

ORIGINAL ARTICLE

Modified Delphi study to determine optimal data elements for inclusion in a pilot violence and injury observatory in Cape Town, South Africa

Ardil Jabar^{a,*}, Shane Bjorkman^b, Richard Matzopoulos^a^a School of Public Health and Family Medicine, Faculty of Health Sciences, University of Cape Town, Anzio Road, Observatory 7925, Cape Town, South Africa^b Digital Marketing and Market Intelligence Manager, 7 Riverview, KT15 2NA England, United Kingdom

ARTICLE INFO

Keywords:

Delphi study
Optimal data elements
Violence surveillance systems
Violence observatories

ABSTRACT

Introduction: Violence and injury observatories (VIOs) are primarily a tool to aid safety and security stakeholders within both governments and non-governmental organisations to develop interventions focused on violence prevention and related to citizen safety issues. VIOs are centres that focus on collating and integrating violence-related injury data sources to monitor, evaluate, and study the progression of violence and crime in a targeted region. In preparation for implementing a pilot VIO in Cape Town, we sought to determine the optimal indicators, datasets and research priorities for inclusion.

Methods: The study employed a two-round Delphi study conducted via email. The Delphi panel constituted 21 participants. This included, but was not limited to, senior members of staff in the Provincial Health Services in Emergency Medicine and Disaster Medicine, representatives from relevant data stakeholders and non-government actors working in violence reduction.

Results: Fourteen violence-related indicators and 12 violence-related datasets reached consensus. Additionally, research priorities were identified within 16 research themes across five different types of violence: elder abuse, youth violence, intimate partner violence, sexual violence, and armed violence. Finally, four data-sharing questions raised by panellists after round one were answered by the Delphi panel following the second round.

Discussion: This study provides a research priority framework for violence and injury prevention work within South Africa. These expert-identified violence and injury indicators and datasets are context-appropriate and may serve to guide the development of additional VIOs within the region.

African relevance

- This study derives a foundational evaluative framework to develop injury surveillance systems in moderately-resourced settings.
- An evidence-based method to build a violence and injury observatory (VIO) is described.
- The study highlights thematic priorities for injury research within South Africa.

Introduction

The World Health Organization reports that approximately 1.6 million people die annually from violence-related causes, making it a global health priority [1]. Violence and injury make up a part of what is known as the "quadruple burden of disease" in South Africa (along with tuberculosis and HIV, non-communicable diseases, and maternal and

child health); the country's homicide rate - six times that of the global average - is a prime example of this [2]. Specifically, in Cape Town, the Western Province's largest city, high rates of morbidity and mortality due to violence and injury call for the immediate implementation of prevention strategies, including initiatives to set up mortality and morbidity surveillance.

The establishment of violence and injury observatories (VIOs) within South America has been found to reduce the burden within a relatively short period [3,4]. Currently, no integrated system exists in South Africa to provide collated data on violence, to allow for targeted interventions and routine monitoring and evaluation.

The VIOs developed in Colombia are primarily a tool to aid safety and security stakeholders within Governments and NGOs, to develop interventions focused on violence prevention [5]. It is a centre with a focus of collating and integrating violence-related injury data sources, to monitor, evaluate and study the progression of violence and crime in

Peer review under responsibility of African Federation for Emergency Medicine.

* Corresponding author.

E-mail address: A.jabaroo@gmail.com (A. Jabar).

<https://doi.org/10.1016/j.afjem.2018.11.001>

Received 10 November 2017; Received in revised form 22 July 2018; Accepted 13 November 2018

Available online 11 December 2018

2211-419X/ 2019 African Federation for Emergency Medicine. Publishing services provided by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

a targeted region [5].

An observatory, as defined by the International Crime Prevention Centre, has several basic criteria including the collection of data, the analysis of data and the public dissemination of data to support violence prevention activities within the local area [6]. The International Scientific and Professional Advisory Council of the United Nations (UN) recommended a similar model for use at the municipal, state, and provincial levels at the 11th UN Congress on Crime Prevention and Criminal Justice in 2005 [7].

