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Implementation of WHO/CDC Guidelines for Intentional Injury Death Surveillance: A Mixed-Methods Approach in Dar es Salaam, Tanzania

Anne H. Outwater[1], Jacquelyn C. Campbell[2], and Edward Mgaya[3]

Abstract

A foundational implementation of the WHO/CDC Injury Surveillance Guidelines was conducted in Dar es Salaam region of the United Republic of Tanzania in 2005. The Guidelines were adapted to gather qualitative as well as quantitative data about intentional injury mortality which were collected concurrently at the Muhimbili National Hospital Mortuary. An interview schedule of 12 quantitative variables and one open-ended question, participant observation and newspaper reports were used. Mixed methods allowed an understanding of intentional injury mortality to emerge, even for those with the least amount of data, the 22% of homicides whose bodies were never claimed. Mixed methods made it possible to quantify intentional injury mortality rates, describe subpopulations with scanty data, and learn how to embed ongoing injury mortality surveillance into daily practice.

Keywords

Injury surveillance, Africa, mixed methods research, homicide, newspaper coverage of homicide, unidentified homicides, mob violence

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Table 1. DSM, TZ 2005: All Adult Unknowns by Type of Death, Percentages

Type of death	*N*	Unknowns	% of deaths
Homicide	338	74	22
Motor traffic accidents	~ 1300	68	~ 5
Suicide	65	2	3
Prisoners (all ARC related)	Not known	8	Not known
Found dead (not injury)	>30,000[a]	32	<0.001
Total	>31,703	184	~ 0.58

a. Estimate based on figures reported in Mswia et al., 2002 for the AMMP Team.

The Injury Surveillance Guidelines (Holder et al., 2001) developed by World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC), describe how to set up a basic data collection system to achieve internationally comparable results even in resource-poor settings. The guidelines are a quantitative tool. Important data such as the organization of places of residence and injury as well as comprehensive statistics can only be captured through quantitative methods. They are most useful when gathering descriptive and normative data.

Quantitative data are not as useful when exploring new ideas or for capturing rich data (Fowler & Mangione, 1990). Proxy respondents (e.g., relatives) can provide information about the deceased but are not always available. Multiple sources and types of data reduce the risk of bias, and increase the likelihood of accurate understanding (Creswell & Plano Clark, 2007). Therefore, when the first violent death surveillance in Dar es Salaam region Tanzania (DSM) was designed, the Guidelines were adapted so that both quantitative and qualitative data were collected using a mixed-methods research design.

Briefly, quantitatively, the DSM homicide surveillance of 2005 found that the age adjusted homicide rate was 12.57 per 100,000 population (males and females, 22.26 and 2.65, respectively; Outwater et al., 2008). The gender gap was 14:1. Most homicide victims were male youth, killed through mob violence (57%), in which a large group (dozens to hundreds) of people, using multiple weapons, in concert kills one or two individuals (Outwater et al., 2008). Others died from assault. The bodies of most homicides were claimed, almost always by their families (Outwater, Tarimo, Miller, & Campbell, in press).

A noted limitation was the lack of data about victims whose bodies were never claimed (Outwater et al., 2008). In total, about 200 unclaimed bodies, labeled Unknowns were buried by the DSM City Council; almost all were unidentified (see Table 1). Among them were 74 (72 males and 2 females) adult homicides, 22% of all homicide deaths. This cohort has received little attention in the scientific literature, although these unclaimed bodies may be a sizeable proportion, especially in low-income settings. The gap distorts our understanding of homicide victims and hampers the development of appropriate interventions. This research note describes and demonstrates the methods used to (a) investigate a group for which few data were

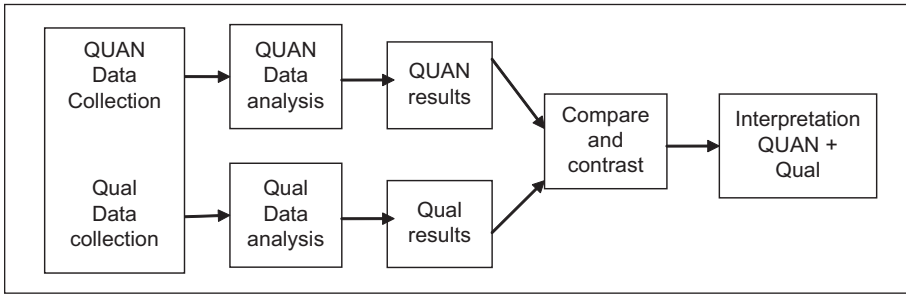

Figure 1. Triangulation design: Convergence model

available, and (b) discover a way to implement an ongoing surveillance system in a resource-poor setting.

