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Diego E. Zavala ^a; Simon Bokongo ^b; I. A. John ^c; Ismail Mpanga Senoga ^d; Robert E. Mtonga ^e; A. Z. Mohammed ^f; Walter Odhiambo Anjango ^g; Peter Olupot-Olupot ^d

^a Ponce School of Medicine, Ponce, Puerto Rico ^b Kisangani University Teaching Hospital, Kisangani, DRC ^c Karolinska Institute, Stockholm, Sweden ^d Mbale Regional Hospital, Mbale, Uganda ^e Zambian Health Workers for Social Responsibility, Lusaka, Zambia ^f Aminu Kano Teaching Hospital, Kano, Nigeria ^g Department of Oral and Maxillo Facial Surgery, University of Nairobi, Nairobi, Kenya

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Implementing a hospital based injury surveillance system in Africa: lessons learned

Diego E. Zavala^{a*}, Simon Bokongo^b, I.A. John^c, Ismail Mpanga Senoga^d, Robert E. Mtonga^e, A.Z. Mohammed^f, Walter Odhiambo Anjango^g and Peter Olupot-Olupot^d

^a*Ponce School of Medicine, Ponce, Puerto Rico*; ^b*Kisangani University Teaching Hospital, Kisangani, DRC*; ^c*Karolinska Institute, Stockholm, Sweden*; ^d*Mbale Regional Hospital, Mbale, Uganda*; ^e*Zambian Health Workers for Social Responsibility, Lusaka, Zambia*; ^f*Aminu Kano Teaching Hospital, Kano, Nigeria*; ^g*Department of Oral and Maxillo Facial Surgery, University of Nairobi, Nairobi, Kenya*

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A multinational injury surveillance pilot project was carried out in five African countries in the first half of 2007 (Democratic Republic of the Congo, Kenya, Nigeria, Uganda and Zambia). Hospitals were selected in each country and a uniform methodology was applied in all sites, including an injury surveillance questionnaire designed by a joint programme of the Pan American Health Organization and the United States Centres for Disease Control and Prevention. A total of 4207 injury cases were registered in all hospitals. More than half of all injury cases were due to road traffic accidents (58.3%) and 40% were due to interpersonal violence. Self-inflicted injuries were minimal (1.2% of all cases). This report provides an assessment of the implementation of the project and a preliminary comparison between the five African countries on the context in which inter-personal injury cases occurred. Strengths and weaknesses of the project as well as opportunities and threats identified by medical personnel are summarized and discussed. A call is made to transform this pilot project into a sustainable public health strategy.

Keywords: firearms; injury surveillance; interpersonal violence; violence and injury prevention

Introduction

From a public health perspective, there are two types of injury of concern worldwide: interpersonal violence (IPV) and road traffic injuries. The World Health Organization (WHO) produced a worldwide report for each of these injuries in 2002 and 2004, respectively^{1,2}. Among the recommendations

*Corresponding author. Email: dzavala@psm.edu

included in these reports, and most relevant to developing regions around the world is the need to generate reliable and consistent data in order to understand and define the context in which these injuries occur.

At the International Conference on the 'Role of Health in the Prevention of War Related Injury' held in Vienna in July 2004, African members of International Physicians for the Prevention of Nuclear War (IPPNW), and other health professionals attending the conference, agreed to participate in a coordinated research effort in response to WHO's recommendations. Thus, a multinational injury surveillance system pilot project in five African countries (Democratic Republic of the Congo (DRC), Kenya, Nigeria, Uganda and Zambia), was begun in early 2006 after IPPNW secured funding from Foreign Affairs Canada and the Small Arms Survey, a project of the Graduate Institute of International Studies, Geneva.

Another important reason for initiating this project is that all its participants realized that obtaining detailed and reliable data on violent injury from a surveillance system would contribute to the understanding of the dynamics of violence in their countries. The problem of violence is not solely an issue of the violent individual; rather, it is a result of several levels of influence on the individual that must be described in order to realistically implement prevention strategies to target the 'roots of violence'. These levels of influence on the individual include his or her most immediate relationships (family and friends), the community and the society in which they live. This reasoning has been developed in a well recognized ecological model and applied to specific IPV incidents, such as violence against children, intimate partners, the elderly and among youth^{1,3}.

On a practical level, the pilot project was an effort to determine whether it was possible to establish an injury surveillance system in countries where resources for public health strategies are minimal or non-existent. Hospitals in each country were selected and a 6 month prospective data collection on new injury cases treated at their emergency departments was begun on 1 January 2007.