The City of Cape Town has been chosen as a site for the pilot VIO, as it is home to seven of South Africa's top ten South African Police Service (SAPS) worst-performing precincts for homicide, rendering it the 'homicide capital' of South Africa. Within Cape Town, there exists a context of high rates of morbidity and mortality due to violence and injury with preliminary initiatives to set up mortality and morbidity surveillance; and access to multiple source of health and non-health data. Given the high rates of interpersonal violence in the Western Cape, the Provincial government has identified several high-risk communities to improve overall violence prevention efforts. One of these measures include the employment of better-quality data and improved analysis to optimise the allocation of resources between these high-risk areas.

We sought to identify the optimal violence and injury-related indicators, datasets and interpersonal violence research themes and methods, which will form the foundational research components for a pilot VIO in Cape Town, South Africa.

Methods

A two-round modified expert Delphi study was conducted between July 2017 and November 2017 utilising a panel of 21 experts from stakeholders working in violence prevention in Cape Town, South Africa. Ethical clearance for this study was approved by the Health Sciences Research Ethics Committee of the University of Cape Town (HREC REF: 861/2016). Panellists were considered for inclusion if they worked primarily in violence prevention activities. The panel included:

- Safety and security experts;
- Senior clinical staff in local emergency centres (ECs);
- Policy stakeholders in local government;
- Non-government actors working in violence prevention;
- Researchers working in the field;
- Senior members of provincial health services working in emergency and disaster medicine;
- Representatives from relevant data stakeholders including the Forensic Pathology Services (FPS), South African Police Service (SAPS), Health Systems Trust (HST), and Violence Prevention through Urban Upgrading (VPUU); and
- Representatives from the University of Cape Town and University of Western Cape Law faculty, the Department of the Premier's Office, Department of Health and Department of Community Safety.

A decision was made to limit the clinical expertise to emergency medicine practitioners as they represented the first point of contact in ECs in the Western Cape. Panellists whose primary field of work was not in violence prevention were excluded. All participating experts' views were given equal weight.

Data analysis was generated using Qualtrics software (© 2017 Qualtrics; Provo, Utah, USA). Thirty-three experts met the inclusion criteria and were invited to participate in the Delphi study; 21 responses (64%) were received. All 21 experts completed both rounds and comprised the Delphi panel.

Elements of the Delphi method and the Child Health and Nutrition Research Initiative priority-setting method were combined. The Child Health and Nutrition Research Initiative priority-setting method employed pre-set measures to both score and generate questions systematically [8]. This structured and transparent method attributes a

Table 1

List of violence-related indicators that reached positive consensus [8].

1. Homicide rate per every 100,000 inhabitants
2. Suicide rate per every 100,000 inhabitants older than 5 years of age
3. Firearm death rate per every 100,000 inhabitants
4. Robbery rate per every 100,000 inhabitants.
5. Complaint rate for Sex crimes per every 100,000 inhabitants
6. Rate of complaints of Intrafamily/family/domestic Violence per every 100,000 inhabitants
7. Prevalence of sexual violence
8. Prevalence of Intrafamily/family and domestic violence
9. Numbers of victims (assault and/or homicide) of community justice (Kangaroo courts)
10. Alcohol and other drug related violence incidents
11. Percentage of male 18 years and above who have experienced sexual violence
12. Percentage of homicide victims testing positive for alcohol/drug use
13. Percentage of road accident deaths testing positive for alcohol use
14. Homicide rate using sharps (penetrating trauma) per 100 000 in Cape Town

Table 2

List of violence-related indicators that reached negative consensus [8].

1. Theft rate per every 100,000 inhabitants
2. Percentage of victimisation due to theft, in people older than 18 years of age
3. Percentage of people with perception of insecurity, in people older than 18 years of age.
4. Percentage of people with perception of risk, in people older than 18 years of age
5. Percentage of people who justify the use of violence, in people older 18 years of age.
6. Rate of Automotive Theft and Robbery per every 10, 000 vehicles registered.
7. Kidnapping rate per every 100,000 inhabitants

priority score to all items on a list of generated research options, which are based on experts' scores (Appendix 1) [8]. Research thematic priorities were presented to the Delphi panel (Appendix 1) using a modified version employed in the Mikton *et al* 2017 study, which focused on global research priorities for violence prevention. Our study removed 'child maltreatment' as a type of violence, as the pilot VIO focused on violence prevention in the adult population. Furthermore, two research questions were omitted where the authors felt that there was possible duplication in a research question.

