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The Accuracy of Mortality Reporting in Displaced Persons Camps During the Post-emergency Phase

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For humanitarian organisations, accurate data are essential to identify emerging health problems and determine programme needs. We visited 45 post-emergency phase displaced persons camps and collected three months' mortality data which we compared with organisations' routine mortality reports. Organisations reported 612 deaths and we identified 741 deaths, for a mortality-reporting ratio, defined as the number of organisation-reported deaths divided by the number of investigator-identified deaths, of 83 per cent. For the majority of camps which under-reported deaths, mortality reporting ratios were significantly higher for women than men, and for camps with central mortality registers rather than those without. In the few camps which over-reported deaths, these occurred primarily among children younger than five years of age, probably due to the inclusion of abortions and stillbirths. Despite the overall under-reporting of deaths by humanitarian organisations, the existing health information systems appear to estimate mortality rates adequately in these post-emergency camps. However, organisations should improve the precision and completeness with which they report the characteristics of deaths in order to provide valuable data to target their programmes at the most vulnerable people.

Keywords: refugee, displaced person, mortality, post-emergency phase, mortality reporting ratio, health information systems.

Introduction

Complex humanitarian emergencies are defined as relatively acute situations affecting civilian populations, usually involving a combination of war or civil strife, food shortages and population displacement, resulting in significant excess mortality (Toole, 1995). In such situations, accurate and timely information is necessary for identifying emerging health problems and determining the needs of displaced populations (refugees and internally displaced persons), as well as for allowing humanitarian organisations to prioritise interventions and evaluate programmes. A properly functioning health information system (HIS) should provide health professionals with

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these data. In both the emergency phase (defined as >1 death/10,000 persons/day) and the post-emergency phase (defined as <1 death/10,000 persons/day) of complex emergencies (CDC, 1992; Burkholder, 1995), information on mortality is essential for identifying trends in the health status of displaced populations. During the emergency phase, the overall crude mortality rate (CMR) is considered one of the most useful tools in assessing the health of the population and the success of health interventions (Toole, 1990, 1993). When CMR exceeds a specific threshold (Sphere, 1998), or an increasing trend is observed, appropriate public health interventions must be implemented and targeted after demographic characteristics and the causes of death have been analysed.

Accurate reporting and recording of deaths can be difficult in displaced persons camps. Social, political, economic and cultural factors may make the reporting of deaths a sensitive issue (Harrell-Bond, 1992; Toole, 1997). The validity and reliability of such data may not be as high as desired, especially for deaths occurring outside health facilities (Toole, 1988; Elias, 1990). Previous effective mortality surveillance systems have relied upon a variety of data-collection methods, including hospital registers, camp management registers (Elias, 1990), community health worker registers, graveyard workers, burial shroud or coffin distributors, 24-hour graveyard surveillance (Toole, 1988), verbal autopsies (Marfin, 1994) and mortality surveys (Boss, 1994).

The aim of this study, as one part of a larger investigation, was to evaluate the accuracy of reporting and recording deaths in displaced persons camps during the post-emergency phase and to provide practical recommendations to improve the accuracy of mortality reporting through simple improvements in HISs. Health services in the 45 post-emergency camps included in this study were provided by national and international non-governmental organisations, government agencies and members of the Red Cross/Crescent Societies.

Methods

We visited 52 refugee and internally displaced persons camps in Azerbaijan (seven camps), Ethiopia (11), Myanmar (three), Nepal (seven), Tanzania (eight), Thailand (five) and Uganda (11) in which health services were run by a total of 10 organisations from November 1998 through March 2000. Camps selected for inclusion in the study were in the post-emergency phase (defined as having a CMR <1 death per 10,000 people per day; CDC, 1992), had relatively stable populations (defined as <5% change in population size during the three months before data collection), had a functioning HIS and had populations that depended at least partially upon outside organisations for both food aid and health-care.

For each HIS, we identified the actual data flow from data collection and reporting from health workers to analysis and final reporting, which usually consisted of a monthly report. Inefficiencies or deviations from the planned data flow, as documented by a flowchart, were noted. We used key-informant interviews, as well as direct observation, to determine each step of data collection, recording, analysis and reporting. A standardised HIS evaluation form, including a flow chart and a description of the attributes of the HIS (CDC, 1988), was completed for each organisation providing health services.

