, the last decade has seen the public health approach to injuries in South Africa (Butchart, Nell & Seedat, 1996; Emmett & Butchart, 2000; Seedat, 1995; Stevens, Seedat, Swart & Van der Walt, 2003) moving to the foreground. This approach argues that all injuries have particular risks and triggers in space, time and context, and involve a relational interaction between people, their environments and the products that they utilise. Therefore, interventions directed at their eradication, reduction and control are possible. No longer are injuries viewed only from the perspective of secondary and tertiary prevention or deterrence and incapacitation (as it relates to violence containment from a criminal justice perspective), but injuries are now seen as being preventable (Krug et al., 2002). One of the tools introduced by this approach is the concept of injury costing. Derived from health economics, injury costing has been utilised to estimate the economic impact of particular health concerns within a population and is advocated as contributing measures for the determination of a range of policy, service delivery and resource allocation decision-making processes (Bender, 2003). These would include estimations of injury costs through cost descriptions, cost-benefit analyses to assess the economic value of interventions against their consequent efficacy and the economic value thereof, and cost-effectiveness analyses to determine the economic benefit of one intervention versus another (Jansson et al., 2001; Levin, 1983).

However, despite containing an internally coherent logic as a conceptual framework to aid health decision-making and planning, costing is by no means ideologically neutral. Werner and Sanders (1997) argue that costing approaches became more prominent through two particular policy strategies of the World Bank as it intervened in ‘Third World’ health policy. These were to facilitate an improvement (i.e. reduction) in government spending on health, and to facilitate the private sector’s involvement in health, as components of structural adjustment policies and stricter fiscal discipline associated with ‘Third World’ economies that were plagued by foreign debt. In so doing, cost-benefit, cost-effectiveness and cost recovery strategies were highlighted as the new fiscal technologies to be employed (Sanders & Meeus, 2002) in order to assist in the creation of more viable economies for international investment. In many instances the result has been greater user-charges in the public sector, a movement away from comprehensive service delivery to cheaper, selective primary health care that is not always responsive to the needs of disadvantaged populations, and the commodification of health care through privatisation that has placed many interventions for the needy out of their economic reach.
Nevertheless, despite the concern that the economic costing of populations’ health status is fundamentally linked to the further commodification of health, costing methodologies have also been strategically employed to leverage support, and to advocate and lobby for better quality and better access to health services for particular populations. A case in point in South Africa is the manner in which costing has been utilised as a tool to support better quality primary, secondary and tertiary prevention initiatives with regard to the HIV/AIDS pandemic. Bowman (2002) states that:

The significance of health care costing has been firmly illustrated by the widely disseminated calculation findings of the social and economic costs and consequences of HIV/AIDS to South Africa. The costing of HIV/AIDS at macro- and micro-economic levels has provided South Africans with single compact economic units with which to measure the effects of HIV/AIDS (p. 4).

Such information has in turn been employed by social movements (for example, the Treatment Action Campaign) which have argued that the short-term health costs associated with preventative programmes and better quality, as well as access to health care for HIV/AIDS patients, would be far less of a strain on the economy than the long-term economic impacts of the pandemic. In addition, the most recent report from the World Bank itself, illustrating the potential economic crisis facing South Africa (Bell, Devarajan & Gersbach, 2003), has continued to apply pressure on the South African state to address HIV/AIDS more forcefully since it has significant consequences for international investor confidence at present.

With regard to injury costing, measuring the economic impact of injury can equip safety promotion and injury prevention practitioners with a compact supplementary tool that can be used as a powerful addition to lobbying, advocacy and policy documentation. Underpinning the philosophy of injury costing is the assumption that translating injuries into compact economic burden units provides stakeholders with accurate cost-burden data that will invariably highlight the economic as well as human value benefits of supporting injury prevention initiatives.

Given that injuries are broadly defined as either unintentional (e.g. motor vehicle crashes, falls, burns and drownings) or intentional (e.g. interpersonal violence, collective violence, and suicide) (Krug et al., 2002; Welander et al., 2000), the potential for costing methodologies to be strategically employed to leverage a greater emphasis on primary prevention can therefore include injurious crime, violence and unintentional injuries.

While the practice of injury costing has undoubtedly grown in international popularity since its formal placement onto the safety promotion and injury prevention agenda (for example, the First International Costing Conference was held in Prague in 1999), it has had limited influence on the injury prevention sector in South Africa.

This chapter reviews the state of injury costing in South Africa, and begins by summarising and commenting on the scope of injury costing studies in this country, with a specific focus on the public, research and development sectors. It then reflects on the challenges and difficulties inherent in the systematic costing of injuries within South Africa, and concludes by identifying critical priorities to assist in the strategic development of costing methodologies within the South African injury prevention and safety promotion context.
THE STATE OF INJURY COSTING IN SOUTH AFRICA

South African attempts to calculate the direct, indirect and human value costs of fatal and non-fatal injuries in the public sector derive from a number of relatively fragmented and highly specific studies (Bowman, 2002). However, capturing injury cost data in the private health sector has been successfully coordinated and administered for the past two decades as a convention necessitated by regulation and careful monitoring of that sector's commercial success. Comparing injury costing in the private sector with the fledgling and often disjointed attempts at such costing in the public health sector is exceedingly difficult. This point is substantiated by studies that have undertaken cost comparisons between public and private health care in South Africa and have emphasized the relative ease of accessibility to private health care injury cost data compared to the limited availability of such data in the public sector (Broomberg, De Beer & Price, 1990; De Beer & Broomberg, 1990; McIntyre & Dorrington, 1990). Injury cost calculation research is therefore prima facie challenged by a public health sector either devoid of a formal costing infrastructure or with limited, proxy or non-standardized costing protocols.

Generating cost data in the public sector requires the development of specified costing tools and the training of personnel, and this could account for the relatively small sample sizes of the various costing studies identified in the literature (Bowman, 2002). Direct government involvement in such initiatives may obviate the infrastructural difficulties experienced in past injury costing studies. Nevertheless, the cost data yielded by such studies suggest that calculation of the national costs of South African injuries is indeed a feasible endeavour, the foundations of which have been tentatively laid by a miscellany of costing studies undertaken in the past 12 years. A review of these foundations follows.

National injury costing studies

In strong contrast to the national costing of the economic impact of HIV/AIDS, most of the national costing projects identified in South Africa measured the direct costs of injury as incurred by individuals, institutions or the state. The literature reveals an almost complete absence of studies that examine indirect costs (e.g. the loss of income or economic productivity due to injury morbidity or mortality) and human value costs (e.g. the population’s willingness to pay for additional security or personal insurance to avoid or minimise the impact of injuries) of injury (Bowman, 2002). Although these studies have costed selected injury items at national level, a complete composition of the national economic burden of injury has yet to be calculated. Inclusion of indirect (such as lost productivity) and human value costs (such as willingness to pay to avoid injury) would be critical, since these costs are generally far greater than the direct costs of injuries.

De Beer and Broomberg (1990), Kane-Berman and Taylor (1990) and McIntyre and Dorrington (1990) reported national expenditure trends in both the private and public health sectors. In perhaps the most comprehensive and extensive costing studies conducted in South Africa, the Council for Scientific and Industrial Research (CSIR) (2000) employed a unit cost methodology to generate national estimates of the direct medical costs, indirect medical costs, property damage costs, pain and suffering costs, funeral costs, legal costs and other miscellaneous costs incurred by individuals...
and the state as a direct result of motor vehicle collisions in South Africa. This study appears to be an exemplar of the utility of injury cost calculations. Estimations of the costs of injuries incurred by individuals and the state as a direct result of crime were provided by both the NEDCOR Project (1996) and the Centre for the Study of Violence and Reconciliation (CSVR) (2000).

National health expenditure trend studies
The history of South Africa and its attendant patterns of racialised health care (Pillay & Bond, 1995) necessitated describing the disparate expenditure patterns of public and private health care. This initiative required the calculation of composite health costs in both sectors. The historically extreme disparities of expenditure in the public and private health care sectors in South Africa are illustrated by McIntyre and Dorrington’s (1990) study. The study made use of expenditure analyses in the collation and analysis of health care expenditure data for the years 1971 to 1988 in an attempt to highlight varying distribution patterns by sector and population groups (Bowman, 2002).

While not categorically national costing studies, three other costing initiatives (Broomberg, De Beer & Price, 1990; De Beer & Broomberg, 1990; Kane-Berman & Taylor, 1990) identified in the literature made use of expenditure analyses to generate cost estimates. The national scope of McIntyre and Dorrington’s study (1990) renders it perhaps the most methodologically representative of costing studies that have employed expenditure analyses as their central tenet. In expenditure analyses of the public sector, source data are generally limited to reports of the auditor general and spending data generated by the Central Statistical Services (McIntyre & Dorrington, 1990). Most analyses of spending in the public sector appear to be confined to these information sources (Bowman, 2002). Relying on the accuracy of these data sources and making use of expenditure analyses in order to generate cost estimates are not, however, without methodological limitations (Finkler, 1982). Although expenditure analysis may prove useful for describing specific hospital spending trends (Kane-Berman & Taylor, 1990), its use as an accurate measure of the real costs of treating injury and other health burdens is limited. Expenditure may be a component of a composite cost figure, but it cannot be regarded as an accurate reflection of the real costs of health care treatment since it is subject to a number of non-economically measurable influences. Bowman (2002) argues that:

The spending of hospitals is determined by budgetary allowances and thus may be skewed by a specific hospital’s internal policies. Even if total expenditure is broken down into injury clusters, the figures could be distorted by the location, governmental allowance (public sector) and internal policy (private sector) of that hospital. An expenditure figure cannot therefore be regarded as an accurate cost of injury (p. 6).