We report on the results of the 6 month data collection effort, and provide a brief comparative analysis of the context in which IPV injuries occur in the five African countries. From this experience, we identify the strengths and weaknesses of the project as well as the opportunities and threats to its sustainability.

Methodology

The hospitals were selected on a convenience basis related to where the primary researchers worked and could set up reasonably robust systems of data collection. Most of the hospitals selected for this project are the main hospital in the cities where they are located (for example, Nairobi, Kenya), or even for the entire country (for example, Lusaka, Zambia).

Table 1 identifies the name and location of each of the hospitals that participated in this project. In Nigeria, it was possible to include two hospitals, taking advantage of a secondary injury surveillance project related to the national presidential elections that took place in early 2007.

An injury surveillance questionnaire, designed by a joint project of the Pan American Health Organization and the United States Centre for Disease Control and Prevention, was used to collect information in each hospital. This questionnaire has been successfully implemented in similar injury surveillance projects in Central America (in Nicaragua and El Salvador). In Colombia, a similar questionnaire is being used in several cities where injury surveillance systems have been implemented.

The questionnaire is divided into two sections on a single sheet of paper. The front page (first section) is pre-coded and collects general data on the injury event such as intention behind the injury, the place and the mechanism of the injury as well as the activity that the patient was involved in when the injury occurred. In addition, there are modules for three specific types of injuries: road traffic injuries, IPV and self-inflicted violence. The last component in this first section includes documentation of alcohol or drug use and clinical data such as the anatomical site of injury, nature and severity of the injury and the patient's discharge status. The back page of the questionnaire (second section) is all the clinical information that is usually documented by a physician, such as physical examination, vital signs, initial diagnosis and treatment and medical procedures implemented.

In a preliminary phase of the project, a workshop was held in Nairobi, Kenya in March 2006, in order to assure the application of uniform data collection and data entry processes in all participating hospitals. An electronic database was created using Epi Info (available as freeware at: www.cdc.gov/epiinfo) and distributed to all participants together with a data entry manual. All data collected and entered into the database were sent via email to the co-ordinating centre at the Ponce School of Medicine in Ponce, Puerto Rico.

Table 1. Multinational injury surveillance pilot project – participating hospitals.

City and country	Hospital(s)	Principal investigator
Kisangani, Democratic Republic of Congo	Kisangani University Teaching Hospital	Dr. Simon Bokongo
Kano, Nigeria	National Orthopedic Hospital Aminu Kano Teaching Hospital	Dr. Ime John Dr. A.Z. Mohammed
Nairobi, Kenya	Nairobi Kenyatta National Hospital	Dr. Walter Odhiambo
Mbale, Uganda	Mbale Regional Hospital	Dr. Peter Olupot-Olupot
Lusaka, Zambia	Lusaka University Hospital	Dr. Robert Mtonga

A detailed process evaluation of the surveillance system was included in the project. It was proposed that on a monthly basis the number of cases registered by type of injury and the number of cases with missing or unknown information for each section of the data collection instrument (such as demographic data, type of injury and the like) be determined. This information provided by the co-ordinating centre served as feedback to each participating hospital. In addition, each participating hospital was to evaluate the sensitivity of the surveillance system by obtaining the number of injury cases registered by the surveillance system and compare it to the number of cases registered by the hospital. Ideally, this ongoing evaluation would have helped to determine the days and times that injury cases were most frequently missed and allow for corrective measure to improve the sensitivity of the surveillance system.

Evaluation

Unfortunately difficulties in internet access and the geographical distance between the co-ordinating centre and the participating hospitals precluded sufficiently effective communication to carry out the proposed monthly evaluation of the surveillance system in each hospital. Electronic delivery of data was not possible on a monthly basis, and delays in obtaining data for evaluation inevitably led to the inability to maintain effective monitoring of the data quality. However, even with these limitations, there were opportunities to provide feedback to each hospital and for some corrections to be made.

Unexpected administrative delays were another obstacle that did not allow for a uniform start of the project in all hospitals. Although colleagues in DRC, Nigeria and Uganda were able to start as agreed on 1 January 2007, in Zambia the project was delayed until 1 March, and Kenya was only able to collect data prospectively in the sixth month of data collection (June 2007). These last two countries collected data retrospectively for the missing months of the data collection period, the severe delay in Kenya forcing our colleagues there to collect most of the data retrospectively. Given the detailed information required by the surveillance system, the retrospective review of cases for the months of January through May of 2007 demonstrated how limited is the epidemiological information routinely collected in medical records.

