

Estimating the South African trauma caseload as a basis for injury surveillance

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ABSTRACT

Objectives: Trauma caseload data will provide empirical guidelines for the selection of sentinel sites for a sustainable non-fatal injury surveillance system in South Africa, which will be an important mechanism for the targeting and evaluation of public health intervention programs.

Methods: Headcount questionnaires completed by Medical Superintendents at 356 state hospitals were analysed to determine the extent and distribution of the South African trauma caseload. The total caseload was estimated by extrapolating data for non-responding facilities by the mean facility headcount in each province. Injury rates were calculated using population estimates supplied by the Central Statistical Services of South Africa.

Results: Approximately 1 million annual trauma cases were reported by the hospitals that responded to our questionnaire (68%) and almost 90% of these facilities treated trauma cases. Extrapolating data for non-responding facilities, an estimated 1.5 million trauma cases present at secondary and tertiary level state facilities annually. Injury rates for traffic, violence or other injuries showed considerable inter-provincial variation. Violence accounted for more than half of the annual trauma caseload. Most of the data (82%) were available from hospital trauma records, while 18% of hospitals collected statistics specifically for the purposes of this study.

Conclusions: Based on the caseload study, 41 sentinel facilities have been selected to provide a representative sample of non-fatal injury in South Africa. The injury surveillance system will provide accurate, reliable and timely data for the evaluation of a range of public health interventions and preventive programs.

Keywords: injury, trauma, non-fatal, surveillance, caseload, headcount

INTRODUCTION

Injuries due to violence and accidents have been acknowledged as one of the leading causes of mortality in developing countries.¹⁻³ The Global Burden of Disease study⁴ projects that of all regions in the world, sub-Saharan Africa will show the largest increase in injury-related burden of disease (due to wars, interpersonal violence and transport-related incidents) from 1990 to 2020, unless effective prevention measures are established.

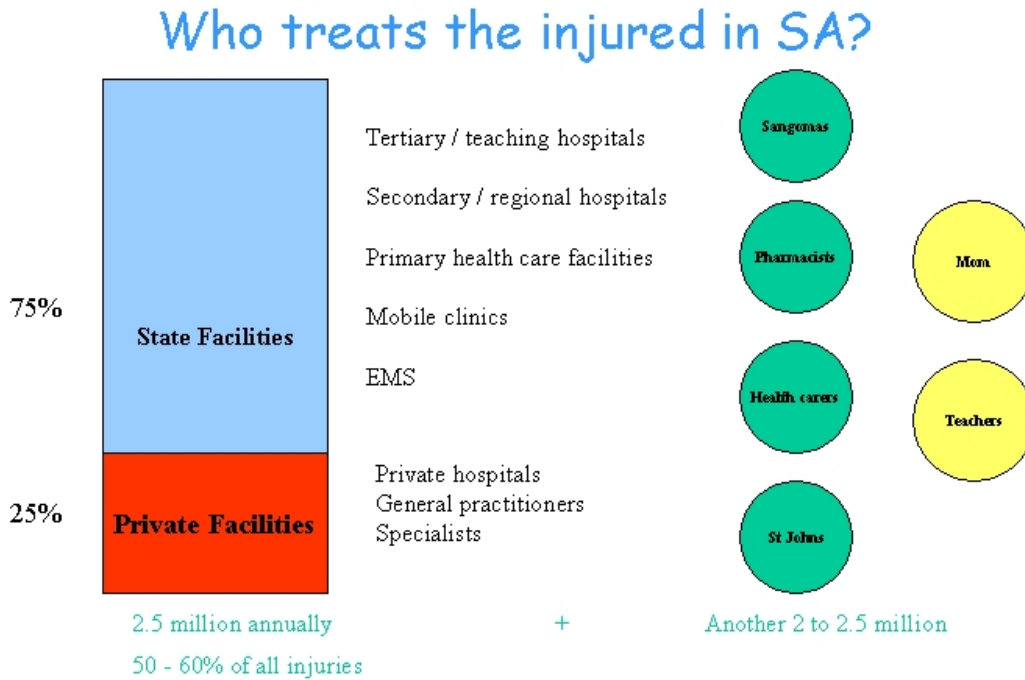
In South Africa, homicide, suicide and transportation accidents contribute substantially to the burden of disease, especially among the poor and disadvantaged.⁵ While road traffic and self-inflicted injuries are the leading causes of injury-related deaths world-wide, violence is a major factor in South African trauma.^{6,7} Although good quality mortality data are regarded as fundamental to the making of health resource allocation decisions,^{8,9} the higher incidence of non-fatal injuries implies that surveillance of morbidity data is more suitable for the design and evaluation of injury prevention interventions.^{10,2} Alcohol and speed are believed to be the cause of the majority of motor vehicle accidents,¹¹ while the increasing ownership of firearms directly parallels the homicide rates from these weapons.¹² Without accurate, reliable and timely information on injury events and risk-factors, the design and evaluation of interventions and prevention programs is seriously compromised.