Despite establishing that what the health care sector spends on treatment of injury and disease is not necessarily such treatment costs in real economic terms, the results of expenditure analysis studies nonetheless contribute to the foundations of establishing an injury costing infrastructure in South Africa, since they translate health burdens into compact economic units of measurement.
Total public health sector spending in South Africa for 1987 was R5.19 billion, significantly less than the R9.21 billion spent on health by the private sector (McIntyre & Dorrington, 1990). This descriptive trend extends into the present; current figures indicate that R32.5 billion and R39.5 billion were spent by the public and private health care sectors respectively during the 2001/2002 financial year in South Africa (National Department of Health, 2002). These are composite budgetary financial descriptions of spending (for a more detailed breakdown of these expenditure figures, please see National Department of Health’s Inquiry into the various social security aspects of the South African Health System and the 2002 Annual Report of the Council for Medical Schemes).

While these figures could be real reflections of disparate trans-sector health spending, spending differences could also be attributed to the differences in the detail and organisation of fiscal information in the public and private health care sectors (McIntyre & Dorrington, 1990). Ruling out the generation of disproportionate economic units requires that composite national costing studies develop standardised methods that may be employed across both sectors in South Africa (Broomberg, De Beer & Price, 1990; De Beer & Broomberg, 1990). As mentioned above, private health care facilities in South Africa make use of sophisticated databases that contain cost information at both individual and injury-type level. The private health care sector therefore already has both the expertise and costing technology to yield accurate, timely and detailed injury costing data. Costing initiatives in South Africa are therefore not obliged to “reinvent the methodological wheel” in order to generate quality injury costing data. Indeed, collaboration and the consequent modification of private health care costing technologies and methods appears to be a viable option in facilitating the development of systematic, accurate, timely and detailed information on the costs of injury in South Africa’s public health sector.

National injury costs resulting from motor vehicle crashes
Translating the injury impact of motor vehicle crashes (MVCs) in South Africa into economic units was undertaken in the early 1990s (Dickinson, Rodrigues & Bass, 1990). The national economic burden of MVCs was also the subject of investigation by the CSIR in both 1999 and 2000.

Both non-fatal and fatal costs of MVC-related injuries were included in the design of research undertaken by Van der Spuy (1996). The CSIR (1999) study made use of a unit cost methodology by which the various economic consequences of MVCs were categorised into compacted units. Once the unit cost schematic had been constructed, data from various sources, including Statistics South Africa, a selection of insurance companies and the Road Accident Fund, were inserted for calculation. The schematic was updated with new data in 1998 (CSIR, 2000). The costs associated with the treatment and consequences of non-fatal injury were identified as far outweighing the cost of fatalities resulting from MVCs. Costs of fatal injuries resulting from road collisions were measured at R2.28 billion when the factors accounting for the 9,470 traffic fatalities in 1993 were inserted into the unit schematic. This figure translates into an MVC fatality cost of R5.95 million per day, which pales in comparison to the total daily costs arising from MVCs related to non-fatal injuries, calculated at R29.96 million per day for that same year (CSIR, 2000).
While this study relied on established datasets for its economic measurements, the scope of its identified units renders it the most comprehensive costing study to date. Its method of application appears the most promising template for the development of a systematic national injury costing initiative. Most importantly, the structuring of its results has resulted in its frequent citation. The study was therefore instrumental in translating the carnage of traffic crashes into the burden of cost.

**Costs of crime**

The NEDCOR Project (1996) calculated the economic impact of crime on business at national level. The study made use of both the direct and indirect categories of costing in its calculations. Using interviews and surveys the project estimated that the direct medical costs, loss of earnings and extra insurance provisions resulting from crime-related injuries perpetrated against individuals had collectively cost those individuals R1.7 billion (or R5 000 per person) in the first 8 months of 1995. The economic impact of a violent crime on any single business was estimated to be R42 300 in 1995. According to the survey, 60% of big businesses and 68% of small businesses had experienced a robbery in 1995. When the damage/loss figure was multiplied by the number of formal businesses in South Africa that had experienced a robbery, the direct costs of crime to businesses were estimated at R15.8 billion in 1995.

Crime as a broad item for costing was re-examined by the CSVR under assignment to the South African Law Commission (CSVR, 2000). Costs of crime were necessarily calculated to inform an investigation into the feasibility of the establishment of a Victim Compensation Scheme (VCS). Costs were measured through calculation of the direct medical costs for treatment of the crime-related injury, and subsequent loss of income incurred by the victim of that crime. Based on an exhaustive set of assumptions and parameters, the CSVR model described the annual costs of compensation for victims of specific crimes. Calculated compensation figures included R3928 per victim of attempted murder and R1605 for victims of rape. The aggregated cost of the proposed compensation scheme was projected at R 4.7 billion.

Importantly, the study points to the imperatives of including indirect costs into a comprehensive injury-costing model:

> Long-term loss of income is by far the largest contributor to the size of any compensatory payments, averaging at about 81% of all payments. Pain and suffering constitutes 12%, with the bulk of the remainder made up by medical and funeral costs. Given our assumptions, the loss of short-term income makes up a negligible 0.9% of the total paid out (CSVR, 2000, p. 107).

Such figures illustrate the significance of including elements that are seldom calculated in the literature, but that cannot be dismissed in attempts to comprehensively cost injuries.

**Provincial injury costing studies**

*Provincial costs of post-mortem investigations in Gauteng*

Costing injury-related activities has also emerged as the vicarious outcome of governmental rationalisation and management policy processes. The Gauteng Department of Health (1999) conducted an investigation into the comprehensive
costs of conducting a post-mortem. Mortuaries were categorised according to size and intake, and sample mortuaries ranged from an M1 (low intake) to an M6 academic (large intake) mortuary. Using the budget activity system, the cost per post-mortem investigation at Diepkloof mortuary (M6 academic) was calculated at R2157.73 for 1998. This figure again draws attention to the often under-represented economic consequences of incurring a fatal injury in South Africa.

City-wide injury costing studies
Homicide
Phillips (1998) attempted to address the glaring omissions in longer-term costing protocols through a costing of death due to homicide in the Cape Metropole in 1998. This study makes a significant contribution to the sector since the direct, indirect and human value costs of homicide were calculated. This appears to be one of the first measures of human value costs in the South African literature. The study estimates the costs of homicide in the Cape Metropole to be R111.88 million at a 4% discounted rate for the indirect cost component of the calculation. This figure does not include intangible human costs, such as for pain and suffering, and is therefore not a complete picture of the long-term costs of injury.

Although the measurement of direct, indirect and human value costs seems to provide an optimal platform for accuracy in nationwide injury costing, quantifying these costs in contexts of significant wealth disparities is difficult since proxy measures (e.g., insurance claims and civil law suits) are only available to those socio-economic segments that can afford them. The quantification of human value costs and various intangibles therefore inevitably over-represents those persons with economic access to proxy measurement variables at the expense of those who cannot afford them.

Miscellaneous injury costing studies
Injury costing in South Africa is characterised by a number of small-scale, limited sample calculations. These initiatives began in 1990 and continue into the present. The economic costs of children involved in MVCs were calculated as early as 1990 (Dickinson et al., 1990), and this was followed by later transport-related injury costing studies such as Lerer and Matzopoulos’ (1995) railway injury costing research. Price (1990), Ijsselmuiden and De Beer (1990), and Hukins and Boyce (1990) calculated the direct costs of medication in differing sectors and injury categories. Quarmby (1999) measured the direct costs of burn injuries, while the costs of poison-related injuries were calculated by De Wet, Van Schalkwyk, Van der Spuy, Du Plessis, Du Toit and Burns (1994). Peden and Van der Spuy (1998) quantified the direct treatment costs of firearm-related injuries. The objects costed therefore ranged from discrete and specific health aspects such as medicines and personnel costs, to the costs of treating MVC victims, firearm injuries, post-mortem activities, burns and poisonings. The following section will provide a brief characterisation of the study of each of these items.

Medicines
The cost of providing medicines to outpatients at Alexander Health Clinic was described in a 1990 study by Price (1990), which aimed to assess the degree to which direct medical costs (prescribed medicines) could be contained through the practice of cost-effective prescribing of those medicines. In another costing of outpatient
medications by Hukins and Boyce (1990), medicines were subjected to a cost description via the scripts of general practitioners. The medication was costed without the inclusion of other necessary variables such as transport and practitioner time. Nevertheless, having established baseline cost figures, the researchers were able to illustrate a saving of R305 000, yielded as a result of a cost-containment programme implemented in 1989. This study illustrates the utility of health costing information. Despite time and personnel being cost variables absent from both of these studies, the literature indicates that both these components have been costed in other South African costing projects.

**Personnel, time and operational costs**
Personnel and operational costs were included in an assessment of hospital spending at Groote Schuur Provincial Hospital in Cape Town (Kane-Berman & Taylor, 1990). Practitioner time and the costs of the maintenance and general upkeep of hospitals are important factors to any injury costing concern. An audit of expenditure was required for system assessment and as a basis for cost-containment recommendations. The categories of direct costs included in the study were personnel time, consumables, non-consumables and operations (Kane-Berman & Taylor, 1990). The study demonstrated that the total hospital expenditure for 1988 to 1989 was R274.5 million (Kane-Berman & Taylor, 1990), clearly illustrating the importance of including these factors in injury cost calculations.