Delphi is a planned consensus process that employs a panel of experts to investigate a complex problem, utilising a sequence of structured statements [9]. The experts answer questionnaires in two or more rounds. Following each round, a facilitator provides an anonymised summary of the experts' forecasts from the previous round as well as the reasons they provided for their judgments.

Our modified process was employed over two rounds [9]:

1. A panel of experts individually and anonymously formulated a series of ideas related to the subject which was to identify the optimal indicators, datasets and research priorities for a pilot VIO. The statements from stage 1 (Tables 1 and 2, and Appendix 1) were collated and distributed to all panellists, where they chose their level of agreement with each statement using a 5 point Likert scale (1-can be dropped, 2-somewhat essential, 3-neither essential or unessential, 4-quite essential, 5-essential to include).
2. Each statement was returned back to the panel, with their own and the rest of the panel's previous Likert scale rating. Feedback was anonymous.

Below are the Organisation of American States (OAS) Citizen Security Indicators submitted as baseline indicators to the Delphi panel in Round One [10].

1. Homicide rate per every 100,000 inhabitants.
2. Suicide rate per every 100,000 inhabitants older than 5 years of age.
3. Firearm death rate per every 100,000 inhabitants.

4. Complaint rate for sex crimes per every 100,000 inhabitants.
5. Rate of complaints of intrafamily/family/domestic Violence per every 100,000 inhabitants
6. Theft rate per every 100,000 inhabitants.
7. Robbery rate per every 100,000 inhabitants.
8. Rate of automotive theft and robbery per every 10, 000 vehicles registered.
9. Kidnapping rate per every 100,000 inhabitants.
10. Prevalence of sexual violence.
11. Prevalence of Intrafamily/family and domestic violence.
12. Rate of criminal victimisation in people older than 18 years of age.
13. Percentage of victimisation due to robbery, in people older than 18 years of age.
14. Percentage of victimisation due to theft, in people older than 18 years of age.
15. Percentage of people with perception of insecurity, in people older than 18 years of age.
16. Percentage of people with perception of risk, in people older than 18 years of age.
17. Percentage of people with perception of fear, in people older than 18 years of age.
18. Percentage of people who justify the use of violence, in people older 18 years of age.
19. Percentage of people with confidence in the institutions, in people older 18 years of age.

Round one of this study required panellists to rate the violence-related indicators, datasets and local research priorities that they felt should be represented in the pilot VIO. The OAS citizen security indicators, voted on by OAS member states in order to standardise the collection and definition of citizen security indicators within the OAS region, were provided as a gold standard baseline indicator list to rate using the Likert scale. The panellists were additionally asked to propose violence-related indicators and datasets (Appendix 2), in order to reduce the chance of indicators or datasets being overlooked. Additionally, an open text box was included for panellists to leave comments, questions or suggestions to present in the second round. Finally, the panellists were asked to rate different research themes (using an ordered ranking scale) within interpersonal violence with space for panellists to comment on the research themes and methods that should be reviewed by the pilot VIO.

All replies were then collated into a sequence of statements. In round two, these statements were returned to the panel members in the form of a series of statements, where panellists were required to choose their level of agreement with the use of the considered measure as a performance indicator. This was done using a five-point Likert scale [6]. Positive consensus was defined *a priori* as 70% or more of respondents scoring four and above, with this value being used to produce final recommendations. Negative consensus was defined as 60% or more of respondents scoring two and below.

Issues expressed by panellists in round one were also added to the round two questionnaires and four questions related to data sharing were presented in round two (Figs. 1–4).

Statements that had not reached consensus in the Delphi study were not considered further.