Background & Rationale

The Violence and Injury Surveillance Consortium, comprising the South African Medical Research Council (MRC), the University of South Africa and the Council for Scientific and Industrial Research, is currently developing a fatal and non-fatal injury surveillance system to provide national estimates for the incidence and types of injury, risk factors and demographic profiles of injured South Africans.¹³ The project is informed by the public health approach to violence and injury prevention, and consists of three components. First, the National Non-Natural Mortality Surveillance System, which aims to monitor all of the estimated 60,000 fatal injuries occurring each year.¹⁴ Second, a substance abuse and injury monitoring system which tracks patterns of alcohol and drug use among a small sample of newly injured victims at selected sites.¹⁵ Third, a non-fatal injury surveillance system that will monitor a sentinel sample of newly injured victims.

Central to the development of the non-fatal injury surveillance system is knowing the medical and surgical help-seeking patterns of newly injured victims so as to ensure that surveillance activities are optimally focused.^{16,1} Previous epidemiological studies of injuries at all severity levels in urban areas¹⁷ and rural settings¹⁸ indicated that more than half of all injuries present at treatment sites other than state hospitals, including clinics, traditional healers, and private hospitals and practitioners. However, approximately 70% of moderate to severe injuries among the poorer sectors of the population, which are at the highest risk, presented at state health facilities. Based on these studies, Figure 1 shows the estimated distribution of new injury cases across the full treatment spectrum.

Figure 1



In this paper, we describe the results of a rapid assessment conducted to ascertain trauma caseloads at secondary and tertiary level state facilities in each province of South Africa. The aim of the assessment was to provide empirical guidelines for the selection of sentinel surveillance sites representative of all non-fatal injuries presenting at state health facilities.

METHODS

Identifying Health Facilities

The different levels of health care in South Africa reflect the type of care offered by a facility. Primary facilities include mobile clinics and visiting points, more than 3,000 clinics providing basic health services for eight hours per day as well as Community Health Centres (CHC) with up to 30 beds, which provide 24-hour accident and emergency services and where patients can be observed for a maximum of 48 hours. Secondary level facilities are defined as large state hospitals, which act as regional referral facilities. Tertiary level facilities differ from secondary level facilities only in that they perform a research function, and are usually attached to university medical departments. We compiled a database which included telephone and fax numbers of all state secondary and tertiary level health facilities. Information about the health facilities was gathered from several data sources including the Health System database of the MRC’s Geographical Information Systems (GIS) unit, the Human Sciences Research Council’s Regional Health Management Information System database¹⁹ and the 1998 Hospital and Nursing Yearbook.²⁰

Questionnaire

To ascertain the trauma caseload and major external causes per facility, a brief questionnaire aimed at

medical superintendents was developed. The questionnaire asked the following four questions: “Do you have a casualty department or trauma unit at your facility which treats patients with injuries?”, “Approximately how many fresh trauma/injury cases are seen in your casualty department/trauma unit annually?”, “Do you keep routine statistics on trauma/injury cases treated at your facility?”; and “What proportion are due to traffic, violence and other accidents?”

Postal Survey

A total of 356 secondary and tertiary level health facilities were identified. Questionnaires were posted to them on the 25th May 1999 with an attached letter outlining the objectives of the study. Medical Superintendents were asked to return completed questionnaires by fax or post at their earliest convenience. Further correspondence included a reminder letter posted on 5 July 1999 and a follow-up phone call on 30 July 1999. Unreliable post and telecommunication services were cited as the reason for non-response from many rural facilities, and, where possible, information was obtained from personal communication with Medical Superintendents by telephone. From our telephone follow-up, we were able to establish which of the non-responding facilities did not treat trauma.