**Railway injury**
The direct medical costs of treating 115 railway admissions to Groote Schuur Hospital were calculated by Lerer and Matzopoulos (1995). The final figure was calculated to be R1 966 700, and the study tracked the passage of the patients through the various sections of the hospital. The bulk of the final costs comprised the contributions of those patients admitted to the Intensive Care Unit. The treatment of the 55 patients in this sector of the hospital was calculated to cost R993 685 (Lerer & Matzopoulos, 1995).

**Trauma patients**
The bills of 120 trauma patients were analysed by Van der Spuy (1996). Direct medical treatment of trauma patients results in massive cost-recovery shortfalls, with only 5.5% of the account settled by the patient him- or herself in the public health sector. Extrapolation of these data to the entire Cape Metropole estimated the costs of these shortfalls to the public sector to be at least R150 million (Van der Spuy, 1996). This figure indicates the severe underestimation of injury costs by the provincial health budgetary allowance.

**Burns**
The direct medical cost of treating a sample of burns was estimated at R6.9 million in 1997; although limited to 460 cases, this general measure acted as an indicator for the severity of this category of injury (Rode, cited in Quarmby, 1999). Quarmby (1999) then responded to this study by using its costing measure to assess the cost consequences of alternative treatments using different materials. This pilot illustrates the strategic efficacy of the establishment of baseline costs in specific injury sectors. Without broad descriptions of the economic costs of injury subsequent comparative, cost-benefit and cost-effectiveness studies would not be possible.
Poison
The costs of injury due to paraffin ingestion were retrospectively analysed in 1990 (De Wet et al., 1994). The study examined the expenditure of six Cape hospitals on a cost per patient per day basis. The daily cost per patient ranged between R144 and R410 during 1990 (De Wet et al., 1994). These figures point to the alarming costs involved in treating the ingestion of a substance that is widely available to the South African population.

Firearm-related injuries
The direct costs of hospital treatment for firearm-related injuries were calculated through the analysis of victims' folders at Groote Schuur Hospital in Cape Town (Peden & Van der Spuy, 1998). The direct treatment costs amounted to R3 858 331 for 969 patients. Estimates by American economists suggest that the direct medical costs account for only 13% of the total costs of firearm injury. Inclusion of the estimated productivity losses and other indirect costs for the 969 patients would then amount to R29 679 315 per annum for a single Cape Town hospital (Peden & Van der Spuy, 1998).

Injury costing methodologies employed
Establishing expenditure by hospital record and medical scheme reports
Analysis of expenditure trends has been a popular method of establishing costs of injury in the literature. This could be due in part to the spending and health care quality disparities between the public and private health care sectors in South Africa. All the literature that employed expenditure analyses for an estimation of costs were comparative studies. As detailed above, expenditure may be considered a component of a composite cost figure, but cannot be regarded as an accurate reflection of the real costs of health care treatment (Bowman, 2002).

Direct medical costing via prescription analysis
In an attempt to discover the costs of medicines, prescriptions were analysed and tabulated to establish the extent to which prescription drug costs could be minimised (Price, 1990). These figures often exclude the inseparable costs incurred through the time and personnel required to distribute medication. While prescriptions provide a useful source of costing data, they can only be used to supplement other measures of health care expense.

Retrospective costing using patient records
This method was the most popular of the costing techniques found in the literature. Retrospective costing using patient records was used in six studies. Burns (Quarmby, 1999), MVCs (Dickinson et al., 1990), firearm-related injuries (Peden & Van der Spuy, 1998) and poisonings (De Wet et al., 1994) were all costed using patient records. The patient record as a costing information source is, however, complicated by challenges to the accurate recording of information necessary to conduct cost calculations, as well as by inefficient filing processes in many South African public sector health facilities.
**Extracting costs from existing reports and other documentation**

Annual public health sector and medical scheme reports formed data sources for cost analyses in three articles in the literature (Ijsselmuiden & De Beer, 1990). As discussed previously, many existing documents report on expenditure rather than on direct costs. Basing cost analyses on documents that report expenditure is therefore inherently problematic (see Finkler, 1982).

**Estimating costs through activity budgets**

This method was employed in estimating the costs of performing a post-mortem (Gauteng Department of Health, 1999). Activity budgets rely on heavily detailed inventories of costs that are frequently updated. Activity budgets are useful proxy measures of costs to the mortuary. They are, however, vulnerable to the same accuracy threats of general budgets. The calculations of budgets are influenced by many extra-economic factors (including internal policy) and therefore cannot be regarded as unmitigated reflections of cost per se (Finkler, 1982).

**Cost analyses using police dockets**

Dockets administered by the South African Police Services (SAPS) were used by the CSVR to determine both the incidence of crime and the extent of associated injuries. The dockets are required to detail the nature of the crime-related injury, but in practice they are unreliable in that they may seldom document the injury accurately, and are not required to indicate the severity of the injury (CSVR, 2000).

**Costs of fatal injuries using health economic extrapolations**

The costing of fatal injury in the Cape Metropole was the only study in the literature that calculated the direct, indirect and human value costs of violence-related injury (Phillips, 1998). Costing in South Africa had hitherto been almost exclusively concerned with the direct costs of injury. The direct costs of homicide were ascertained using the mortuary budgets for the given sample. Indirect costs were calculated using a combined willingness-to-pay and human capital method that relied on demographic information and other data provided by the Central Statistical Services. The use of historically skewed economic and demographic data as a source of baseline costing information could prove problematic, given the definitive inaccuracy of such documentation. The inaccuracy of this information is particularly pronounced in the South African context, where demographic and socio-economic information released by the apartheid government is largely considered to be inaccurate.

What is apparent from the selected review conducted above is that injury costing as a comprehensive and systematic technology is not thoroughly embedded and institutionalised within the public health, research and development sectors. While many of the studies and methods utilised are valuable for facilitating such institutionalisation in future, they represent partial estimations of the economic burden of injury in South Africa at present, primarily because of the paucity of infrastructural support and technical skills available within the sector.

**CHALLENGES AND FUTURE PRIORITIES**

Several challenges to stimulating strategic national injury costing protocols within the public health, research and development environments currently exist in South Africa. These require prioritisation if injury costing is to be utilised as an effective safety promotion and injury prevention tool in future.
Firstly, given the limited nature of injury costing in the South African safety promotion and injury prevention sector, critical debate on costing technologies and methodologies needs to be stimulated in order to clarify the most strategic elements of costing that can facilitate health and safety for all. Not only would this include interrogating the underlying assumptions of injury costing, but also the ideological pitfalls and considered strengths of costing that may either contribute to undermining or promoting health and safety for all in future. Through this process a more informed approach to injury costing and its utility can be undertaken.

Secondly, the paucity of skills related to injury costing in South Africa requires some redress to ensure quality assurance in respect of data collection, data analysis and data utilisation. In addition, infrastructural support and capacity for these processes to occur must be generated. This should include public-private partnerships in the health sector, multisectoral and interdisciplinary involvement (between, for example, health economists, lobbyists, researchers and safety promotion practitioners), skills transfer, as well as the political will to provide institutional capacity to support injury costing.

Thirdly, the current methodologies employed in South African injury costing studies are partial, tend to be located within small-scale, localised studies, and therefore emphasise mainly the direct health costs associated with injuries. In order to provide more meaningful data, the methodologies employed need to be able to provide a national commentary on injuries, and should also include more comprehensive cost analyses that speak to indirect, human value and other social costs. In this way a more accurate depiction of the economic burden of injuries at national level could be generated; this could also be complemented by newer strategies to document the unquantifiable elements of the social burden of injuries in South Africa.

Fourthly, while a range of intentional and unintentional injuries have been costed in the past several years in South Africa, a more directed and focused approach to selecting injury clusters to be costed requires some consideration in relation to their health priority status. Here the epidemiological data on injury morbidity and mortality that currently exist need to be strengthened and utilised as baseline data to direct this selection process at city, provincial and national levels.

Finally, ongoing assessments of the utility of this information need to occur to determine whether injury costing data can successfully be employed to influence resource allocation, planning, intervention and policy decision-making through lobbying and advocacy. Tracking data utility patterns, as well as the manner in which injury costing data may stimulate other forms of costing initiatives (e.g. cost-benefit analyses in relation to prevention interventions), could be considered in this regard.

This chapter has essentially argued that as an underdeveloped tool at the disposal of the injury prevention and safety promotion sector in South Africa, injury costing requires some thoughtful consideration as a potential strategy in the ongoing pursuit of facilitating a safer society. However, it also recognises the inherent limitations of economically quantifying injuries and their consequences, especially in social contexts where significant wealth disparities exist between different sectors of the population. In addition, it is noted that even though injury costing can be strategically employed
to leverage support for primary prevention endeavours, the economic burden of injuries should not be the sole premise on which prevention work is undertaken; rather, a broader social burden perspective needs to ultimately inform such strategic decision-making and prioritisation.

REFERENCES


The 2002 World Health Report by the World Health Organisation (WHO) describes the burden of disease, disability and death in the world today (WHO, 2002b). It reveals that a relatively small number of risks contribute substantially to disease and death in human populations throughout the world. The report identifies a number of cost-effective interventions to counter some of these risk factors. It further states that in order to know which interventions and strategies work, governments must be able to assess and compare the magnitude of risks accurately. The subject of risk is therefore a major component of this report. Risk assessment is defined as “a systematic approach to estimating the burden of disease and injury due to different risks” (WHO, 2002a, p.4). The report makes key recommendations to help countries develop risk reduction strategies and programmes. It stresses that governments will need to strengthen their surveillance systems, improve scientific research and access global information systems to support the empirical basis of their policies. It is within this context that this chapter is written.