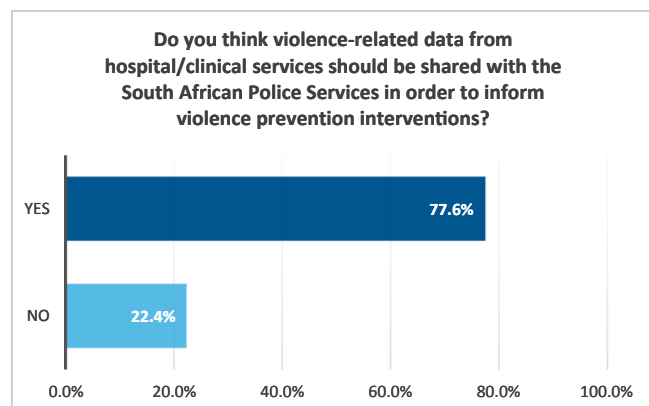


Fig. 1. Data sharing between SAPS and clinical services.

Results

Round one produced a series of 31 statements and 16 research themes across five different types of violence for priority rating (Appendix 1), which were presented to the panellists. The second and final round comprised 25 statements. Each of the statements was presented with a summary explaining the reason for the panellists' choices. This allowed panel experts to adjust their response in light of other experts' opinions.

After round two, 14 indicators and 12 datasets from 9 data sources had reached positive consensus. This represented 55.3% of the total number of statements. Nineteen statements reached consensus at > 90% and 40 reached consensus at > 80%. The additional statements originate from panellist suggestions following Round 1. Ten statements did not reach consensus. Seven statements reached negative consensus (> 70% scored the indicator as 1 or 2 on the Likert scale). The 14 indicators and 12 datasets that reached consensus are shown in Table 1 and Appendix 3, respectively. The remaining statements are not presented here.

The violence and injury indicators that reached positive consensus (Table 1), negative consensus (Table 2), and no consensus (Table 3) are further described below.

With regard to the indicators that reached positive consensus, three indicators represented death as an outcome, four indicators were related to sexual and/or domestic violence and one indicator (Robbery rate per every 100,000 inhabitants) was related to theft. From the panellist proposed indicators from round one that reached consensus, three were related to alcohol and/or drug use in violent incidents, one was related to vigilantism, and one each for homicide rate using sharps and adult males who experience sexual violence.

Twelve datasets from nine data sources reached positive consensus (Appendix 3), with only one dataset not reaching consensus (The Cape Panel Area Survey). This included three datasets that were proposed by the Delphi panel after round one, with nine of the datasets originating from study authors operational knowledge of local violence-related datasets.

Research priorities for violence prevention were answered comprehensively and are described as a Supplementary table in Appendix 1, using a modified voting template employed from the Mikton et al 2017 Delphi study. Voting with regards to research priorities took place using a numbered scale which ranged from most important to least important as demonstrated in Appendix 1.

Four questions were generated from the panellists from round one with regards to the subject of data sharing and were presented to the panel in round two in the form of three multiple choice questions and one true or false statement (Figs. 1–4).

Discussion

Fourteen of the original 21 OAS citizen security indicators were deemed appropriate by the Delphi panel for use in the South African context. The inclusion of the three indicators related to death as an outcome (homicide rate, suicide rate, and firearm death rate) reflect the high national homicide rate which is seven times the global average [11] and high national suicide rate.

Four indicators were related to sexual and domestic violence, which again were chosen in the context of a high prevalence in both acts of violence locally. Whilst the sexual crime complaint rate is collected by SAPS at the precinct level, domestic/intrafamily violence is not classified as separate categories in routine SAPS reporting. The specific category is reported in STATSSA Victim of Crime (VOC) surveys which are not conducted routinely and when implemented, have a regional focus. The under reporting of sexual violence in South Africa to SAPS is documented and highlighted by the VOC surveys where victims are able to self-report sexual crimes anonymously. Additionally, specific categories of sexual offences are not listed. Previously, only one broad