Method

Design

A mixed-methods research design was used. Mixed methods focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies (Tashakkori, & Creswell, 2007). Its central premise is that a combination of quantitative and qualitative approaches often provides a better understanding of research problems than either approach alone.

This cross-sectional survey used a variant of a triangulation design described by Creswell and Plano Clark (2007) (see Figure 1). By being triangulated, that is, "collected from a diverse range of individuals and settings using a variety of methods" (Denzin, 1996), data can be validated, especially important when data are sparse. Quantitative and qualitative data were collected at the same time but analyzed separately. Before interpretation was completed, the data sets were compared and contrasted.

The protocol was approved by the Johns Hopkins University Institutional Review Board in the United States and the Commission of Science and Technology, National Institute of Medical Research, and the Muhimbili University College of Health Sciences Research and Publication Committee, in Tanzania.

Data Collection

The surveillance was undertaken at Muhimbili National Hospital (MNH) Mortuary to where all DSM police mortality cases (including homicide, suicide, motor vehicle accidents, and deaths of unknown causes) were brought. The data presented in this research note are a subset of homicides: adults buried by the city as Unknowns.

Three sources of data were used (interview, observation, and newspaper reports). Quantitative data were collected from relatives and friends via face-to-face interviews when possible and through police report when not. Qualitative data were collected through interviews, observations, and newspaper reports. Data were collected concurrently: closed- and open-ended questions on a single interview schedule, participant observation at the mortuary, and daily review of eight newspapers. The quantitative data set was primary.

Quantitative Data

Interview schedule. The 12 quantitative variables collected for violent deaths in 2005 were all those recommended in the Injury Surveillance Guidelines (Holder et al., 2001), except two (86%). They were: sex, year of birth, date of death, place of residence, place and site of death, occupation, role of human intent in the occurrence of the injury, activity at time of death, injury cause/weapon(s) used, events leading up to the death, and relationship of perpetrator to the deceased. Time of injury death was not included because it was believed the data gathered would be inaccurate. Data on alcohol or drug use were not gathered due to lack of funds. Whenever possible, face-to-face interviews were conducted by one of three nurses, all of whom had previous interviewing experience. "Injury Cause/Weapons Used" was determined by a pathologist. Otherwise, data were gathered from police report and observation.

Qualitative Data

Qualitative data were collected through the open-ended question, participant observation, and newspapers. In cases of unclaimed bodies when two friends were killed together, whenever possible, data were collected from those claiming the body of his fellow. The open-ended question: "Is there anything else you would like us to know?" was meant to allow respondents to emphasize what they wanted to share.

The principal investigator worked at the mortuary's registration desk for about 5 hours each morning for 7 months, interacting with the bereaved, the police, and the mortuary staff. The purposes of the participant observation included (a) validating the quantitative data by visual autopsy (that is, external examination or visual inspection of the body without taking a blood sample), (b) gaining contextual understanding of homicide in DSM by observing the victims' appearance and (c) learning enough about the daily routine of the mortuary so as to understand how to set up an ongoing surveillance system. Descriptive, methodological, and analytic notes of the mortuary-based observations were recorded almost daily in a field notes journal (FN).

Every issue of eight newspapers influential in Tanzania was gleaned for any mention of homicide in DSM from January 1—June 30, 2005 and sporadically thereafter. Five Swahili- and three English-language newspapers were followed of which six were privately owned (two were government owned) and five were dailies (three were weeklies). Newspapers were used to verify that each victim had been recorded in the MNH mortuary registration ledger, and the content was analyzed for contextual data.

Qualitative and quantitative data were linked physically in folders and preserved specific to each case. Each survey questionnaire was filed with other same case data including observations, newspaper articles, and memos pertaining to it. The case numbers were linked to the mortuary's registration ledgers which were linked to postmortum reports.

Data Analysis

Interview Schedule

Quantitative and qualitative data were analyzed, focusing on Unknown adult homicides.

Quantitative. Following the Surveillance Guidelines (Holder et al., 2001), EpiInfo was used for entry and analysis of the quantitative data. Frequency distributions, means, standard deviations, proportions, and ratios were selected as appropriate for each variable. Data on the identified bodies have been reported elsewhere (Outwater et al., 2008). For this research note, data were analyzed focusing on the adults who were buried by the city (Unknowns). Comparisons with adults whose bodies were claimed (Knowns), were calculated using relative risk and a ratio of high- to low-confidence levels as described by Poole (2001).