This chapter focuses on information management and public health. The current status of health information systems (that should include the collection of injury data) in South Africa is examined. Two important existing systems which constitute milestones towards the development of injury information management systems in South Africa are reviewed, and the case for extending these and similar programmes is argued. It is suggested that it is important to link such programmes to other information management systems dealing with health (and ill health) and injury within the context of a national health information management system. The importance of the South African Demographic and Health Survey (Department of Health, 2001) in contributing to the information we have on non-fatal injuries nationally is highlighted. The Initial Burden of Disease Estimates for South Africa, 2000 (Bradhaw et al., 2003), which highlights the importance of injuries to the burden of disease in South Africa, is also reviewed. The international picture as regards injury and in particular the World Report on Violence and Health (World Health Organisation, 2002a) are examined, and the importance of a public health approach in dealing with violence is elaborated. The state of the epidemiology of injuries and its usefulness in developing intervention strategies is outlined. In conclusion, the technology available (and the potential of the internet in particular) for improving management of injury data is reviewed.
INFORMATION MANAGEMENT AND PUBLIC HEALTH

Function of information management
The function of information management is to obtain, manage and use information to improve the health of communities and of the population at large. Specifically, in public health information is used to improve health service performance, governance and management processes. A health information system is not a single system but comprises many components, including administrative, financial and surveillance dimensions. Because of rapid advances in technology and data transfer capabilities these systems by necessity have to be open, but linked (Bradshaw & Mbobo, 1995).

For this to be possible the necessary information systems, information technology infrastructure and policies have to be in place. Specifically, there has to be a functional national health information system; a national science and technology information policy; a national master plan for health informatics and telematics; a specially designed computer centre at the National Department of Health; and an intranet site at this department.

South Africa is lagging somewhat in its development of a general health information management system, let alone one dealing with injuries in particular (Bradshaw, 1997). We need to review our current situation and reflect on problems hindering development.

Health information management in South Africa: Current situation
There are a range of problems hindering effective development of a comprehensive health information system in South Africa. Information is often delayed in terms of collection, and when collected it is not analysed promptly. We have a historically weak vital events registration system. This has improved somewhat over the last few years, as the various departments started integrating and moving away from the previous apartheid structures. However, this has been a slow process.

There is a further complication in that the Department of Home Affairs rather than the Department of Health collects data on vital events. This is compounded by the fact that multiple information systems organised through the public health programmes often function independently. In addition, there are poorly integrated hospital-based information systems. Also, the information systems in the private sector (a significant player in health care delivery) are not integrated and often vital information is missing. Hence, the quality of information generated is not reliable. There is a lack of information, training and education at micro and macro levels for future users of information systems. Finally, and most importantly, problematic as they are the current information systems are becoming difficult to sustain, given available levels of financial and human resources.

Health information systems in South Africa
South Africa has slowly improved local capability in health service planning, disease surveillance and evaluation of health services. This may be the result of better equipped managers who have used information in an effective manner to support decision-
Major issues that remain are: how to align health information with operational management and strategic planning in the health care delivery system; how to enhance information management and strategic planning in the health care delivery system; and how to enhance human capacity and the use of information technology to improve data collection and the dissemination of information.

Of note is the National Department of Health’s attempt through its National Health Information System for South Africa (NHISSA) to roll out the development of an integrated health information system from 1995 (Mandil, 1995). The shift in focus has been to look at the development of health status indicators rather than workload indicators only. The roll-out to districts has been slow. The national roll-out has a two-pronged approach. The first is aimed at building the capacity of health care providers to generate and use information for local action (information management skills), and the second at developing the infrastructure needed to support the implementation of the NHISSA.

In 1999 a national primary health care essential data set consisting of 49 elements was approved. In the past two years all nine provinces have developed essential data sets (also known as minimum data sets) for primary health care. Data for the essential data sets are collected at facility level. Consolidated data sets for districts have been incorporated in the computerised District Health Information System (DHIS), which is the current national standard system. The national data input coverage has increased from 33% in 1999 to 94% in 2001. In addition, other health data are being collected by health facilities and sent up to a variety of departmental clusters at higher levels. This includes surveys and ad hoc requests from vertical programmes, both provincially and nationally, resulting in a substantial amount of vertical data available at national level. However, there are poor mechanisms to facilitate sharing between vertical health programmes and national and provincial health departments. Mechanisms at provincial and national level to analyse data and generate useful reports to provide a clear picture of the health status of South Africa are in development. The incorporation of an injury surveillance system into the DHIS and hospital information systems is lacking and should also be investigated (Williamson & Stoops, 2001).

An overview of common data sets available to the public health sector and their application is provided in Table 1. The health information systems referred to in Table 1 are commendable and should be strengthened and expanded where applicable. However, injury data collection systems within the general health information systems mentioned are glaringly absent.

To get a better understanding of information management systems for injury data we need to review the international picture as well as local and international experiences in the collection and analysis of such data and how they determine public health interventions.
The World Report on Violence and Health (WHO, 2002a) emphasises the use of the public health approach in dealing with violence. The report further emphasises that action on the public health front requires measuring the extent of the particular health problem being addressed. The public health approach is science-based and therefore relies on the use of accurate and well-timed information. Reliable data on violence are extremely important, says the report, not only for planning and monitoring purposes but also for advocacy.

The World Report on Violence and Health (WHO, 2002a) points out that measuring violence poses many challenges. Internationally, countries differ in the development of their information management systems. The report states that there is great variation in the completeness, quality, reliability and usefulness of available information. It further states that authorities incompletely or never record many acts of violence. Also, the lack of consistency in definitions and data collection make it difficult to interpret or compare data. The report acknowledges that mortality data
are the most widely collected and the most readily available. Sources of information include death certificates, registers of vital statistics and coroners' reports. However, the point is made that mortality data represent only the tip of the iceberg, and that for every one person who is killed, very many more are injured, psychologically undermined or disabled for life. The report states that since non-fatal outcomes are much more common than fatal outcomes, other types of data are needed to complete the picture of violence. These include:

a) Data on disease, injuries and other health conditions;
b) Self-reported data on attitudes, beliefs, behaviours, cultural practices, victimisation and exposure to violence;
c) Community data on population characteristics and levels of income, education and employment;
d) Crime data on the characteristics and circumstances of violent events and violent offenders;
e) Economic data related to the cost of treatment, social services and prevention activities; and
f) Policy and legislative data.

All of these sources can be useful in understanding the problem and further illustrate the report’s emphasis on multisectoral partnerships as key elements of the public health approach. The report states that the public health approach does not replace the criminal justice and human rights responses to violence, but rather complements them and offers additional tools and sources of collaboration.

The report further elucidates the usefulness of information management in the interpretation of data on violent injuries. It estimates that in the year 2000, of the 1.6 million people worldwide who lost their lives due to violence, around half were suicides, a third were homicide victims and about one-fifth were casualties of armed conflicts. Males accounted for three-quarters of all victims of homicide, and the highest homicide rates in the world were found among males aged 15 to 29 years. Homicide rates among males tend to decline with age. Rates for suicides, in contrast, tend to increase with age for both sexes, and the highest rates for suicide were found among men aged 60 years and older. Country income levels determine rates of violent death, with rates in low- to middle-income countries more than twice as high as those in high-income countries (WHO, 2002a).

Although providing insightful information that can be used for public health interventions, these overall rates often conceal wide variations. For example, in the African Region and the Region of the Americas, homicide rates are nearly three times greater than suicide rates. In the South-East Asia and European Regions, suicide rates are more than double homicide rates, and in the Western Pacific Region, suicide rates are nearly six times greater than homicide rates. The overall rates also conceal wide variations within countries – between urban and rural populations, between rich and poor communities, and between different racial and ethnic groups. In Singapore, for example, people of Chinese and Indian ethnic background have higher suicide rates than ethnic Malays. In the USA in 1999 African-American youth aged 15 to 24 years were victims of homicide at a rate of more than twice that of their Hispanic counterparts and over 12 times that of their Caucasian, non-Hispanic counterparts (WHO, 2002a).
The information management system should inform public health interventions timeously. Traditionally, public health interventions are characterised in terms of three levels of prevention:

a) Primary prevention, which aims to prevent violence before it occurs;

b) Secondary prevention, which focuses on the more immediate responses to violence, such as pre-hospital care, emergency services and treatment such as for sexually transmitted diseases following rape; and

c) Tertiary prevention, which focuses on long-term care in the wake of violence, such as rehabilitation and reintegration and attempts to lessen trauma or reduce the long-term disability associated with violence.

However, greater priority should be given to the primary prevention of violence, according to the report.

The World Report on Violence and Health (WHO, 2002a), although focusing on violence globally, provides useful insight into the information management systems requirements for managing and using injury data.

The South African situation

Injuries arising from intentional incidents (e.g. violence, crime, suicide) and unintentional incidents (e.g. traffic-related, falls, fires, poisonings) contribute significantly to our national burden of disease (Marais & Stevens, 2002, p.1).

The South African Demographic and Health Survey

The motivation for conducting a Demographic and Health Survey (Department of Health, 2001) began in 1995, when the Department of Health’s National Health Information Systems of South Africa Committee recognised the serious gaps in information required for health service planning and monitoring. For the survey, conducted between January and September 1998, 12 247 households were visited and 17 500 people throughout nine provinces were interviewed. The survey findings as they relate to injury data are of particular relevance to this review and are described below.

The South Africa Demographic and Health Survey (SADHS) is the first survey to provide national level information about non-fatal injuries on a nationwide scale. Information was gathered about the injuries that 32 199 adults had experienced in the month prior to the survey by means of a household questionnaire. The survey revealed that 372 adults (15 years and older) had sustained an injury severe enough to warrant
medical attention in the month prior to the survey (conducted between late January and September 1998). The overall injury rate per month for adults was 1233 per 100 000, compared to 468 per 100 000 for children under the age of 15 years. The annual injury rate for adults in South Africa is thus estimated to be 14 796 per 100 000, i.e. one in seven adults require medical attention for an injury per year (Table 2). Previous estimates have shown that one in 10 people require medical attention for an injury per year (Van der Spuy, 1996). The figure therefore seems to be rising.

