

Introduction: The National Injury Mortality Surveillance System

Compiled by Richard Matzopoulos, Brett Bowman, Mohamed Seedat, Anesh Sukhai

1.1 BACKGROUND TO VIOLENCE AND INJURY SURVEILLANCE IN SOUTH AFRICA

In South Africa injury is one of the major causes of death. Information about deaths due to external causes is of critical importance for monitoring demographic, seasonal and socio-economically related trends in the major causes of death and disability. Since 1991 such information on causes of death has been missing from the national vital statistics. Police data systems only record information for murders, and the national transport information system records information for an incomplete subgroup of motor vehicle collision deaths. Deaths due to suicide, other unintentional causes (e.g. fires, falls, poisonings), and where the manner of death is undetermined are not reported by any agencies.

Recognising the need for regular and timely injury mortality information, the National Injury Mortality Surveillance System (NIMSS), managed and maintained by the Crime, Violence and Injury Lead Programme (CVI), co-directed by the Medical Research Council and the UNISA Institute for Social and Health Sciences, aims to:

- Provide ongoing and systematic information about the incidence, causes and consequences of all non-natural deaths at local, regional and national levels;
- Enable the early identification of new injury trends and emerging problem areas so that adequate interventions can be timeously established;
- Determine priorities for injury and violence prevention action, both for high-risk groups and socio-environmental risk factors;
- Help evaluate direct and indirect violence and injury prevention and control measures; and
- Monitor seasonal and longitudinal changes in the non-natural death profile.

The NIMSS information is collated from existing investigative procedures at mortuaries, State forensic chemistry laboratories and the courts. All deaths

due to external causes are included, allowing an overview of how the different categories of external cause (e.g. gunshots, burns) contribute to the profile of non-natural mortality in men, women, and children.

At the time that this report was compiled, there were no alternative sources for the information about fatal injuries collated from mortuaries. It is therefore essential that the system establishes links with birth and death registration vital statistics so that the information vacuum around non-natural deaths in the vital statistics is filled. It is also important to link the system with the police database, so that the possible extent of under-reported deaths due to interpersonal violence and motor vehicle collisions can be established. Similar reasoning underlies the need to link the NIMSS with the national database on road collisions and injuries. The ultimate goal of the NIMSS is to establish a permanent system that will register all such deaths that occur annually in South Africa.

1.2 THE NIMSS ANNUAL REPORT

The NIMSS Annual Report summarises the data from all mortuaries that participated during the reporting year. We assume that the report will provide useful information for presentations and research projects aimed at violence and injury prevention and control, but we also hope that the report will stimulate further research about the underlying causes and risk factors that drive the patterns of fatal violence and injury. This will inform policy and practice decisions, especially in cities where the NIMSS has full coverage, and if these data can stimulate research to answer the questions that emerge, then the possibilities for prevention of violence and injury will be greater than ever before.

This report is intended for injury prevention practitioners and policy makers to assist them in developing strategies informed by empirical data. For a more detailed scientific exposition of the methods, readers should refer to: Butchart A, Peden M, Matzopoulos R, Phillips R, Burrows S, Bhag-

Box 1. History of the NIMSS

In the late 1980s a number of public health-oriented research groups started epidemiological investigations into the causes and consequences of violence and injuries as a basis for improved injury prevention and control. Since then the scale of the injury problem and the importance of the scientific evidence for violence and injury prevention has increasingly been recognised by State and non-governmental stakeholders in making South Africa safer.

A November 1997 Essential National Health Research meeting prioritised violence and injury surveillance for improved violence prevention and control. Action to improve methods for the monitoring and prevention of injuries in South Africa began in 1998 when the South African Department of Arts, Science, Culture and Technology (DACST) approved funding over the 1998-2000 period for a science council and university consortium to develop a national violence and injury surveillance system. A consortium of researchers housed in the Medical Research Council (MRC), University of South Africa's Institute for Social and Health Sciences & Centre for Peace Action, and the Council for Scientific and Industrial Research was commissioned to develop an injury surveillance system, broadly termed the South African Violence and Injury Surveillance System, which had three components:

- a national injury mortality surveillance system;
- a national non-fatal injury surveillance system; and
- a trauma and drug surveillance system through periodic cross-sectional surveys of drug and alcohol use in newly injured victims.