Qualitative. Qualitative analysis began by transcribing texts of the responses to the open-ended question (usually less than 50 words). Translation of responses and newspaper articles from Swahili to English were done by the PI and checked for accuracy by other members of the research team and a professional Swahili first-language translator. The transcripts were read multiple times in both languages and memos written.

Texts of both the open-ended question and the FN were divided into small units including words, phrases, and sentences. Codes were developed around them (Creswell & Plano Clark, 2007). The first codes were developed a priori, that is, related to the quantitative variables of the surveillance instrument. Then in vivo codes emerged from the particular data being analyzed.

Newspapers. A matrix was built with four a priori characteristics (sex, perpetrator, weapon, and occupation), as shown in Table 2. Their codes were based on what appeared in the data; for example firearms do not appear in the matrix because they were not mentioned in any newspaper stories. To learn if newspaper coverage was representative, and if not, what was most important to the public, data was quantified by calculating a ratio of the number of stories in which a variable was mentioned and the number of cases. This ratio, reflecting intensity of coverage by variable, was considered a proxy for public interest. A ratio of one represented one newspaper story per case. Less than one indicated lesser interest, and more than one indicated elevated public interest.

Results

Data sources are reported in Table 3. The most reliable source of data was the police. The most in-depth source for Knowns was relatives. For Unknowns, police report and observation were the principle data sources. Age for example, was estimated by the

Table 2. DSM, TZ January Through June 2005. Newspaper Coverage of Adult Homicides, Interest Ratio by Incident Characteristics

Characteristics	Cases (*n*)	Cases with news stories (*n* [%])	Stories including the characteristic (*n*)	Interest ratio (No. of stories: No. of cases)
Sex				
Female	8	4 (50)	12	1.5
Male	153	15 (10)	26	0.2
Perpetrator				
Blood relative	2	2 (100)	14	7.0
Intimate partner	2	1 (50)	2	1.0
Sex assault	1	1 (100)	1	1.0
Mob	111	7 (6)	10	0.1
Weapon				
Blunt	31	3 (10)	9	0.3
Sharp	43	7 (16)	12	0.3
Fire	24	1 (4)	1	0.04
Bodily force	39	1 (3)	1	0.03
Occupation				
Small business	28	1 (4)	5	0.2
Unknowns Buried by the City	39	4 (10)	7	0.2
Employed	18	2 (11)	2	0.1
Thief	55	3 (5)	6	0.1
Overall	161	19 (12)	38	0.2

police or the mortuary manager based on visual autopsy. As some bodies were identified by families later and ledger entries corrected in those cases, it was possible to compare estimated ages with actual ages. Of 20 consecutive corrected entries, the estimated range of ages was 20-29 whereas the actual age range was 15-46. No estimated age was exactly correct but both the actual and estimated mean and median ages were the same (30.7 and 27.5 years, respectively). Therefore, the age estimates were subsequently used, when actual ages were not available.

Quantitative Data, Comparing Known and Unknown Homicide Cases

Quantitative data were gathered on all cases. Of a possible 15 quantitative surveillance data points per case, Known homicides averaged more than 13 points per case. Unknowns averaged less than 7 data points (sex, year of birth, place and site of death, injury cause, instrument of death, and date of death), almost all of which were data gathered through observation and visual autopsy by the police and mortuary team.

Table 3. DSM, TZ 2005, Data Sources for Percent of Known and Unknown Cases, by Type of Violent Death

	Adult homicide % (*n*)		Child homicide % (*n*)		Suicide % (*n*)		All violent death[a] % (*n*)	
Type of death	100 (338)		100 (24)		100 (65)		100 (427)	
Source	Known (264)	Unknown (74)	Known (7)	Unknown (17)	Known (63)	Unknown (2)	Known (334)	Unknown (93)
Police	100 (264)	100 (74)	100 (5)	100 (19)	100 (63)	100 (2)	100 (334)	100 (93)
Relatives[b]	81 (214)	0	100 (5)	0	78 (49)	0	80 (268)	0
Newspapers[c]	13 (16/122)	10 (4/39)	100 (2/2)	17 (2/12)	46 (16/35)	100 (1/1)	22 (36/164)	14 (7/50)

a. Excludes legal deaths.
b. Relatives who gave more data than the 12 quantitative variables.
c. Newspaper data was collected from January-June 2005 only, therefore the denominators reflect the smaller *n*.