Unintentional injuries accounted for 78% of all reported non-fatal injuries. Fewer than 25% of adults reported an intentional injury. The annual non-fatal violence rate was 3204 per 100 000 adults (1 in 31). The annual attempted suicide rate was 492 per 100 000 adults. Table 2 shows that the majority of these adults were male (64%). The overall injury rate for women was 805 per 100 000 with a median age of 42 years. The rate for men was 1754 per 100 000 population. The data showed a high rate of unintentional injuries among males aged 45 to 54 years. The trend covers all types of unintentional injuries, i.e. traffic collisions, occupational injuries and other ‘accidents’, and has not been documented in South Africa before. The injury rate in urban areas was almost twice that of non-urban and rural areas. In terms of provincial distribution the rates of adult injuries were highest in the Western Cape, followed by Gauteng and Mpumalanga.

The SADHS is an excellent source of injury information for South Africa and should inform other information management systems in public health. It should be used to develop appropriate prevention strategies and be made more accessible to other users. The SADHS should be repeated regularly, much like the Census, since it provides valuable public health information that is vital for public health planning.

Table 2. Monthly injury rates per 100 000 adult men and women

<table>
<thead>
<tr>
<th>Background characteristic</th>
<th>Intentional injury</th>
<th>Unintentional injury</th>
<th>All injuries</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-24</td>
<td>406.5</td>
<td>150.8</td>
<td>757.3</td>
<td>443.3</td>
</tr>
<tr>
<td>25-34</td>
<td>396.8</td>
<td>205.1</td>
<td>1 251.4</td>
<td>408.6</td>
</tr>
<tr>
<td>35-44</td>
<td>774.3</td>
<td>174.4</td>
<td>1 673.3</td>
<td>807.6</td>
</tr>
<tr>
<td>45-54</td>
<td>79.8</td>
<td>138.2</td>
<td>2 987.0</td>
<td>830.5</td>
</tr>
<tr>
<td>55-64</td>
<td>216.0</td>
<td>239.1</td>
<td>1 260.5</td>
<td>776.1</td>
</tr>
<tr>
<td>65+</td>
<td>0.0</td>
<td>155.6</td>
<td>1 290.6</td>
<td>836.2</td>
</tr>
</tbody>
</table>

| Residence                 |        |         |        |         |        |         |        |         |
|---------------------------|        |         |        |         |        |         |        |         |
| Urban                     | 443.8  | 161.4   | 1 578.3 | 844.6   | 2 022.1 | 1006.2  | 8888   | 10382   |
| Rural                     | 280.4  | 193.4   | 1 045.8 | 328.5   | 1 326.2 | 521.9   | 5571   | 7358    |

Total 380.8 174.8 1373.1 630.6 1753.9 806.4 14 459 17 740

(Adapted from the Department of Health, 2001)
Other innovative national surveillance systems on injury data have also been implemented locally and offer valuable lessons, both in terms of setting up information management systems on injury data and the type of information produced. The most important of these is the National Injury Mortality Surveillance System, discussed next.

**National Injury Mortality Surveillance System**

The National Injury Mortality Surveillance System (NIMSS) was developed to fill the current gap in the collection of vital statistics. Statistics South Africa last reported an analysis of fatal injuries by manner of death and external cause in 1991. The first NIMSS report covered the period 1 January 1999 to 31 December 2000 and described the 14 897 injuries that were registered at 10 mortuaries in five provinces. The NIMSS report for 2000 covers the period 1 January 2000 to 31 December 2000, during which 18 876 fatal injuries were registered at 15 mortuaries in five provinces (Burrows, Bowman, Matzopoulos & Van Niekerk, 2001).

In the absence of accurate and reliable routinely collected data, current estimates for the national number of deaths that occur due to non-natural causes are estimated to be between 65 000 and 80 000 per annum. Further analysis of the figures collected by NIMSS in 2000 indicated some interesting results (Table 3).

**Table 3. Manner of non-natural death by sex of victim (N=18 649)**

<table>
<thead>
<tr>
<th></th>
<th>Homicide</th>
<th>Accident</th>
<th>Suicide</th>
<th>Undetermined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>7 269 (48.6%)</td>
<td>4 041 (32.3%)</td>
<td>1 447 (9.7%)</td>
<td>1 405 (9.4%)</td>
</tr>
<tr>
<td>Female</td>
<td>0 37 (29.1%)</td>
<td>1 613 (43.7%)</td>
<td>3 26 (8.8%)</td>
<td>677 (18.4%)</td>
</tr>
<tr>
<td>M:F Ratio</td>
<td>6.8</td>
<td>3.0</td>
<td>4.5</td>
<td>4.1</td>
</tr>
</tbody>
</table>

(Adapted from Burrows et al., 2001)

In terms of manner of death, homicide was the major cause, accounting for 45% of all cases. Accidents accounted for 35% of all cases and suicide for 9%. Males constituted 80% of all injury deaths. Homicide was the main cause of non-natural deaths for males (49%), and accidents for females (44%).

From Table 4 it can be seen that of the 18 876 non-natural deaths, 70% of the cases were in blacks, 16% in coloureds, 12% in whites, and 2% in Asians. Furthermore, the majority of victims were young adults, with 37% of all cases aged 15 to 29 and 36% aged 30 to 44.

**Table 4. Manner of non-natural death by race of victim (N=18 621)**

<table>
<thead>
<tr>
<th></th>
<th>Homicide</th>
<th>Accident</th>
<th>Suicide</th>
<th>Undetermined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>6 384 (48.9%)</td>
<td>4 409 (33.8%)</td>
<td>857 (6.6%)</td>
<td>1 787 (13.8%)</td>
</tr>
<tr>
<td>Black</td>
<td>1 488 (48.9%)</td>
<td>957 (33.4%)</td>
<td>235 (7.9%)</td>
<td>262 (8.8%)</td>
</tr>
<tr>
<td>Coloured</td>
<td>300 (17.1%)</td>
<td>861 (39.5%)</td>
<td>502 (26.5%)</td>
<td>379 (16.9%)</td>
</tr>
</tbody>
</table>

(Adapted from Burrows et al., 2001)
The study further showed that firearms accounted for most cases of death (28%) due to external causes. In infants and children younger than 5 years burns were the major cause of death. In those from 5 to 14 years pedestrian injuries ranked first. For all other age groups above 14 years firearms were the leading cause of death. Death by means of sharp objects ranked second for the age group 15 to 44 years, and motor vehicle collision (MVC) pedestrian deaths ranked second for those aged 45 and older.

Table 5 shows the gravity of intentional injuries in South Africa. Homicides account for the vast majority of deaths. Over half of the homicides were due to firearms and almost a third were by sharp instruments. The number of homicide victims rose abruptly in the 15- to 19-year age group, peaked in the 25- to 29 age group, and remained high up to the age of 44 years. There were 6.8 male homicide victims per female victim. Of the males, 56% were killed by means of firearms. Firearms accounted for 43% of female homicides. Homicide by strangulation was 13 times more frequent among females than males.

External causes accounted for 6503 or 35% of all fatal injuries. Of these, 72% were transport-related, 12% were due to burns, 4% due to drowning, and 4% due to falls.

Table 5. Homicide: External causes by race of victim

<table>
<thead>
<tr>
<th></th>
<th>Firearm</th>
<th>Sharp</th>
<th>Blunt</th>
<th>Strangle</th>
<th>Burn</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>59 (67.0%)</td>
<td>12 (13.6%)</td>
<td>9 (10.2%)</td>
<td>5 (5.7%)</td>
<td>1 (1.1%)</td>
<td>2 (2.3%)</td>
</tr>
<tr>
<td>Black</td>
<td>3459 (54.2%)</td>
<td>1965 (29.2%)</td>
<td>847 (13.3%)</td>
<td>46 (0.7%)</td>
<td>56 (0.9%)</td>
<td>107 (1.7%)</td>
</tr>
<tr>
<td>Coloured</td>
<td>612 (41.2%)</td>
<td>617 (41.5%)</td>
<td>220 (14.6%)</td>
<td>16 (1.1%)</td>
<td>8 (0.5%)</td>
<td>14 (0.9%)</td>
</tr>
<tr>
<td>White</td>
<td>238 (62.6%)</td>
<td>53 (13.9%)</td>
<td>58 (15.3%)</td>
<td>19 (5.0%)</td>
<td>2 (0.5%)</td>
<td>10 (2.6%)</td>
</tr>
</tbody>
</table>

(Adapted from Burrows et al., 2001)

NIMSS data provide other important information that reflect further on the state of our nation’s mental health. For example, if the 1782 suicides are analysed then firearms and hanging each accounted for one-third of them. Most suicide victims were between 25 and 39 years of age. There were 4.5 male suicides for every female suicide.

There was a strong association between alcohol and all types of non-natural deaths, particularly homicide and transport-related deaths, where more than 50% of the victims tested positive for blood alcohol.

NIMSS data showed an enormous and important variation between provinces: the Eastern Cape had the highest proportion of homicide deaths, followed by KwaZulu-Natal and the Western Cape. The Northern Cape and Gauteng had greater proportions of unintentional deaths and suicides.