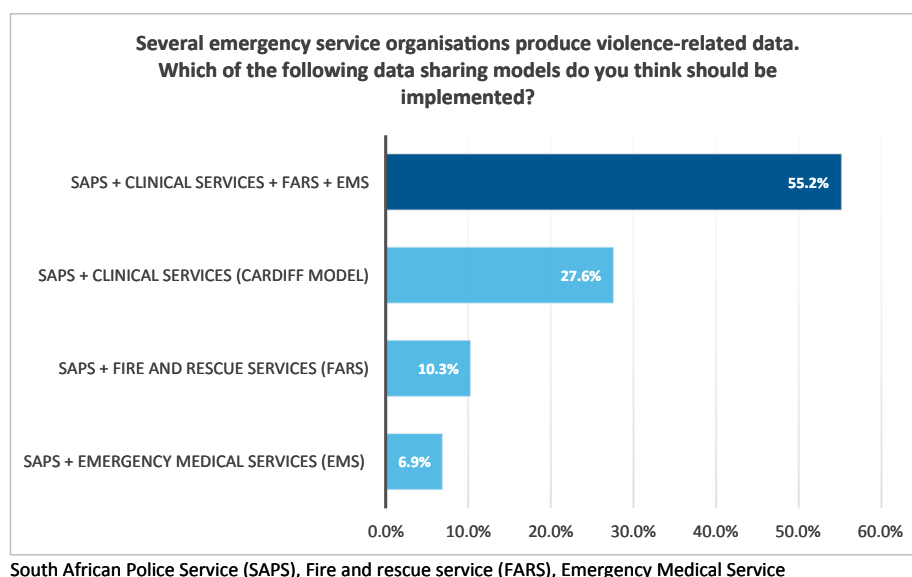


Fig. 2. Data sharing models to inform violence prevention.

category (total sexual crimes) was reported by SAPS which prevented the analysis of trends in specific sexual offences. Since 2017, this has been changed with the new categories including rape, sexual assault, attempted sexual offences, and contact sexual offences [12].

Three indicators are related to alcohol and/or drug use including alcohol and other drug related violence incidents, percentage of homicide victims testing positive for alcohol/drug use and percentage of road accident deaths testing positive for alcohol use. The absence of the routine reporting of alcohol and/or drug related violence incidents limits its use in shaping local alcohol and drug policy related to violence prevention interventions.

The choice of weapon use in homicide differs regionally across South Africa, with penetrating trauma related to sharps, being the commonest weapon used in homicide in Cape Town. As there is regional variability in weapon use across South Africa, the reporting of this indicator (homicide rate using sharps) would help contextualise local crime and guide the development of local violence prevention policy e.g. stricter punitive legislation for knife carrying.

The indicator recording the numbers of victims (assault and/or homicide) of community justice (Kangaroo courts- an unofficial court held by a group of people in order to try someone regarded, especially without good evidence, as guilty of a crime or misdemeanour) is usually recorded only by the Emergency Medical Services (EMS) and EC teams attending to the victim. Reasons for community assault or homicide are usually related to the communities' response to the alleged criminal

activity of the victim. This type of vigilante behaviour is often found in communities where there is a collapse in the relationship between the local police and community. This was highlighted in the Khayelitsha commission of inquiry which took place in 2014 which was an official inquiry into the "allegations of police inefficiency and a breakdown in the relations between SAPS and the community of Khayelitsha".

With regards to indicators that reached negative or no consensus, the majority of these reflected perception of safety indicators. A possible reason for the panellists' exclusion of these indicators, is that these indicators are collected by STATSSA using the victim of crime surveys, and thus this would represent an unnecessary duplication. Additionally, the kidnapping indicator reached negative consensus as this represents a violent crime found more commonly in South America, the vast majority of countries within which are represented in the OAS member states.

One of the study limitations is that several SAPS members from the divisions of Visible Policing, Forensic Service and Detective Service did not respond in time to participate in the Delphi panel; only one SAPS member was able to participate and did so in the final Delphi round. Additionally, STATSSA Victim of Crime (VOC) surveys which document crime not reported to the SAPS, are not conducted routinely and when implemented, have a regional focus.