Table 4. Characteristics of Adult Homicide Victims, Known Versus Unknown

Identity				
N = 338	Known *n* (%)	Unknown *n* (%)		
Characteristics	264 (78)	74 (22)	RR (95% CI)	95% CLR
Type of death[a]				
Mob	146 (55.3)	60 (81.1)	0.76 (0.69–0.84)	1.22
Assault	115 (43.6)	9 (12.2)	1.31 (1.18–1.45)	1.23
Not known	3 (1.1)	5 (6.8)		
Primary weapon[a]				
Sharp object	71 (26.9)	13 (17.6)	1.08 (0.97–1.21)	1.25
Blunt object	72 (27.3)	16 (21.6)	1.03 (0.92–1.16)	1.26
Bodily force	42 (15.9)	10 (13.5)	1.01 (0.88–1.17)	1.33
Gun	36 (13.6)	7 (9.5)	1.06 (0.91–1.22)	1.34
Fire	29 (11.0)	16 (21.6)	0.78 (0.63–0.98)	1.55
Asphyxia	11 (4.2)	4 (5.4)	0.92 (0.69–1.25)	1.81
Not known	3 (1.1)	8 (10.8)		
Injury site[a]				
Home	19 (7.2)	0 (0)	1.27 (1.20–1.35)	1.12
Sports/athletic area	8 (3.0)	0 (0)	1.26 (1.19–1.33)	1.12
Place of business	37 (14.0)	1 (1.4)	1.25 (1.15–1.36)	1.18
Street/public place	129 (48.9)	52 (70.3)	0.77 (0.70–0.86)	1.23
Other residential	36 (13.6)	3 (4.1)	1.18 (1.06–1.32)	1.24
Farm/countryside	15 (5.7)	4 (5.4)	0.93 (0.73–1.17)	1.60
Institution	5 (1.9)	2 (2.7)	0.89 (0.56–1.43)	2.55
Not known	15 (5.7)	12 (16.3)		

Note: RR = relative risk; CI = confidence interval, CLR = upper-to-lower confidence limit ratio.
a. Differences in percentages are due to rounding.

There was about 50% less quantitative data on Unknowns than Knowns, reflecting the importance of relative informants who usually had knowledge about the victims' place of residence and occupation, events leading up to the death, role of human intent, and perpetrator.

A comparison of characteristics of homicides involving Knowns versus Unknowns is shown in Table 4. Type of death, primary weapon used, and injury site differed. The small confidence limit ratios show that the relative risk results are statistically stable. Unknowns were more often killed by community mobs; Knowns more often died from assault. Unknowns more often died of fire and in a public place whereas Knowns were more often killed in residences and places of businesses.

Unknowns and Knowns were also different as to age. The Unknowns had a lower mean and median age (26.4 years and 25 years) compared with Knowns (31.1 years and 29 years). In addition, estimated age range and standard deviation of Unknowns (16-40 years, *SD* 4.9 years) was narrower than that of Knowns (15-78 years, *SD* 10.6 years). Unknowns were drawn from a smaller segment of the population.

Unknowns were found in at least 29 of Dar es Salaam's 73 wards. Only three wards were the site of more than three Unknown homicides. However, 10 (13.5%) Unknowns died in one ward, Tabata, which is mixed residential and small business; most deaths occurred in a business section of mechanics and vehicle spare-part sellers.

Qualitative Data Results

Interview schedule: Open-ended question. As these data were usually collected from relatives, few were available for Unknowns. The police gave additional information for 23% (17) of Unknowns. For example, they sometimes reported the item stolen by the homicide victims: cell phones (4), handbags (2), chickens (2), a pig (1), items from a house (1) and a factory (1). Most Unknowns died as petty thieves.

Participant observation:. Daily presence at the mortuary, working at the registration desk, receiving and discharging bodies, resulted in constant validity checks with minimal disturbance to the daily routines of the mortuary. Most police cases were visually autopsied by the first and third authors to gather or confirm data about age, weapons used, and cause of death. Observations revealed qualitative signs of health and socioeconomic status. For example, most Unknowns were small, and without any visible body fat; they almost always arrived at the mortuary with few clothes, as described in field notes of case 352–2005:

> The body of a small male youth was brought in by the police and laid neatly against the wall on the cement floor, then covered with a clean stained sheet. The youth was wearing red polyester girl's underpants, and dirty red cut off shorts tied with a string. No shirt no shoes. (FN. p. 297)

In addition, participant observation led to understanding how, with minimal disturbance to staff, a passive injury-surveillance system could be implemented, even in this low resource setting: the variables can be embedded into the mortuary's registration ledgers.