The NIMSS is the only one of these three components that is still being maintained, through funding from the MRC and the Department of Health, which covered the cost of printing the data collection forms. For 1999 a total of 14 897 fatal injuries were registered in the NIMSS. This figure differs slightly from that which appears in the 1999 NIMSS Annual Report because outstanding cases from some mortuaries have since been added to the 1999 database.

wandin N, Saayman G, Cooper A, and participating Forensic Pathologists. The South African national non-natural mortality surveillance system — rationale, pilot results and evaluation. *South African Medical Journal* 2001; 91:408-417.

Perhaps most importantly, the annual report provides an overview of the data only, and does not fully reflect the rich amount of information in the surveillance database. This additional information includes, in particular, suburb-level indicators of where injuries occurred and, of course, many cross-tabular analyses that could not be accommodated in this summary report. The utility of the information collected by the NIMSS lies in the pointers it provides for improving the prevention and control of injuries in South Africa, and in evaluating the impact

For 2000 the caseload increased to 18 876. Fifteen mortuaries in five provinces collected data for the period 1 January to 31 December 2000. Therefore, the data collected by NIMSS in 2000 accounted for between 24% and 29% of all non-natural mortality. The deaths were mainly recorded from urban mortuaries, and city-wide coverage was limited to Port Elizabeth, Cape Town and Pretoria/Tshwane.

In 2001 the NIMSS extended its coverage with the inclusion of surveillance sites in Mpumalanga (including rural mortuaries), East London and Durban. For 2001 the caseload increased to 25 361. Thirty-two mortuaries in six provinces collected data for the period 1 January to 31 December 2001, including 14 Mpumalanga mortuaries, mainly in rural areas. The NIMSS coverage included five cities, namely Port Elizabeth, East London, Cape Town, Pretoria/Tshwane and Durban.

In 2002 another rural mortuary in Mpumalanga and the Stellenbosch mortuary in the Western Cape were added to the NIMSS database. A total of 32 890 cases presented to the 34 participating mortuaries, including 6733 (20.5%) deaths due to natural causes, and another 663 (2.0%) that were either viewed or stored at the mortuaries. A total of 25 494 of these deaths were due to non-natural causes.

In 2003 an Mpumalanga mortuary was lost from the system, but three additional rural mortuaries from North West Province commenced participation in August 2003. A total of 31 921 cases presented to the 36 participating mortuaries, including 2352 (7.4%) deaths due to natural causes, and another 1509 (4.7%) that were either stored or viewed at the mortuaries. The sources of the 24 600 non-natural deaths are included in Appendix II. Full city coverage was maintained in 2002 and 2003 in Port Elizabeth, East London, Cape Town, Pretoria/Tshwane and Durban.

of direct (e.g. gun law enforcement) and indirect (e.g. socio-economic development) interventions that are expected to reduce some of the major causes of fatal injury. Prevention agencies can contact the Crime Violence and Injury Lead Programme for customised reports and data analysis.

These NIMSS reports provide a baseline profile for future monitoring and an information platform to reinforce the ongoing extension and improvement of the system. In achieving its goals the NIMSS is intended to meet the information requirements of three main stakeholder groups, namely the forensic medicolegal services; the national crime prevention strategy; and violence and injury prevention agencies at local, provincial and national level.

- For forensic medicolegal services the NIMSS provides important information for the allocation of resources, auditing of costs and rationalisation of services. The current absence of information prevents proper assessment of costs, inhibits evaluation and impedes proper planning.
- For the national crime prevention initiatives the NIMSS provides crucial baseline data for all deaths due to violence and other injuries, including information on the covariance between violence and unintentional injury deaths, demographic and geographic variations in the magnitude and patterning of violent deaths, and information on particularly sensitive indicators such as the use of firearms and alcohol.
- Injury prevention agencies include national and local government, the South African Police Services, non-governmental organisations, business and parastatals. The NIMSS can provide descriptive information needed for the design and implementation of preventive interventions at municipal, metropolitan, provincial and national levels.