Some inter-city comparisons were possible. For example, crude non-natural mortality rates show that Port Elizabeth has a higher homicide rate than Cape Town, but the firearm homicide rate is higher in Cape Town. Port Elizabeth has also a 50% higher suicide rate than Cape Town. However, mortality rates for motor vehicle-pedestrian collisions were nearly 50% higher in Cape Town, and the mortality rate for rail deaths was five times higher in Cape Town.
Information management systems for injury data compare well with other information sources in South Africa. For example, Bradshaw, Schneider, Dorrington, Bourne and Laubscher (2002), in their analysis of the 327,253 deaths reported in South Africa for 1996 showed that injuries accounted for a substantial proportion of them. In fact, their figures indicate that injuries accounted for 25% of male and 10.2% of female deaths.

NIMSS, as any good information management system on injury data should, gives us an idea of the overall causes of fatal injuries in South Africa and what the possible targets for public health and criminal justice prevention strategies could be. An aim is for NIMSS to progressively expand its geographic and case coverage until all injury deaths are included in what is intended to be an ongoing system for the epidemiological surveillance of fatal injuries. NIMSS is vital for observing trends of what causes fatal injuries in South Africa, and it needs to develop further as an intrinsic part of the information management systems of our forensic pathology units, mortuaries and the Department of Health. It also needs to inform the criminal justice system, both in terms of non-natural causes of death and opportunities for prevention.

The criminal justice system uses the Crime Administration System (CAMS) for the management of crime information and it also provides insightful information on crime trends, including serious crime such as murder and rape as well as common assault, over the past few years. For example, overall murder cases have declined from 19,672 in 1994 to 15,054 in 2001, but rape and attempted rape have increased from 29,399 in 1994 to 37,711 in 2001 (South African Police Service, 2003).

NIMSS, like CAMS, provides vital information on injuries and crime on a national basis. There are also smaller, more local initiatives that also contribute to our understanding of injuries and possible preventive measures. These are described below.

**Learner Incident and Injury Surveillance System**

The Learner Incident and Injury Surveillance System (LINCISS) was initiated in mid-2000 as part of the UNISA Institute of Social and Health Sciences Safe Schools Project, which is currently being implemented in Eldorado Park secondary schools. LINCISS records and monitors all incidents and/or injuries through the completion of a surveillance register each time such incidents and/or injuries occur on the school premises (Swart & Stevens, 2002).

LINCISS focuses on specific causes of incidents of violence and injury occurring in the school environment. It also focuses on the possible behavioural determinants that compromise pro-social activities at schools and that may be directly or indirectly associated with crime, violence and injury among school-going youth. It includes gathering information on the demographics of learners involved in incidents (e.g. age, grade and sex), the details of the person recording the incident (e.g. teacher, principal or secretary), the nature of the incident (e.g. physical assault, sport-related or sexual harassment), the location of the incident (e.g. classroom, playground or toilets), and the time of the incident (e.g. class time, lunch breaks, or before or after school). With reference to the incidents in which physical injuries were sustained, LINCISS describes the type of injury sustained (e.g. cut, penetrating wound or bruise), the body part injured (e.g. head, shoulder or foot), and the care provided to the
injured person (e.g. first aid or doctor). For injuries resulting from intentional acts, details about the number of people involved and the offender-victim relationship are also described. Unintentional incidents were also reported in some detail. This kind of detail could assist the school and the relevant authorities to develop appropriate intervention strategies.

From July 2000 to November 2001, 144 incidents and/or injuries were recorded. Table 6 describes cases of substance use and cases of physical violence (assault) distributed according to grade. Of the 37 cases associated with the use or distribution of alcohol, tobacco products or drugs, 62% involved male learners, while 38% involved females. Most learners involved were from Grade 8 (43%); 14% were from Grade 9; 27% were from Grade 10; and 8.1% were from Grades 11 and 12 respectively. Of the 68 reported cases of physical fighting or assault, 68% involved male learners and 32% involved female learners. Of learners involved in physical fighting or assaults 44% were in Grade 8; 24% were in Grade 9; 16% were in Grade 11; and 2% were in Grade 12. It appears that the majority of cases involved learners in Grades 8 to 10, i.e. younger learners. This is clearly a cause for concern.

Table 6. Cases of substance use (N=37) and of physical fighting/assault (N=63) according to grade

<table>
<thead>
<tr>
<th>Substance use</th>
<th>Grade 8</th>
<th>Grade 9</th>
<th>Grade 10</th>
<th>Grade 11</th>
<th>Grade 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases of physical fighting</td>
<td>44%</td>
<td>24%</td>
<td>14%</td>
<td>16%</td>
<td>2%</td>
</tr>
</tbody>
</table>

(Adapted from Swart & Stevens, 2002)

Preliminary analysis of the information cited above defines areas of possible future research, but more importantly points to the development of intervention strategies directed at school-going youth. One of the long-term goals of LUNISS is to provide ongoing and systematic information about the incidence, causes and consequences of violence and injury within schools at local, regional and national level. Similar programmes and possible interventions are also being developed elsewhere in South Africa, such as the School Injury Surveillance System (SISS) in the Western Cape and the Home Visitation project in Gauteng and Western Cape (MRC-UNISA Crime, Violence and Injury Lead Programme, 2003).

Crime and Violence in the Workplace Study

The Crime and Violence in the Workplace Study (Marais, Van der Spuy & Rontsch, 2002) is another important local study. It reports on the influence of crime and violence on the delivery of health services in the Western Cape. The survey was conducted at the following research sites in Cape Town: G. F. Jooste Hospital, Mitchells Plain Day Hospital, Gugulethu Day Hospital, and the Trauma and Emergency Unit at Groote Schuur Hospital. A structured questionnaire was administered to a sample of health workers. A total of 176 questionnaires were completed. Most of the interviewees were women (75%) and nearly two-thirds (62.5%) were nursing staff. Doctors constituted close to a third of the sample (29%) and 65% of this group were male. The rest of the sample (8.5%) were paramedics and administrative staff.
More than half (60%) of the sample indicated that they were “reasonably satisfied” with their jobs. Almost two-thirds (62.9%) indicated that working conditions had deteriorated in the past few years, and the majority (80%) agreed that the main reason for this was an insufficient health budget. Judging by responses to the broad question on “the most important issues in the workplace”, crime and violence did not feature prominently. Responses to a follow-up question on workplace crime and violence indicated that doctors and nurses thought differently about it: 61.1% of the sample indicated that they frequently have to contend with violence and crime in the workplace, and 58.1% did not regard violence as “part of the job”. In contrast, 46.9% of doctors regarded crime and violence issues as “part of the job”. A series of questions was put to respondents to gauge when and where around the hospital they felt safe or unsafe. Table 7 below summarises the responses.

**Table 7. Perceptions of safety of health workers in different contexts**

<table>
<thead>
<tr>
<th></th>
<th>Moderately safe (%)</th>
<th>Unsafe/very unsafe (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nurses (N=110)</td>
<td>Doctors (N=51)</td>
</tr>
<tr>
<td>Where you live</td>
<td>44.5</td>
<td>41.2</td>
</tr>
<tr>
<td>Travelling to work</td>
<td>40.0</td>
<td>56.9</td>
</tr>
<tr>
<td>At work</td>
<td>48.1</td>
<td>64.7</td>
</tr>
<tr>
<td>Outside trauma unit</td>
<td>30.0</td>
<td>36.0</td>
</tr>
<tr>
<td>Inside trauma unit</td>
<td>34.9</td>
<td>62.7</td>
</tr>
<tr>
<td>At visitors’ entrance</td>
<td>35.8</td>
<td>38.0</td>
</tr>
</tbody>
</table>

(Adapted from Marais, Van der Spuy & Retscho, 2002)

These are just some of the interesting findings from the study, indicating how complex questions such as those related to job satisfaction and risk of crime and violence in the workplace can be answered using simple survey tools. These results have important human resource implications as well. The survey at the hospitals formed part of a project design that also included qualitative methods such as field observations, in-depth interviews with senior health officials and focus group discussions with staff members. Such information management systems should be a part of the hospital information system as a matter of routine, and analysis of this study reveals that once accessible in a central repository of data, they can contribute to measures of preventative intervention.

**National Non-Fatal Injury Surveillance System**

The National Non-Fatal Injury Surveillance System (NANFISS) is another important information management system on injury data that needs to be consolidated, expanded and linked to other appropriate information systems. It involves injury and violence surveillance through a sentinel system based on health facility injury registers.
Only secondary and tertiary facilities have been included in the 41 sentinel sites in NAFI, in order to focus on moderate to severe injuries (MRC-UNISA Crime, Violence and Injury Lead Programme, 2003). It is mentioned here for completeness.

There are numerous other initiatives of information gathering systems put up by disparate players to meet different needs. We need to plan together and work as if we are developing one huge health information system that is open and able to offer linkages to all the different players.

The NIMSS and LINCISS information management systems are two of the very few attempts in South Africa to develop a meaningful understanding of the local distribution and determinants of injury. There are numerous smaller surveillance systems and studies looking at particular areas of concern, but they lack a national scope and are often based on very few sites.

What is required is the development of an integrated national monitoring system of injuries in the context of a national action plan for injury prevention. The development of a national information management system will also allow for the integration of injury prevention policies into the social and educational sectors. The short-term goal, however, is to increase collaboration and the exchange of information currently collected on injury and its prevention. What must be commended is the launch of the Injury and Safety Monitor in June 2002, which attempts to do just that.

Injuries are predictable and preventable. With a good information management system, our ability to avoid injuries will be enhanced.