Newspapers. Newspaper accounts added contextual information and gave insight to community perceptions and responses to an event. Ten percent of adult Unknowns, and 13% of adult Knowns were reported in the newspaper (see Table 3). Most comprehensive coverage was given in a Swahili language privately owned and an English-language government newspaper.

Newspaper coverage highlighted outlier cases, about which the information was sometimes detailed. Coverage intensity was highest for violence involving Known female relatives, for example, eight stories about a matricide and six stories about a fratricide (Table 2). Newspapers were least effective at reporting the norm, male youth killed by mobs using bodily force and fire. The stories of Unknowns were principally about someone else. Examples include a case of mistaken identity in which an Unknown (53–2005) was buried by a family who later discovered their son alive in jail. The focus of a story which included an armed carjacker killed by a mob (430–2005), was the taxi driver portrayed as a hero. This carjacker was the only Unknown homicide reported in more than one newspaper. " . . . the hijacked driver attacked from behind the bandit who

was holding the pistol . . . The driver then raised alarm and some people around came to his rescue . . . and the hijacker met his death . . .” (Sapali, 2001).

In a few cases, all four data types converged and a deeper understanding of the deceased emerged. Box 1 is a narrative that emerged around a youth who died from mob violence and was buried by the City. A newspaper report was linked with the quantitative surveillance (Case 474–2005), and qualitative observational (FN) and in depth interview (ID5028AO) data.

Box 1. Case Study

A newspaper reported that “Mob kills phone thieves: Dar es Salaam Regional Police Commander Alfred Tibaigana said yesterday that two suspected thieves aged between 18 and 25 years were beaten to death by a mob after snatching a mobile phone from Anna W. [name given] (24). Tibaigana said the incident occurred at Jangwani area at around 6 a.m. He said no one has so far been arrested in connection with the incident.”(Kimario, 2005)

These deaths were confirmed at the mortuary. The surveillance questionnaires revealed that HB (277–2005) and Dula (484–2005) were killed by a community mob using machetes and stones in front of a church parking lot. The thieves suffered wounds all over their bodies. HB’s body was claimed by his family; Dula’s was buried by the city as an Unknown.

The mortuary manager recognized one of them. She explained: “They have been hanging around Fiya for a long time, stealing people’s purses, phones . . . mmmhh” She shook her head and pursed her lips. She herself had 2 or 3 purses taken. . . . (FN, p. 356). “They were thieves, their place was Jangwani. Each person that passed they robbed. The day of the incident, they were two, they robbed her. They were beaten by angry citizens” (484–2005).

One of the groups who came with the family to claim the body of HB, had known Dula about 13 years. Salum was subsequently interviewed in-depth (ID5028AO). He validated and contextualized the above data. When asked “What was his occupation?” Salum answered, “Wizi tu, Just stealing. People are passing, they are strangled. Wizi si mzuri, Thieving isn’t good. . . . He had been beaten before but lived. But he continued, because what could he do—no jobs. So he continued what he was doing—knowing he would be killed.”

Salum remembered:

> Dula was the height of a seven year old when he came to DSM. He just appeared in DSM at the market in Kariakoo. He was in the market

(continued)

Box 1. (continued)

collecting rotten fruits, for example, mangoes and vegetables, peeling and eating them. He never cooked. He either ate food raw, or ate from the Mama Mtilie cooking on the streets. He went to the bathroom anywhere.

Dula was from Mtwara. He had no relatives. He stayed a long time at DogoDogo Center [a home for street children], until he wanted women. He saw that he had already become an adult and he ran away. He tried petty business—he tried to sell cassava. He bought cassava and sat by the side of the road, but the cassava dried up before he could finish selling it. Thereby he came to steal. He lived in an area of chaos: a lot of uproar, breaking and entering, thieving, smoking bhangi. Dula smoked heroin and marijuana. In the evening, he went to steal. Dula lived on the streets although for the last year he had got a room. He owned a radio, a video, and a bed.

He helped others when they had problems—he helped his friends with whom he was stealing. It was his habit when he raised some money to give others a little.

How do you see his life? "It was written by God. He knew himself" (ID5028AO).