Data Analysis

Data from the returned questionnaires were captured in Quattro Pro²¹ and cleaned and analysed with EPI-INFO version 6.04²² epidemiological database software. No questionnaires returned after the cut-off date of 31 August 1999 were included in the analysis. Caseload data for non-responding facilities were extrapolated by weighting the responding facilities within each province for the sampling realisation. A weighted analysis was used with a finite population-correcting factor to estimate the total population within provinces and nationally together with 95% confidence intervals. The distribution of injuries due to traffic, violence and other causes was assumed to be the same as the cumulative provincial proportions from responding facilities. Injury rates were calculated from these estimates using the population figures from the 1996 National Census conducted by the Statistics South Africa (SSA), and a 95% confidence interval was calculated for the total injury rate in each province.

RESULTS

Questionnaires were completed for 242 of all 356 facilities (including 28 hospitals that did not treat trauma), representing an overall response rate of 68%. From returned questionnaires and telephone calls to non-responding facilities, we established that 318 of the facilities treated trauma (89%). The proportion of facilities that treated trauma was high in the following provinces: Eastern Cape (92% of the facilities), Free State (90%), Mpumalanga (96%), Northern Cape (95%), Northern Province (96%), and the North-West Province (100%). A lower percentage of hospitals treated trauma in Gauteng (only 80%), KwaZulu-Natal (80%) and the Western Cape (72%), due to a larger number of specialist tuberculosis, psychiatric and maternity hospitals in these provinces.

Of the 318 facilities that treated trauma, 67% responded to the questionnaire. The provincial response rates were as follows: 56% of the trauma treating facilities from the Eastern Cape, 79% from the Free State, 67% Gauteng, 70% KwaZulu-Natal, 79% Mpumalanga, 89% Northern Cape, 49% Northern Province, 45% North-West Province and 100% from the Western Cape. Headcount data were available from 209 (98%) of the trauma treating facilities that responded to the questionnaire, while 168 (79%) of these facilities specified the proportion of injuries that were due to violence, traffic and other injuries. Most of the data (82%) were available from hospital trauma records, while 18% of the hospitals collected statistics specifically for the purposes of this study. Injury categories (traffic, violence or other accident) were available for 83% of the responding facilities.

Table 1 shows the number of facilities supplying caseload information in each province, the number of reported cases, the number of facilities not reporting caseloads, and the estimated national trauma caseload at

all secondary and tertiary level state facilities. The annual total caseload for facilities that responded was over one million, and the estimated national annual total for all state facilities was just over 1.5 million.

Table 1. Annual trauma caseloads by province

	No. of facilities supplying caseloads (1)	No. of reported cases (2)	Mean no. of cases per facility (Std Error) (3)	No. of facilities not supplying caseloads (4)	Total no of trauma cases (2)+ (4) x 3
Eastern Cape	33	150,705	4,567 (1,321)	26	268,255 (110,222-426,288)
Free State	21	79,626	3,619 (1,181)	7	105,903 (34,052-177,754)
Gauteng	18	198,406	11,023 (2,386)	9	297,609 (161,662-433,556)
KwaZulu-Natal	38	200,144	5,267 (1,106)	18	294,212 (169,080-419,343)
Mpumalanga	18	41,759	2,320 (0,376)	6	55,539 (36,573-74,506)
Northern Cape	15	50,414	3,361 (0,996)	3	60,497 (22,051-98,943)
Northern Province	22	52,112	2,369 (1,058)	22	104,244 (7,402-201,086)
North West	14	36,954	2,640 (1,091)	17	81,668 (8,754-154,582)
Province					
Western Cape	30	236,032	7,868 (1,065)	1	243,113 (175,821-310,405)
All provinces		1,046,152	4,742 (0,284)		1,511,040 (1,335,011- 1,687,068)

The mean number of cases per facility varied considerably. It was highest in Gauteng, where responding hospitals reported an average of 11,023 cases per year, or 30 per day. The Western Cape also had a high number of cases per facility (7,868 cases per year or 22 per day) while the lowest mean caseloads were around 2,500 per annum (seven per day) in Mpumalanga, the Northern Province and the North West Province. Of the facilities that provided trauma caseloads, 168 (80%) also described the distribution of cases among violence, traffic and other external causes. More than half of the injuries were attributed to violence, although this showed considerable inter-provincial variation, accounting for 64% of trauma cases in the Northern Cape and only 33% in the Northern Province.