At the end of the data collection period, all principal investigators were engaged in an evaluation of the implementation process through a brief SWOT analysis (Strength, Weaknesses, Opportunities and Threats). The result of this analysis is discussed in the next section.

Table 2 summarizes the results of the six month data collection effort. Between January and June 2007, 4207 injury cases were registered in all hospitals. More than half of all cases were injuries due to road traffic

(58.3%) and 40% were IPV injuries. Self-inflicted injuries were minimal (1.2% of all cases). Figure 1 illustrates the relative distribution of all cases collected in each hospital by month (January to June 2007).

The number of cases reported from DRC was the lowest ($n = 99$). Data collection in DRC was hindered by technical problems and sporadic communication. The dates shown for the cases reported monthly showed large gaps in days. No cases were reported for the month of June 2007,

Table 2. Distribution of cases by type of injury and country.

Country	DRC	Kenya	Nigeria	Uganda	Zambia	Total
RTI	42	400	271	389	1352	2454
%	42.4	68.3	80.4	82.6	49.8	58.3
Self-inflicted	9	1	6	7	26	49
%	9.1	0.2	1.8	1.5	1.0	1.2
IPV	48	179	57	67	1332	1683
%	48.5	30.6	16.9	14.2	49.1	40.0
Other	0	3	2	7	4	16
%	0	0.5	0.6	1.5	0.2	0.4
Unknown	0	3	0	1	0	4
%	0	0.5	0	0.2	0	0.1
Missing	0	0	1	0	0	1
%	0	0	0.3	0	0	0
Total	99	586	337	471	2714	4207
%	100	100	100	100	100	100

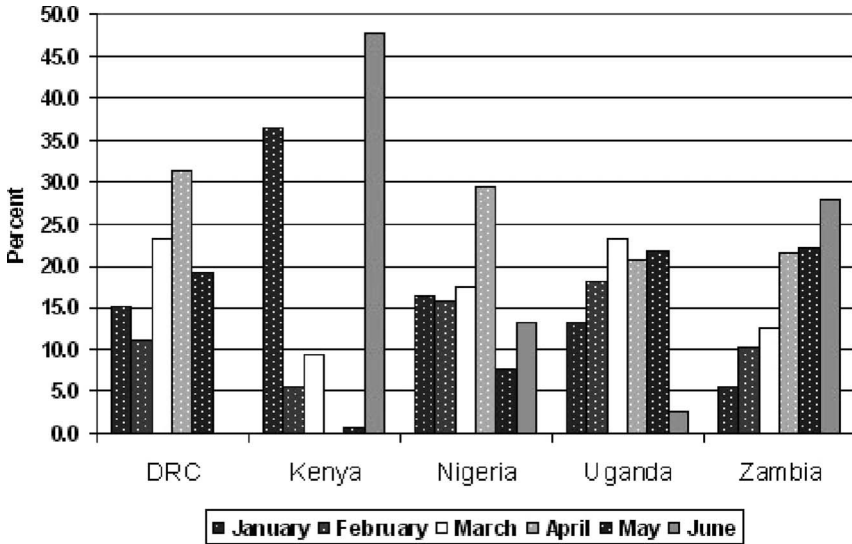


Figure 1. Distribution of injury cases by month and country.

suggesting that the surveillance system was not working properly. It was later reported that many cases were not entered into the computer database due to technical problems. Despite these limitations, the profile of IPV injuries in this country showed the potential of the surveillance system in providing detailed information on injuries here.

The number of cases reported per month varied widely in Nairobi, Kenya. There were a minimal number of cases reported for the months of April and May (one and four cases, respectively). This large gap in case coverage precluded an in-depth analysis of this hospital data. In contrast, the total number of cases reported by the Lusaka University Hospital, in Zambia represents 64.5% of all cases in the five hospitals ($n = 2714$). This remarkable achievement was possible mainly due to the fact that the co-principal investigator in this hospital found that the only way to ensure an effective reporting of injury cases at the Emergency Department was to pay medical staff for each completed case, in addition to the fact that this hospital is the main hospital for the entire country (see Discussion).

The remainder of this report describes the findings for IPV cases only. Data from all hospitals is shown in order to describe what is possible in terms of comparing detailed information on IPV injuries in different cultural and population settings, while applying uniform methods and procedures for data collection. Because of its limitations as a pilot study, the results are only preliminary and no emphasis is made in applying statistical methods to test for differences between the hospital experiences.