**EPIDEMIOLOGY AND OTHER SOURCES OF INFORMATION ON INJURIES**

**Injuries and the global burden of disease**

Injuries are clearly a leading cause of death throughout the world. In The Global Burden of Disease, Murray and Lopez (1997) reviewed the leading factors behind mortality and disability on a global basis. Among countries in the developed world, injuries from motor vehicle accidents are the eighth leading cause of death and suicides are ninth. The impact is greater if the cancer categories are grouped together (Table 8).

In the developing world, recent global evidence suggests that injuries are assuming greater importance as a cause of death and disability. Furthermore, the impacts of injuries from accidents are projected to increase dramatically to the year 2020 (Murray & Lopez, 1997). Of significance are our local initial burden of disease estimates, which are described below.
Information management systems for injury data

Initial Burden of Disease Estimates for South Africa, 2000

The Initial Burden of Disease Estimates for South Africa, 2000 (Bradshaw et al., 2003) was published in March 2003 amid controversy. The report largely used Murray and Lopez’s approaches to calculate estimates of the burden of disease in South Africa. As Professor William Pick, Acting President of the Medical Research Council of South Africa, stated in the foreword (Bradshaw et al., 2003, n.p.):

These estimates provide the most up to date picture of the extent to which HIV/AIDS has impacted on the South African burden of disease. The increasing burden caused by the epidemic, together with the considerable burden posed by intentional and unintentional injuries, point to two areas of intervention that will be of critical importance for the improvement in the health of South Africans in the future. These findings, although indirect measures, are also critical in developing an understanding of the magnitude of the problem of injuries in public health and should contribute to the information management systems of injury data in South Africa.

The report is briefly reviewed here. The main focus of the study was to determine the causes of premature mortality (years of life lost or YLLs) experienced in the year 2000. It has also provided an estimate of the additional burden contributed by morbidity and injury (years lived with disability or YLDs), in order to estimate the disability adjusted life years (DALYs), as well as an estimate of the impact of AIDS on premature mortality in the year 2010. The 1996 Statistics South Africa figures were the latest cause of death data used. The number of deaths for the year 2000 was estimated using the ASSA (Actuarial Society of South Africa) 2000 model (see Bradshaw et al., 2003). What is interesting and relevant to this discussion is that the estimates from the model were further refined using other sources of information. The overall level of mortality was calibrated to match estimates of child mortality and adult mortality from recent surveys, the Census and vital statistics. The model was calibrated to replicate the antenatal HIV sero-prevalence survey data for pregnant women who attend public sector clinics. Interestingly, NIMSS data were also used in this exercise.

### Table 8. Leading causes of death in developed regions, 1990

| 1. | Ischaemic heart disease |
| 2. | Cerebrovascular disease |
| 3. | Lung cancer |
| 4. | Lower respiratory infection |
| 5. | Chronic obstructive pulmonary disease |
| 6. | Colon and rectum cancer |
| 7. | Stomach cancer |
| 8. | Road traffic accidents |
| 9. | Self-inflicted injuries |
| 10. | Diabetes mellitus |

(Based on number of deaths. Adapted from Murray & Lopez, 1997.)
Important findings were as follows: non-communicable disease accounted for 37% of deaths in 2000, followed by HIV/AIDS which accounted for 30% of deaths. The patterns for males and females differ. Females had a higher proportion of HIV/AIDS and non-communicable disease and a lower proportion of injury deaths. The cause of death profile by broad groups is shown in Table 9.

Table 9. Estimated cause of death profile by sex, South Africa, 2000

<table>
<thead>
<tr>
<th>Cause</th>
<th>Male (M=303 081)</th>
<th>Female (M= 253 504)</th>
<th>Persons (M=556 585)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV/AIDS</td>
<td>26%</td>
<td>34%</td>
<td>30%</td>
</tr>
<tr>
<td>Other communicable diseases, maternal and perinatal and nutritional (Group II)</td>
<td>21%</td>
<td>20%</td>
<td>21%</td>
</tr>
<tr>
<td>Non-communicable (Group III)</td>
<td>36%</td>
<td>40%</td>
<td>37%</td>
</tr>
<tr>
<td>Injuries (Group III)</td>
<td>17%</td>
<td>6%</td>
<td>12%</td>
</tr>
</tbody>
</table>

(Adapted from Bradshaw et al., 2003)

Further breakdown reveals that HIV/AIDS, chronic disease, poverty-related conditions and injuries all contributed substantially to the number of deaths in 2000. This is called the quadruple burden of disease. After HIV/AIDS (29.8%), cardiovascular disease (16.6%), infections and parasitic diseases (10.3%), malignant neoplasms (7.5%), intentional injuries (7.0%) and unintentional injuries (5.4%) are the leading causes of death in South Africa in 2000.

In terms of the top 20 specific causes of premature mortality (YLLs) by sex in South Africa for the year 2000, homicide/violence ranks second to HIV/AIDS. The study states that the burden from injuries, both intentional and unintentional, is extremely high for males, and the major causes of this burden are homicides, road traffic accidents and fires. Suicides also contributed to a large loss for males. The study highlights the need for more detailed assessments, for example when premature mortality is considered. Also, intentional injuries ranked higher than unintentional injuries. However, when non-fatal outcomes are taken into account, the ranking reverses.

Despite the shortcomings of the report, it has identified the major causes of premature mortality and morbidity in South Africa. It further projects that without interventions, the impact of HIV/AIDS will more than double the burden of premature mortality by the year 2010. The disease burden from HIV/AIDS does not diminish the burden from other causes of premature mortality, but adds significantly to them.

The epidemiology of injury

The use of epidemiological techniques to collect data on injury are in themselves an important approach for information systems to adopt. The SADHS is in fact a huge cross-sectional survey, i.e. an epidemiological study design. This should be further
encouraged in South Africa. An overview of the use of epidemiological techniques in injury data collection and analysis is given below, with particular reference to their use in developing public health intervention strategies. Injuries have been identified through various surveillance systems as a leading cause of mortality and morbidity in both the developed and developing world. Like other non-communicable diseases, they present a real challenge to epidemiologists both to understand the basic determinants of their occurrence (the frequency with which they occur and the risk factors for their occurrence) and to develop intervention programmes to reduce their impact. The work of William Haddon (1980) eloquently outlined how epidemiological applications have relevance to injury prevention.

According to Haddon (1980), injuries are not accidents. This is a challenge to the common view held by injury research professionals. The basis for this statement is that injuries most often occur to certain risk groups and are fairly predictable in their occurrence, whereas with accidents events are generally random in nature. For example, in motor vehicle crashes there are common observations that crash risks are higher among males and among the young and increase in the very old. This age and sex relationship is fairly consistent across several countries. Alcohol is another major factor involved in motor vehicle crashes. In some areas, alcohol-related crashes account for one-half of all fatalities in motor vehicle crashes. Also, what is predictable is that more alcohol-involved crashes occur in the evening hours than at other times in the day.

On a global basis, an analysis by the World Bank (1993) suggests that injury mortality rates are higher in developing countries (94 injury deaths per 100 000 population) than in developed countries. The reasons for this vary. One hypothesis is that there may be fewer integrated injury control efforts in these areas. Another hypothesis is that there may be higher rates of occupational injuries in developing countries, where priority is given to employment rather than health. However, evidence regarding both theories is debatable. The important lesson for us is that injury data, properly collected, can provide vital information in the development of public health interventions.

Similarly, a study of the causes of death among US citizens travelling abroad found consistently higher injury death rates for travellers to developing countries than travellers to developed countries. On a national basis the argument is not so straightforward. The theory of decline in injury mortality with economic progress does not exist everywhere. Wide variations exist in injury mortality rates across both developed and developing countries. For example, deaths from injuries are higher in the USA than in Sweden. Also, there is evidence to suggest that patterns of injury differ within countries. For example, African-Americans in the USA have one of the highest homicide rates in the world (Hargarten, Baker & Guptill, 1991).

**Epidemiology and the prevention of injuries**

Most injuries are preventable events. In applying the public health model to disease control we can understand the processes into which injury control programmes fit. Injury control programmes develop from our understanding of both the frequency with which the events occur (through monitoring) and the risk factors that lie behind their occurrence (through analytical epidemiological studies) (see Figure 1).
William Haddon, the father of injury epidemiology and injury control, played the leading role in bringing epidemiological principles to injury research and intervention programmes. Haddon (1980) argued that injuries could be examined within an epidemiological framework. Classically, in epidemiology, the interaction of three factors are considered in the development of disease, viz. the host, the agent and the environment.

Haddon (1980), former director of the National Highway Traffic Safety Administration and the Insurance Institute for Highway Safety in the USA, applied this epidemiological approach to injuries and most often to injuries from motor vehicle accidents. According to Haddon, human beings' behaviour in operating motor vehicles is the most important determinant of motor vehicle crashes, and physical energy is the agent in injury events. The environment is the milieu in which the vehicle and the human are interacting, such as the type of road, the weather conditions involved, etc.

Haddon proposed various steps to reduce injuries due to motor vehicle accidents. These steps focus primarily on altering the environment in which the physical energy transfer takes place, and the degree to which energy can be built up. For example, speed limits aid in reducing the degree of energy that can potentially be involved in a crash. Engineering designs and changes in the automobile can affect the time and space in which the energy transfers takes place. Overall, these steps transformed injury control efforts internationally. Hargarten et al. (1991) applied these same steps or principles to injury prevention strategies for overseas travellers. Hartgarten et al. proposed the avoidance of alcohol, the use of safe cars and seatbelts, the avoidance of night driving, and the importance of knowing the local emergency and medical systems as appropriate advice for overseas travellers.

The epidemiology of injuries can only be determined if good information management systems are in place. These include special surveys as well as the routine collection of injury data, their collation, analysis and distribution to the relevant stakeholders.