Although the system captures data from rural mortuaries in Mpumalanga and North West provinces, the NIMSS is still more representative of the urban rather than the rural injury mortality profile. In order to enhance the utility of the NIMSS data in driving prevention initiatives at city level the current report includes, for the first time, an analysis of fatal injuries for South Africa's four largest cities, namely Cape Town, Durban, Johannesburg and Pretoria/Tshwane. Recent NIMSS reports can be accessed at www.sahealthinfo.org.za/violence/nimss.htm

1.3 METHODOLOGY

The NIMSS uses existing medico-forensic investigative procedures. It collates onto a single data form and into a single computer database items spread between four points in the investigative procedure, namely postmortem reports, SAP 180 forms, chemical pathology laboratory results, and criminal justice system reports. The NIMSS data collection form is included in Appendix I.

The NIMSS records 21 items of information for every deceased that enters the forensic medicolegal system in the participating facilities. To meet the system's goals and enable international comparisons, the NIMSS classifies the primary medical cause of death using the International Classification of Diseases version 9 (ICD 9) and assigns a probable manner of death code to each case,

because the final manner of death is only available after court findings, which are often only available up to 4 years after the death. Spatial and temporal data are recorded, as is the presence of alcohol in the deceased through information from forensic laboratory reports.

The data are collected by the police and forensic pathologists at each site, and captured into a computerised database by clerks and secretarial staff at the mortuaries. The data are then sent to the Crime, Violence and Injury Lead Programme offices in Cape Town, where they are combined with other mortuaries' data and data from the forensic chemistry laboratories, cleaned, and analysed. Mortuary-specific annual caseload reports are produced for the South African Police and forensic pathologists at each facility.

Not all cases had information recorded for every item, and therefore totals in charts and tables may vary. Owing to the relatively few cases where date and time of injury were available, date and time of death have been reported instead. While death would have occurred at the time of injury for a majority of cases, some victims will have died hours or days after the injury itself, and this bias must be kept in mind when reading the relevant tables and charts¹.

Age standardised mortality rates for the four cities with full coverage have been calculated using 2001 Census population estimates obtained from Statistics South Africa.² As city-specific growth rates were unavailable, the population estimates were adjusted by the provincial population growth, which was calculated using the 2001 and 2003 projected figures from the ASSA2002 AIDS and Demographic Model of the Actuarial Society of South Africa (ASSA)³ (see Appendix III). The WHO World Standard Population Distribution was used for age standardisation.⁴

1.4 THE FUTURE OF THE NIMSS

It is clear that the current injury mortality surveillance system needs to be extended to provide greater coverage and therefore greater quality of data if accurate information-based policy formulation, service delivery, prevention strategies and funding allocation are to be actuated. The proposed automation of the NIMSS appears to provide a viable conduit to this extension as well as capacity and data-richness, including:

- A fatal injury surveillance system providing

1. Analysis of time of injury versus time of death for specific subcategories of injury can be prepared on request.

2. Parry K. City-level population estimates by age, 2001 (customised report). Statistics South Africa, 2004.

3. www.assa.org.za

4. Ahmad OB, Boschi-Pinto C, Lopez AD, Murray CJL, Lozano R, Inoue M. Age Standardization of Rates: A new WHO standard. GPE Discussion Paper Series No 31. Geneva: EIP/GPE/EBD WHO.

- reliable, regular and quality information on all causes of non-natural death and injuries as well as patterns of alcohol use;
- Comprehensive GIS mapping of injury mortality;
- Regular reports on the macro-economic determinants of the causes and consequences of injury and mortality;
- Regular reports on the gender differentials in causes and consequences of injury mortality;
- Demographic, income and expenditure impacts of fatal and non-fatal injuries;
- Regular reports profiling fatal and non-fatal injury trends among children and adolescents;

- Empirically informed policies, services and funding allocations;
- Systematic, comprehensive and standardised contributions to the WHO database on the South African burden of disease; and
- Empirically based evaluation of prevention initiatives.