Results

Issues related to quality of the data as shown by the evaluation of the surveillance systems at the end of the data collection period suggest that an injury surveillance system takes time to begin functioning properly in terms of capturing the information on specific injury cases arriving at the emergency department in each hospital. The hospital in Lusaka, Zambia provides the best evidence of this, as shown in Figure 1. The number of cases collected gradually increased from beginning to end. On the other hand, the experience in Nairobi demonstrates that retrospective data collection on injury cases in a large hospital setting is problematic, as complete data capture by the surveillance system was not possible. Despite the large limitations in implementing the surveillance system in Kisangani, the fact that data emerged from such a difficult scenario as the DRC is promising.

Demography

The sex and age distribution of injury cases due to IPV by country show that the majority of IPV cases are young males. Approximately three out of four cases reported in all sites are males, except for DRC where over forty

per cent were women. More than half of all IPV cases are in the 20 to 39 years of age range.

Interpersonal violence injury context

Place

The data on the place where the IPV injury occurred were well documented in most hospitals. Figure 2 summarizes this information. In Nigeria approximately equal proportions of cases reported as IPV incidents took place at home or out on the street (35.1% and 36.8%, respectively). In Zambia one third of the reported IPV injury cases occurred at home (33.3%), and almost half on the streets (48.5%). In contrast, in Uganda almost two out of three cases of IPV injuries occurred at home (64.2%). Kenya and DRC have a large proportion of cases with ‘unknown’ or ‘other’ place of injury.

Activity

This information was not well-documented in Zambia, Nigeria, DRC and Kenya. For most of the cases reported, this information was either ‘unknown’ or classified as ‘other’. In Uganda, in more than half of IPV cases it was reported that individuals were either at work or at some recreational activity when injured (25.4% and 29.9%, respectively).

Mechanism

One of the greatest concerns of the health and human rights advocates is the accessibility of (mostly illicit) small arms and light weapons in developing

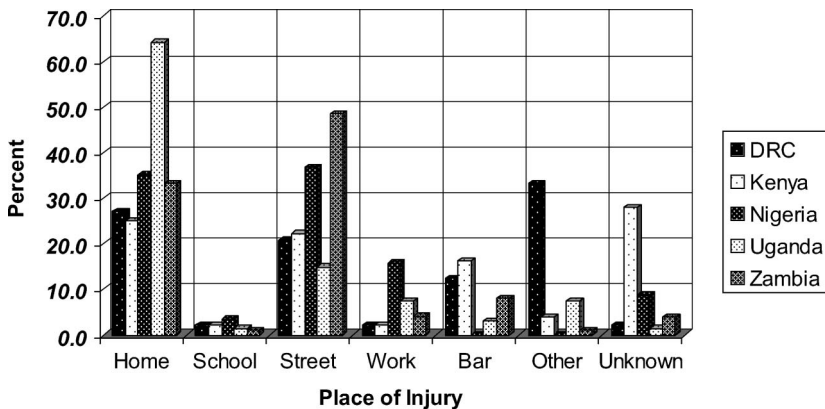


Figure 2. Place of IPV injury reported.

regions of the world. Their impact on health⁴ and human rights⁵ has been well documented. The injury surveillance system does provide an opportunity to document-specific information on the mechanism of injury – how the injury was sustained. Figure 3 summarizes these findings.

The use of blunt force is the overwhelming mechanism of IPV injuries in Zambia (95.6%) and Kenya (57%). In Nigeria and DRC, the use of firearms is the leading mechanism of injury (42.1% and 39.6%, respectively). Uganda shows a more equal proportion of cases reporting use of blunt force (40.3%) and stabs or cuts (35.8%).

Context

Understanding the context in which IPV occurs allows for developing a comprehensive approach to violence prevention. Identifying the most frequent circumstances in which IPV injuries occur in a given place provides the knowledge to plan targeted preventive strategies. Unfortunately this type of information was not adequately documented in Nigeria and Kenya where 61.4% and 42.0% of the cases had unknown or missing information. In Zambia, most IPV cases were injured during quarrels or fights (70.2%). In Uganda and DRC, this proportion is much less (32.8% and 29.2%, respectively). DRC shows the greatest proportion of sexual assaults (20.8%) of all five countries. The only other country reporting sexual assault injuries was Uganda (3.0%).