**Capture-recapture techniques**

Another important technique that can be used to assess the burden of injuries and their causes is a relatively new technique called capture-recapture (LaPorte, 1994).
Its application in injury epidemiology has grown exponentially. It has been used in assessment studies in the USA to capture information on dog bite-related fatalities, motor vehicle fatalities, teenage and childhood injuries, fatal occupational injuries, spinal cord injuries, and a whole range of other injuries. It is a quick and cost-effective way to get reliable information on injuries and their determinants (LaPorte et al., 1995).

According to LaPorte (1994) it works as follows: if you wanted to, say, ascertain the number of fish in the Sea of Galilee you would go and catch fish from that sea, tag them and release them. On subsequent days you would catch fish again and note the number of tagged fish in the catch. By using a simple formula one could estimate the total number of fish, with confidence intervals surrounding the estimate.

LaPorte (1994) argues that using capture-recapture techniques as a primary means of monitoring the human condition could bring substantial benefits, particularly in view of existing data sets being incomplete, flawed or inaccessible. LaPorte points out that human population scientists have avoided using such methods because they believe that the data yielded were 'shoddy' and yielded flawed conclusions. Yet LaPorte argues that estimates of birds, fish and mosquito populations show that the degree of undercounting can be estimated precisely and used to adjust for the degree of ascertainment. These estimates, based on capture-recapture techniques, are more accurate than those derived from available lists, either alone or aggregated. LaPorte suggests that we must break away from two basic tenets of human population scientists: that undercounting is bad and that we need to count everyone. We need to develop this expertise in South Africa.

Other sources of injury data

The management of injury data should not only rely on the objective assessment of clearly defined variables (usually measured quantitatively). Qualitative, socio-anthropological research methods based on the judgement of expert evaluators, system users, potential users or other stakeholders should also be used. These more qualitative approaches to data collection provide a deeper insight into the 'why' of injuries. Tolan (2001), examining youth violence and its prevention in the USA, applied a developmental-ecological perspective to assess risk and make recommendations on prevention.

Small communities present their own peculiar problems when even commonly occurring conditions including injuries are studied. Most techniques for ongoing surveillance are based on substantial populations. Data available for communities with fewer than 10 000 individuals are difficult to obtain and rates computed are not reliable. Yet these communities tend to be more responsive if data used to justify programmes are based on local observations. What is recommended is the use of participatory action research in such settings (Mittleman, Maldonado, Gerberich, Smith & Sorock, 1997).

In conclusion, the management of data resources from multiple perspectives using several methodologies are likely to produce valuable and often insightful results. The primary purpose of injury information analysis is to prevent injuries and improve the health of the public.
THE WAY FORWARD

Public health and injury prevention depends on the transfer of information, which telecommunications systems provide very cost-effectively. In South Africa the correct application of the new technology available can vastly improve the accumulation and dissemination of public health information.

Telecommunication networks began with electronic computer-to-computer correspondence among scientists. The internet represents a ‘meta-network’ – a network of networks. It provides a way of joining many diverse networks, including those of the government and, very recently, the vast network of industry. The scope and use of the internet have exploded over the last decade. This technology holds great potential as a tool for improved management of injury information.

Given the technology available, we could quite easily develop a national injury information management system if there was the necessary political will and budgetary commitment. We can start by networking all the appropriate players in public health, including local health departments, and academic, government, industrial and private agencies, with great and immediate benefits. We then need to create a national plan linked to an action plan for injury prevention that will release the necessary resources for the development of a national injury information system.

In the meantime, we need to build the capacity of existing data collection systems such as the NIMSS. We also need to improve the information on injuries collected at clinics, hospitals, and police stations. Additionally, we need to network the relevant databases so that information on injuries can be shared and disseminated among the relevant stakeholders. It is also critical that NHISSA, as it evolves, should be a more open system to allow for opportunities for linkages and expansion. Injury surveillance should be seen as part of its family of systems and data sets.

Information on occupational injuries should also be collected and stored in an easily accessible database. Community projects such as UNCISS and other injury surveys, however small, should make their information easily accessible through, for example, publications such as the Injury and Safety Monitor. National surveys such as the SADHS should be supported and expanded to include other determinants of injury, and should also be made easily accessible to health planners. International links could also be established. For example, networking of injury epidemiologists could allow for electronic courses on injury prevention to be provided across the world (LaPorte, 2002).

There has to be a consolidation of what has already been achieved by improving the quality and flow of data and by promoting appropriate information uptake. We have to initiate positive modifications by focusing on client orientation, the effectiveness and efficacy of information systems, promoting electronic information sharing, and by the incorporation of new technology such as Geographic Information Systems (GIS). We need to promote further systems expansion through all districts and hospitals, including private care, as well as other departments’ facilities (e.g. South African Police Service). This means that we have to integrate multiple management information systems (MISs) and align this integration with devolution plans. Furthermore, we need to support ongoing research and harness the assistance of academia and research agencies.
Injury prevention professionals together with other public health professionals, who appreciate the importance of appropriate health information systems, should start working together and bring pressure to bear on the relevant political structures. In this way we move towards the development of comprehensive information systems.

In conclusion, the management of data resources from multiple perspectives, using several methodologies, is likely to produce valuable end results, not forgetting that the primary purpose of the management of injury information is to improve the health of communities and the population at large, with a main focus on the prevention of injuries.

REFERENCES


**SELECTED GLOSSARY**

**Injury** refers to damage to the body that is manifested within 48 hours, or usually within considerably shorter periods. Injury can be defined as damage to a person caused by an acute transfer of energy (mechanical/kinetic, thermal, chemical, electrical, radiation) or by a sudden absence of heat (hypothermia) or oxygen (asphyxiation, drowning).

**Trauma** refers to both the physical and psychological damage that results from an injury. In this volume the primary concern is with physical trauma.

Deaths due to injury are classified as **non-natural deaths**. These include all deaths that were not due to, or may not have been due to, natural causes and that in terms of the Inquests Act are subject to medico-legal investigation.

**Intentional injuries** are injuries due to violence. According to the World Health Organisation three broad categories of violence can be identified: (a) interpersonal violence, which includes intimate violence, acquaintance violence and stranger violence; (b) self-inflicted violence, which includes suicidal violence and self-mutilation; and (c) organised violence, which includes legal intervention and warfare. In this volume we distinguish between two types of intentional non-natural deaths: homicide, which comprises fatal interpersonal and organised violence, and suicide, which refers to fatal self-inflicted violence. The homicide category excludes deaths due to culpable homicide (i.e. homicide that is not intentional).

**Unintentional injuries** include transport injuries from road traffic collisions, trains and aeroplanes, and burns, falls, poisoning, drowning, occupational injuries and other acute unintentional exposure to damaging energy. Consistent with the public health approach, the term unintentional injury is preferred to ‘accident’ in order not to give credence to the notion that injuries are due to fate, ‘acts of God’, or other unpredictable and uncontrollable events and, as such, not responsive to injury prevention initiatives. In this volume we distinguish between two types of unintentional non-natural deaths: **transport deaths**, which comprise fatal road traffic collision, train and aeroplane injuries, and **other unintentional injuries**, which comprise fatal unintentional injuries as a result of burns, falls, drowning, poisoning, electrocutions, lightning, exposure and other miscellaneous unintentional causes.

The term **undetermined deaths** refers to deaths where the medical examiner is unable to determine the intent of the death, i.e. whether the death was due to homicide, suicide or unintentional injuries. We recognise that in many data sources the undetermined deaths category will include a very small number of cases where the medical examiner is unable to determine whether the cause of death was due to natural or non-natural death (e.g. after examination of skeletal remains), but this has been ignored for the sake of simplicity.

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1The editors wish to acknowledge Richard Matzopoulos and colleagues of the MRC-UNISA Crime, Violence and Injury Lead Programme for compiling this section.
The **external cause** of death refers to the specific circumstance or event that preceded the death. Examples of the external cause of death include firearms, stabbing, motor vehicle collisions, drowning, fires and poisoning, all of which may result in injury and eventually death.

In general, the term **sex** is used to describe distinctive physiological features related to being male or female. The term **gender** comprises different occupational, social and psychological attributes that are variously attributed to being male or female. The latter concept depends on societal norms, is not internationally comparative, and cannot be reliably defined for fatal cases.

**Surveillance** is a process that involves the ongoing and systematic collection, analysis and interpretation of data relating to the occurrence of a health event (in this case an injury or injury-related death) and the timely dissemination of this information to those who need to know and those who need to apply it.

**Burden of disease** is a comprehensive measure of ill-health that includes fatal and non-fatal outcomes. The burden of disease approach attempts to derive consistent and coherent estimates of all causes of ill-health and death. The disability-adjusted life year (DALY) is a summary measure of burden of disease that uses time to equate death and disability. It comprises the years of life lost due to premature death (YLLs) and the years of life lived with a disability (YLDs), weighted according to the severity of the disability.

Many chapters use the term **population group** and associated terms such as ‘African’, ‘Asian’, ‘Coloured’ and ‘White’. We recognise that ‘population group’ is a social construction that serves particular political purposes. The use of these terms does not imply any acceptance of the racist assumptions on which these labels are based. We do not suggest that genetically distinct ‘population groups’ exist with inherent biological differences. Instead, the terms are used to reflect the differential manner in which apartheid impacted (and still does) on the lives and health of South Africans. The ‘population groups’ are gross proxy measures of social groupings in South Africa and give no indication of intra-group diversity. The use of ‘African’, ‘Asian’, ‘Coloured’ and ‘White’ dissolved the sharp stratification within these groups, but the labels still serve as the primary research and scientific indicators of social grouping.