calculated provincial rates per 1,000 population for injuries due to all causes, and for those due to violence, traffic and other causes (Table 2). The injury rate for all causes and all provinces was 40 per 1,000. The Northern Cape had the highest overall injury rate (74), followed by the Western Cape (58.84), and these provinces also had higher rates of violence-related injuries. The lowest rates for all injuries were recorded in the Northern Province (17) and the North West Province (19), although the Northern Province had a higher rate of traffic-related injuries than other provinces.

Table 2. Distribution of annual trauma rates per 1,000 population, South Africa, 1999.

	Population	Estimated Violence Injury Rate	Estimated Traffic Injury Rate	Estimated Other Injury Rate	Total Injury Rate
Eastern Cape	5,865,000	27	9	9	45.7 (18.8-72.7)
Free State	2,470,000	27	7	9	42.9 (13.8-71.9)
Gauteng	7,171,000	17	9	16	41.5 (22.5-60.4)
KwaZulu-Natal	7,672,000	16	10	12	38.3 (22.0-54.6)
Mpumalanga	2,646,000	10	5	5	21.0 (13.8-28.1)
Northern Cape	746,000	52	8	21	81.1 (29.6-132.7)
Northern Province	4,128,000	8	13	4	25.3 (1.8-48.7)
North West Province	3,043,000	18	4	4	26.8 (2.9-50.8)
Western Cape	4,118,000	31	9	19	59.0 (42.7-75.4)
All provinces	37,859,000	20	8	11	40.0 (35.2-44.6)

Our estimated trauma caseload does not represent all non-fatal injuries that occur in South Africa. As an adjunct to the hospital-based caseload study, we conducted a retrospective review of trauma cases presenting at seven Community Health Centre (CHC) facilities in the Cape Town Metropolitan area. The estimated 56,500 injury cases treated annually at the CHCs represent another 75% of cases over and above those recorded in the caseload database for secondary and tertiary hospitals in the Cape Town Metropolitan area. The most recent figures available from the Department of Health indicate that there are 141 CHCs nationally. If these facilities

saw an average annual caseload as large as those sampled in Cape Town - not an unreasonable assumption considering that these are the closest health facilities for millions of rural South Africans - the national annual trauma caseload at all state facility levels would be closer to 2.5 million, or a rate of 66 per 1,000 population.

DISCUSSION

The study has provided empirical guidelines for the selection of sentinel surveillance sites representative of all non-fatal injuries presenting at state health facilities for inclusion in the South African Non-fatal Injury Surveillance System. The sample population will comprise first time attendees at selected secondary and tertiary level state facilities and will exclude referrals. The data set will be complemented by injury data from sentinel CHCs and, where possible, private hospitals and general practices. A data collection form has been developed with the guidance of local and international experts incorporating elements of the International Classification of External Causes of Injury (although these have been modified somewhat for the South African situation) in order to obtain internationally comparable data. The data collection form has been developed to include doctor's notes, forensic drawings, and case management information in order to avoid the transcription of duplicate information by the clinician. The completed form therefore provides a comprehensive summary of the patient's injuries, management and outcome. Two sites were chosen for the piloting of the National Non-fatal Injury Surveillance System data capture form, viz. King Edward VIII hospital (KEH) in Durban and GF Jooste hospital in Cape Town. Implementation at 41 sentinel hospitals is expected to commence by the beginning of 2001.

In developed countries, non-fatal injury surveillance systems can be divided into two main categories. The first type collects detailed information on a specific subset of injuries such as traumatic spinal cord injuries²³ or firearm-related injuries.²⁴⁻²⁶ Other systems collect fewer data items and follow an 'all-injuries' approach. The current South African system will follow the latter approach and assimilate the evolving data collection practices in both developed and developing countries. The Australian National Injury Surveillance and Prevention Project (NISPP)²⁷ focussed on child injury surveillance in about 45 hospital emergency departments in 12 regions before it matured into the Injury Surveillance Information System (ISIS), an 'all-ages, all-injuries' surveillance system. ISIS is supplied by routine hospital case data systems in all states and territories and aims to increase the potential for primary and secondary prevention of injury. ISIS was based on various international systems including the British Home Accident Surveillance System²⁸ and the National Electronic Injury Surveillance system of the US Product Safety Commission.²⁹ The Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) initiated in 1990 followed the NISPP/ISIS model, initially collecting data from 10 paediatric hospitals before the inclusion of six general hospitals between 1991 and 1994 provided some information on adult injuries.³⁰ In South Africa, the implementation of the Child Injury Database at the Red Cross Children's Hospital, South Africa's only paediatric hospital, in 1989 has highlighted some of the key variables for a successful system including the importance of a well-structured and easy-to-complete questionnaire, data collection, data management and procedural issues.