Relationship of perpetrator to the victim

The surveillance system in Nigeria was not successful in obtaining this critical information for IPV cases. More than half of these cases (61.4%)

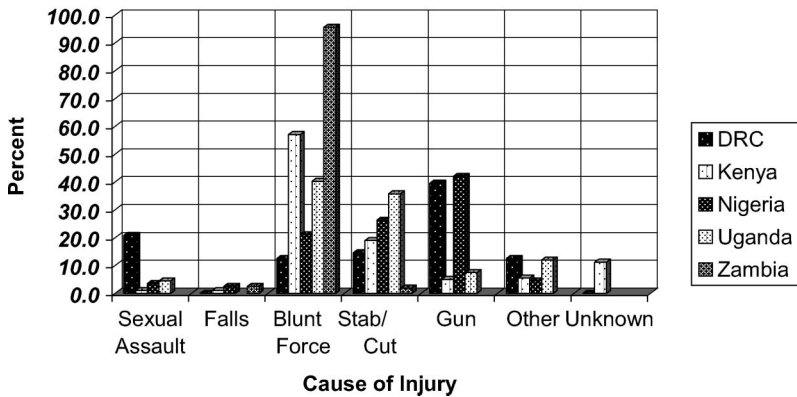


Figure 3. Cause of IPV injuries.

had missing information. For the rest of the countries, the perpetration of injury between intimate partners is less than 25%. In Zambia more than half of IPV perpetrators were unknown individuals (53.8%), although information (30.6%) in a large proportion of cases is missing.

Of the 48 IPV cases reported in DRC, in 52% (25 cases) the perpetrator was classified as 'other'. Upon further examination, ten of these cases were attributed to 'police' or 'security forces'; in another seven cases the injuries were attributed to 'the enemy' or 'rival', and three IPV injuries were attributed to 'armed robbers'. Thus, in DRC the corrected proportion of cases whose perpetrator was an 'unknown person' is 60.4%, higher than that reported by Zambia.

Anatomical site of injury and discharge status

The surveillance system questionnaire includes medical information that should already be well documented in the patient's medical record. At least 50% of all IPV cases in each country were reported as head injuries, except in DRC where approximately 38% of cases had head injuries.

All, or nearly all, IPV injuries treated in Uganda (100%), Kenya (100%) and Zambia (99.9%), hospitals were discharged alive. In Nigeria and DRC, 15.8% and 14.6% of cases, respectively, died while in the Emergency Department. Sixty gunshot injuries were documented in all five countries, of which 11 led to the death of the patient while at the hospital. Four occurred in DRC and eleven in Nigeria. These cases represent 65% of all deaths registered in the pilot project. The overall case fatality rate for all IPV cases reported is one per cent (17/1683), for gunshot wounds 18.3% (11/60), and for all other mechanisms of injury deaths 0.4% (6/1623). Thus the probability of death due to gunshot injuries for IPV is more than forty times greater than from other types of IPV lethal injuries. This finding demonstrates the lethality of small arms use in IPV.

Final evaluation – SWOT analysis

At the end of the pilot project, the principal investigator in each hospital was asked a series of questions that can be summarized as the strengths and weaknesses of the project, as well as the opportunities and threats they have identified in carrying out the project. Table 3 summarizes the results. It is interesting to note the perception of different aspects of the project by hospital personnel in each country. For example, the questionnaire was seen as a 'strength' for its ease of use, whereas, at the same time at another hospital, it was seen as a 'threat' because of the requirement to collect detailed information and the time it took to obtain this. Similarly, the data collection process was perceived as a 'strength' in one hospital and 'weakness' at another.

Table 3. Strengths, weaknesses, opportunities and threats analysis.

Strengths	Weaknesses
<p>Technical support; TOT, training of ED staff; Availability of extra data on injuries; Involvement of medical students/medical assistants; Data collection and data entry well done; Use of questionnaire/easy to fill out; Acceptance by hosp staff/administration.</p> <p>Opportunities</p> <p>Injury data available for research; Increased awareness of surveillance systems by hospital and health authorities; More thorough evaluation of patients; Improvement of data capture by hospital personnel; Can be implemented in hospital on a permanent basis and expanded to other hospitals; Findings can be used for advocacy work in favour for more surveillance; Capacity building and improvement of infrastructure in local hospitals.</p>	<p>Insufficient funding for 24/7 data collection for 6 months; Difficulty in obtaining ethical research clearance; Limited number of ED staff available/ED staff are very busy; High patient turnout; Data collection process; Lack of computers and weak internet connections.</p> <p>Threats</p> <p>Requires accurate data entry and computer literacy; Inadequate funds and incentives for ED staff; Questionnaire is very detailed hence requires longer history-taking; Lack of full time data entry personnel, Need skilled personnel; Political instability.</p>

Note: TOT, Trainer of trainers; ED, Emergency Department.