Although the above outcomes and impacts may be actuated nationally with the extension of the NIMSS to all State mortuaries, the current focus will be the consolidation of city-level reporting until funding and resources are made available for further expansion.

Box 2. Importance of injury mortality surveillance

Injury surveillance systems are generally designed, implemented, organised and managed by research or academic institutions in collaboration with governmental and non-governmental organisations. In high-income countries (HICs) such as the USA, Australia and Canada, governmental organisations play a leading role in the organisation and management of these systems. This is also the case in some low-to-middle income countries (LMICs), although initial support is often received from external agencies. For example, WHO is working with the Ministries of Health in several African countries to strengthen the surveillance capacity of the national health systems.

In the USA the responsibility for publication of the *Morbidity and Mortality Weekly Report* (MMWR) was transferred to the Centers for Disease Control (CDC) from the National Office of Vital Statistics in 1962. CDC continues to collect weekly mortality data reported voluntarily by a number of selected cities in the USA. Today, the 121 Cities Mortality Reporting System continues to serve as the timeliest source of mortality data in the USA. Despite changes in the methods for reporting and the cities participating, the system has consistently captured one-third of the nation's deaths.

In Canada the Network for Health Surveillance is a partnership involving people interested in health surveillance from all levels of government, non-governmental organisations and universities. The Network defines health surveillance as the tracking and forecasting of any health event or health determinant through the collection of data and its integration, analysis and interpretation into surveillance products, and the dissemination of those surveillance products to those who need to know. In the pursuit of more effective health surveillance practices the Network is building the standards and system tools needed so that public health decision-makers in Canada can access the information via the Internet to better meet the needs of public health.

In Australia the National Injury Surveillance Unit (NISU) is the collaborating unit of the Australian Institute of Health and Welfare (AIHW) in the area of injury. NISU is a separate, identifiable activity of the Research Centre for Injury Studies at Flinders University, and the AIHW provides the core funds which allow NISU to operate. The Commonwealth Department of Health and Ageing provides additional funds, enabling NISU to undertake projects for that agency.

Whereas many HICs have sophisticated injury surveillance systems in place, this is not the case in most LMICs. In Jamaica the Ministry of Health's Division of Health Promotion and Protection in collaboration with the CDC and other research and academic institutions established the Violence-related Injury Surveillance system (VRISS). In 1996 injuries were the second leading cause of hospitalisation in Jamaica. The VRISS was first designed and implemented at Kingston Public Hospital to develop strategies to reduce the impact of violence-related injuries on Jamaican health care resources. Upon successful implementation, the system was expanded by the Ministry of Health. The expanded system provides data to support needed policy changes to minimise the impact of injuries on the health services and on the health of the population⁵.

To address the dearth of fatal and non-fatal injury data emanating from Africa, the World Health Organisation with its research partners has supported injury surveillance activities in several African countries, including Mozambique and Ethiopia⁶. At the same time, doctors and injury prevention practitioners in Uganda have pioneered a reliable trauma registry system that includes information geared towards prevention as well as recording clinical conditions⁷.

5. Ward E, Durant T, Thompson M, Gordon G, Mitchell W, Ashley D. Implementing a hospital-based Violence-Related Injury Surveillance System a background to the Jamaican experience. *Injury Control and Safety Promotion* 2002, 9(4): 241-247. Retrieved December 3, 2003, from <http://www.szp.swets.nl/szpjournals/ic094241.htm>

6. Bartolomeos K, Peden M. WHO supported injury surveillance activities in Africa: Mozambique and Ethiopia. *African Safety Promotion: A Journal of Injury and Violence Prevention*, 2003; 1(2): 34-37.

7. Kobusingye OC, Lett RR. Hospital-based trauma registries in Uganda. *J of Trauma: Injury, Infection, and Critical Care* 2000; 48(3): 498-502.