In our study of secondary and tertiary level health facilities in South Africa, we estimated that the annual trauma caseload was approximately 1.5 million. While violence was the leading cause of injury in eight of the nine provinces and accounted for more than half of the annual caseload nationally, the proportion of injuries due to violence, traffic and other external causes showed considerable inter-provincial variation, which was even more pronounced when the distribution of injuries in each province were converted to population-based rates. The inter-provincial disparities have been considered in selecting 41 facilities for the Non-fatal Injury Surveillance System for implementation in October 2000, which, grouped by province should follow provincial injury profiles.

Comparative international studies have also shown differences in injury profiles.³¹ We searched the internet, the MEDLINE electronic database and unpublished data, grey literature and minutes from round table discussions archived at the Medical Research Council's National Trauma Research Programme for articles on non-fatal injury surveillance. Our review revealed a paucity of internationally comparable non-fatal injury data and highlighted difficulties in comparing data, which we can best illustrate with an example. In Thailand in 1983 nearly two million injured people were treated in hospitals, representing a rate of 40.4 per 1,000 population.³² In the same year, New Zealand had 58,457 hospital admissions due to injury in 1983 representing a rate of approximately 17.8 per 1,000 population. The rates are not comparable, as the Thailand rate is for hospital presentations, while the New Zealand figure represented hospital admissions. If hospital admissions comprised 20% of all injuries requiring medical attention, the New Zealand total would be approximately 300,000 cases,³³ a rate of 89 per 1,000 population. Using the same extrapolation for the United States, the 2.8 million annual hospital admissions², would represent a rate of 56 injuries per 1,000 population.

The South African rate of 40 per 1,000 population for injuries presenting at secondary and tertiary facilities and 66 per 1,000 when the further one million cases seen at CHCs are included seems comparable. However, the finding is questionable in the light of South Africa's extremely high fatal injury rates for violence and transport, which are believed to be among the world's highest⁶ and certainly much higher than in New Zealand. The phenomenon could be ascribed to different thresholds of presentation in poorer countries, as a result of reduced access to care and different health seeking behaviour among the injured. On a macro level, poverty limits the number of facilities, beds and the level of care available to the injured, while supporting an environment where injuries are likely to occur. Health care consumers afflicted by a variety of ailments compete for a limited number of beds and only the more severely injured patients seek medical attention. Furthermore, in societies where injury is endemic, the perceived injury severity is lower and patients with minor injuries are less likely to seek medical attention³⁴. Definite policies concerning injury surveillance and control are non-existent in most developing countries, particularly in Africa and injury prevention studies are scarce.³⁵ However, a violence and injury surveillance system has recently been established in Uganda and includes hospital based trauma registries, community surveys and a specific violence surveillance program.¹⁰

National departments, service planners, NGOs and the media (print and radio) are increasingly calling for a comprehensive approach to address the epidemic of injury and violence in South Africa. The Departments of Health, Safety and Security and Arts, Culture, Science and Technology, have shown considerable interest and support for the injury surveillance system, which will provide an accurate, reliable and timely mechanism for the evaluation of a range of public health interventions and preventive programs.

In South Africa, the recently established Presidential Initiative on Crime Prevention draws on the public health approach in designing strategies for the primary prevention and control of violence-related injuries. This is an inter-science council initiative in which information from the injury surveillance system described here is expected to provide formative and outcome evaluation data for multi-sectoral interventions targeting rape, gun violence, and violence prevention through infra-structural development in a number of pilot sites. The surveillance data have also been earmarked for studies evaluating the completeness and accuracy of police statistics, as well as scientific investigations into the economic and social costs of injuries and the potential savings of appropriate prevention programs.

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