The requirement of a more thorough evaluation of patients was seen as an 'opportunity' to improve the documentation of injury cases. Inadequate funding and lack of human resources, particularly skilled personnel, were both perceived as weaknesses and a threat to the project by more than one hospital.

All five hospitals agreed that the technical support and the training provided before the collection of data were key elements of the project.

Discussion and conclusions

The Multinational Injury Surveillance Pilot Project was a collective response to WHO's call for collaborative efforts for the prevention of violent injuries, to increase the capacity for data collection and to carry out research on violence in different populations and cultural settings.

Despite the limitations of the data collected in some hospitals, the general pattern of IPV injuries seems to be that they are most likely to result from blunt force, used mostly in quarrels or fights among young males, where the perpetrator is not a family member or known person, leading to non-fatal head injuries. Having said this, some differences in the context in which IPV injuries are reported are worth noting. For example, it is quite remarkable that only three gunshot injury cases (0.2%) were reported in Zambia, whereas firearms were the greatest single cause of IPV injuries in Nigeria (42.1%) and DRC (39.6%).

This research should, at the very least encourage and support local initiatives in developing regions of the world where the burden of violent injury needs to be assessed urgently, using reliable and up to date techniques. In the medium and long term, an injury surveillance system is, but an initial step in providing key epidemiological information for the development of violent injury prevention and control strategies. Such interventions would be 'evidence based' with the intent of having a real impact on the 'roots of violence'.

The case for implementing an injury surveillance system for a region or city in developing countries has already been well made through the work done in Cali, Colombia, where several of the city hospitals actively participate in an injury surveillance system based on emergency departments. This effort is co-ordinated by the Institute for Peace Promotion and Injury and Violence Prevention, at the University del Valle in Cali and the success of this work has led to the implementation of similar surveillance systems in other cities in Colombia (personal communication. Maria Isabel Gutierrez, Instituto de Investigación y Desarrollo en Prevención de Violencia y Promoción de la Convivencia Social, Cali, Colombia).

The next step for the participating hospitals in our present study is to provide feedback to the hospital administration and health authorities on

the 6 months experience of data collection. It is hoped that health officials as well as hospital administrators will realize the importance of such surveillance systems, and that it should not be seen as a short-lived project but as an urgently needed public health strategy which can provide reliable data on IPV injuries in a city or region and eventually an entire country. Efforts are being made to secure funds to transform this pilot project into a sustainable process within each hospital.

This pilot project is an important contribution in persuading the international health community to re-evaluate the limitations assumed in developing countries. There are many health professionals in these countries with concern and conviction who are willing to work in resolving the violence that afflicts their societies.

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Notes on contributors

Dr. Diego E. Zavala is Professor of Public Health at the Ponce School of Medicine in Puerto Rico and a human rights activist with Amnesty International. His research is focussed on strengthening the relationship between the public health and human rights approach to the prevention and control of violent injury.

Simon Bokongo is a Lecturer at the School of Medicine, University Teaching Hospital of Kisangani Democratic Republic of Congo (DRC). He is the IPPNW DRC Affiliate Representative to the International Council, and is a Board Member of the International Society for Violence and Injury Prevention.

Ime A. John is a physician and consultant in public health with a special interest in violence and injury prevention. Dr. John is a co-president of International Physicians for the Prevention of Nuclear War (IPPNW).

Ismail Mpanga Senoga is a physician at Mbale Regional Hospital, Uganda.

Dr. Robert E. Mtonga is the medical director of the IANSA Public Health Network. He is a former board member of the International Physicians for the Prevention of Nuclear War (IPPNW). He is currently a member of the International Campaign to Ban Landmines (ICBL), the Cluster Munitions Coalition (CMC) and the International Action Network on Small Arms. He also serves as researcher for the Landmine Monitor and is the Programmes Director for the International Council for the Rehabilitation of Torture Victims in Zambia.

Aminu Z. Mohammed is a consultant pathologist and Chairman, Medical advisory Committee at Aminu Kano Teaching Hospital, Kano, Nigeria. Dr. Mohammed is the current vice-president of the Nigerian affiliate of IPPNW.

Walter Odhiambo Anjango is in the Department of Oral and Maxillo Facial Surgery, University of Nairobi. He is the IPPNW African Regional vice president.

Peter Olupot-Olupot is Medical Officer at Mbale Hospital, Uganda, and is in General Practice.

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