This study provides a research priority framework for violence and injury research within South Africa. Additionally, violence and injury indicators and datasets have been identified through expert consensus,

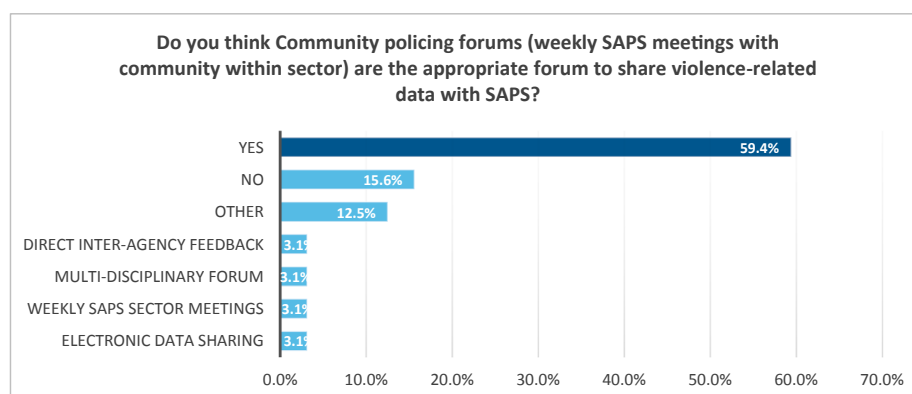


Fig. 3. Using community policing forums to share violence-related data with SAPS.

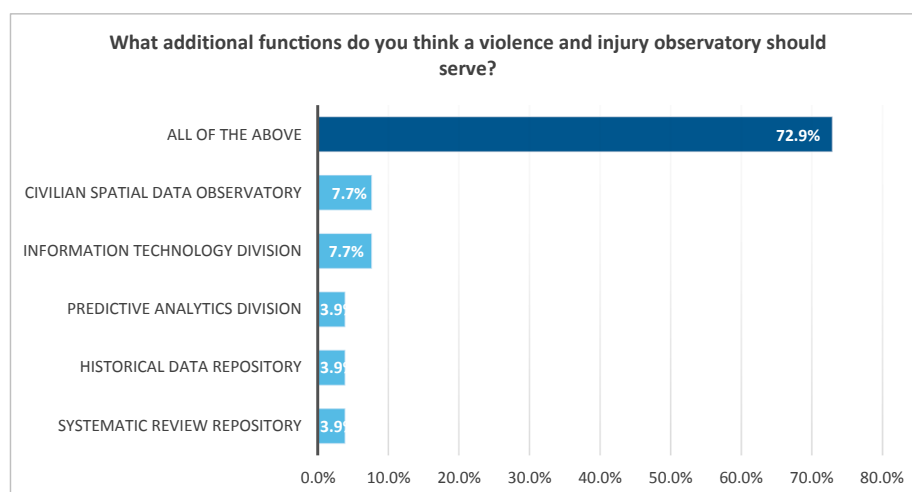


Fig. 4. Different functional capacities of the pilot VIO.

Table 3

List of violence-related indicators that did not reach consensus [8].

1. Rate of criminal victimisation in people older than 18 years of age.
2. Percentage of victimisation due to robbery, in people older than 18 years of age.
3. Percentage of people with perception of fear, in people older than 18 years of age.
4. Percentage of people with confidence in the institutions, in people older than 18 years of age.
5. Perceptions of safety indicators including: 1. Crime shift, year-on-year; 2. Safe at home, day/night; 3. Safe in area, day/night; 4. Safe to commute, AM/PM; and 5. Safety of learners, on commute (AM/PM).
6. Rape conviction rate.
7. Percentage of people who know where to access help if being victim of crime.
8. Perception about most common crime in the City of Cape Town.
9. Perception about the most feared crime in the City of Cape Town.

which provide the optimal data elements to develop prospective VIOs regionally.

The current focus of the pilot VIO is to form a steering committee to oversee the VIO implementation. This includes providing other researchers in the field access to datasets housed within the VIO. Additionally, several VIO initiated studies have commenced including a systematic review, several GIS-based spatial studies and evaluative research which focuses on alcohol policy and the firearm control act.