Discussion

By following the Injury Surveillance Guidelines (Holder et al., 2001), knowledge was discovered in a relatively simple way that was acceptable to both investigators and respondents. Onsite data collection, newspaper review, and participant observation enabled opportunities to both compare and contrast data as well as link different types. Quantitative results provided the framework of understanding. As was demonstrated in Case Study 474–2005, qualitative data confirmed quantitative findings and added much unaddressed context.

Mixing methods enabled quantitative and qualitative data sets to reveal a story that was more comprehensive than either could have provided separately. For example, quantitatively, it was discovered that Unknowns are younger, more often killed by mob violence, in a public place than Knowns. Qualitatively, through the open-ended question it has been learned that many of the victims are petty thieves,

and observations of their body size and clothing suggest that they are economically very poor.

Although the quantity of data collected qualitatively was relatively few, occasionally even Unknowns could be placed within their contexts. How representative Dula (Case 474–2005) is, of all Unknowns is not clear. However, as the merging of the data sets was so smooth, the story resonates, and his demographics (age, sex, site and cause of death) are typical, he may be representative of many of this cohort: uneducated, unemployed petty thieves, without nearby family to claim the body. The community supported him while he lived his life as a parentless street child, but finally refused to sustain an adult preying on them for all his needs.

Newspaper accounts added qualitative depth to individual cases, often emphasizing the outsider status of Unknowns. As has been reported elsewhere, the coverage was biased against the statistical norm, with most reports covering the most uncommon events (Paulsen, 2002; Peelo, Francis, Soothill, Pearson, & Ackerley, 2002). Newspapers have been shown to have a larger impact on public perception of violent crime than any other news source (Wright & Ross, 1997) and yet they do not usually reflect the actual patterns of homicide. In DSM, nonrepresentative coverage may lead the public to believe that relative homicides involving women are more common, and that the killing of young men by mobs is less common than the revealed reality. The importance of newspaper data, suggests that it would be useful to partner with journalists in giving the public a balanced picture of violent death in DSM.

Research Process and Sustainability

Active surveillance ceased in DSM at the end of 2005, when the PI withdrew. However, all corpses entering the mortuary continue to be registered in the ledgers. Variables still being collected are as follows: sex, age, place of residence, human intent, cause, date and place of death, and sometimes, weapons used.

Although feasibility, full capture of homicide deaths, potential accuracy, flexibility, acceptability, and utility were established by this study, sustainability of active surveillance was not. In Mozambique and Ethiopia, where WHO was actively supporting injury-surveillance activities in 15 hospitals and health centers, it was also found that the instituted surveillance systems were unsustainable. Bartolomeos and Peden concluded that the data collection mechanisms need to be "incorporated into the daily tasks" of the institution (Bartolomeos & Peden, 2003).

To meet the challenges often encountered by passive surveillance systems including underreporting and incomplete data, the instrument must be simple and brief (Gordis, 2000). At MNH, quantitative surveillance could be implemented through the mortuary registration ledgers. The challenge is that data entry be reliable enough so that when chances to analyze it arise, the results are accurate. The Police were a very reliable source of quantitative data. Further collaboration between MUHAS and the Tanzania Police Force would be useful. Data sets should be linkable.

Limitations

The principle investigator is not a native Swahili speaker. Mistakes based on language could have occurred; cultural meanings may have been missed. These potential problems and other sources of bias were ameliorated by being part of a multidisciplinary, multicultural, and multilingual team at the mortuary in which cross-cultural discussions could take place easily and frequently. The mortuary team validated the findings. The mixed-team approach was also important in uncovering differences in normative perceptions. Writing notes was instructive and therapeutic during field work; the resulting field notes have been important in clarifying and anchoring memories.

Although the qualitative data sets were not comprehensive, and would be difficult to incorporate into a passive surveillance system, it was extremely useful both in starting to describe subgroups and in gathering information about how to build an on-going surveillance system. The generalizability of the methods is wide. It is believed that they can be adapted to all mortuaries in Tanzania and inform surveillance in other low-resource settings.

Conclusion

The Injury Surveillance Guidelines were clear. Through small adaptations (addition of an open-ended question), and augmentation by easily available resources (newspapers), an abbreviated and limited use of a mixed-methods research design allowed measurement of incidence, examination of meaning and context, even for subpopulations with scanty data, and understanding of how to embed a surveillance system into everyday practice.

When setting up pilot surveillance systems, mixed-methods research is an important component to building a useful knowledge base. After the initial phase however, or if there are inadequate resources to support an ongoing active surveillance system, a basic passive surveillance system incorporating standardized coded variables embedded into daily practice would still be valuable.

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