A civilian spatial data observatory is currently underway to utilise incident locations spatial data from multiple data sources to provide visualisation of violence hot spots, regional crime trends and local violence prevention ongoing programs.

There have been calls in the 2017 South African national health review for the development of a National Health Observatory. Whilst the authors agree in principle, it is felt that an emphasis should be placed on the development of regional/provincial health observatories or VIOs prior to the development of a national observatory. In starting with a smaller regional focus, it is possible to identify systemic problems with data collection at the primary level. This allows lessons learnt to be disseminated to other prospective VIOs. Additionally, it is possible to contextualise regional health and violence burdens, with the intention to develop interventions tailored to the local health burdens and not utilise a generic top down intervention approach. A national health observatory or VIO would then serve as the collection point of national health data, allowing for strategic development of national health policy based on evidence-based quality and timely data.

Ethics

Ethical clearance for this study was approved by the Health Sciences Research Ethics Committee of the University of Cape Town. HREC REF:

861/2016.

Funding

Funded by the South African Medical Research Council under the Clinician Researcher development PhD scholarship programme.

Conflicts of interest

The authors declare no conflicts of interest.

Dissemination of results

Dissemination pending post-publication.

Authors' contributions

Authors contributed as follow: AJ and RM conceived the original idea. AJ and SB designed the experiments and collected the data. AJ carried out analysis of data. AJ and SB drafted the manuscript and RM revised it. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.afjem.2018.11.001>.

References

- [1] Krug EG, et al. World report on violence and health. Geneva 2002.
- [2] Bradshaw D, Groenewald P, Laubscher R, Nannan N, Nojilana B, Norman R, et al. Initial burden of disease estimates for South Africa, 2000. South Afr Med J Suid-Afrikaanse tydskrif vir geneeskunde 2003;682–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/14635557>.
- [3] Gutierrez-Martinez MI, Del Villin RE, Fandiño A, Oliver RL. The evaluation of a surveillance system for violent and non-intentional injury mortality in Colombian cities. Int J Inj Contr Saf Promot 2007;14(2):77–84. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17510843>.
- [4] Gutiérrez LA, Pacheco S, Juárez AY, Palacios LA, Cerqueira MT. Using evidence on violence and injury prevention for policy development and decision making in Ciudad Juarez, Mexico. Rev Panam Salud Publica 2012 4599 Jun 21;31. Available from: http://www.scielosp.org/scielo.php?script=sci_arttext&nrm=iso&lng=pt&tng=pt&pid=S1020-49892012000500003.
- [5] OAS. Manual for the creation of national public security observatories on crime and violence [Internet]. Washington, DC, Available from: <http://www.oas.org/dsp/alertamerica/documents/ManualforNationalObservatories.pdf>; 2009.
- [6] Joanie P, Ferland S, Bruneau S. Crime observatories: international experience directory. Montreal 2009.
- [7] Norwegian Ministry of Foreign Affairs. Measuring and Monitoring Armed Violence:

- Goals, Targets and Indicators - Background Paper Oslo Conference on Armed Violence. 2010; (April):32.
- [8] Mikton CR, Tanaka M, Tomlinson M, Streiner DL, Tonmyr L, Lee BX, et al. Global research priorities for interpersonal violence prevention: a modified Delphi study Available from Bull World Health Organ 2017;95(1):36–48<http://www.who.int/entity/bulletin/volumes/95/1/16-172965.pdf>.
- [9] Goodman CM. The Delphi technique: a critique. J Adv Nurs 1987;12:729–34.
- [10] OAS. The regional system of standardized indicators in peaceful coexistence and citizen security project [Internet]. Available from: <http://www.seguridadregion.com/>; 2014.
- [11] United Nations Office on Drugs and Crime. Global study on homicide. Vienna; 2011.
- [12] SAPS. Crime statistics South Africa [Internet]. Cape Town. Available from: <https://www.saps.gov.za/services/crimestats.php>; 2017.