We selected mortality data from the three months before the month of our visit for all camps except one camp in Tanzania that had had a large influx of refugees two

months before and during our stay. In this camp, we collected three months' data beginning five months before our visit. Six camps were ineligible for this study because mortality data could not be directly collected by project investigators owing to logistical problems and time constraints. Two adjacent camps in Tanzania were reported as one camp because the health organisation combined both camps' mortality data for its monthly report.

As a result, the analysis included data from 45 camps served by nine different health organisations in seven countries. A project investigator evaluated the HIS and investigated and recorded deaths at each of these camps. Within a country, each health organisation generally had the same HIS in all of its camps. However, a health organisation usually did not have the same HIS in camps in different countries. Thus, although there were a total of nine different health organisations, two organisations worked in multiple countries (one in two countries and one in three countries) and their HISs in each country were analysed separately, resulting in the evaluation of 12 HISs.

Deaths reported by health organisations

As a part of normal HIS operations, camp health personnel collected mortality information from a variety of sources, including hospital in-patient departments, maternal and child health (MCH) centres, referral hospitals, community health workers (CHWs) and graveyard workers. The aggregation of reported deaths from different sources into one list varied greatly according to the HIS; reports were entered on to different types of forms, into various types of registers, or into a central mortality register. At the end of each month, data were forwarded to field headquarters and incorporated into a monthly report. The reported deaths were then transcribed from these monthly reports on to a standardised mortality form. For the purposes of this paper, all deaths reported by HISs will be referred to as 'organisation-reported deaths'.

Deaths identified by project investigators

Project investigators sought information on deaths using the same sources used by the health organisations within the camps. Furthermore, discussions and interviews with key informants, including community leaders, camp health staff, ambulance drivers and CHWs, were used as supplemental sources to collect and confirm information on deaths that may not have been reported to the HIS. Deaths identified in this way were recorded on a standardised mortality form with the following information: address, date of birth (or age at time of death if the date of birth was not known), date of death, sex and location of death (within or outside a health facility). Inclusion criteria included the following: death of a resident of the camp of interest that occurred during the three-month period of study. Stillbirths and late-term abortions were specifically excluded. Deaths recorded by investigators in this manner will be referred to as 'investigator-identified deaths'.

In this paper, the number of investigator-identified deaths is the actual number of deaths among the displaced population and is thus the standard to which organisation-reported deaths are compared. The mortality-reporting ratio is defined as the number of organisation-reported deaths divided by the number of investigator-identified deaths multiplied by 100. Whenever possible, individual organisation-

reported deaths were matched to investigator-identified deaths by the information on the standardised data-collection form.

Data analysis

Data were entered and descriptive and bivariant analyses were performed using SPSS version 9.0 (SPSS Inc., Chicago). Camp population size for each of the three months was provided by the health organisation. The average camp population during the three-month period was calculated by adding each of the three monthly population estimates, then dividing by three. The same average population estimates obtained from the health organisations were used for all rate calculations. Differences between means were tested by t-tests, and differences between percentages were tested by chi-square tests.

Results

The 45 camps ranged in size from 836 to 55,077 inhabitants, with a mean of 14,527 and a median of 12 044. The mean period from establishment of the camps until data for this study were collected was 5.9 years (range: 1.1–17.5). No characteristics, such as population size or location or type of HIS, differed between the six camps excluded from the study and the 45 camps included in the study.

Overall, 742 deaths were investigator identified compared with 612 organisation-reported deaths over a total period of 135 camp months of observation, a 21 per cent difference (see Table 1). In nine (75 per cent) of 12 HISs, the number of investigator-identified and organisation-reported deaths differed. Among these nine HISs, the number of deaths were over-reported in two (22 per cent) (there were more organisation-reported deaths than investigator-identified deaths), and the number of deaths were under-reported in seven (78 per cent) (there were more investigator-identified deaths than organisation-reported deaths). The number of investigator-identified deaths and the number of organisation-reported deaths differed in 25 (56 per cent) of the 45 individual camps studied. Of these 25 camps, the number of deaths were over-reported in seven (28 per cent) and under-reported in 18 (72 per cent).

HIS-specific CMRs calculated from investigator-identified deaths ranged from 0.28 to 0.52 deaths per 1,000 persons per month with a median of 0.39. The CMRs derived from organisation-reported deaths ranged from 0.21 to 0.52, with a median of 0.39. The overall CMR for all of the displaced populations, calculated from the total number of investigator-identified deaths and the total midpoint population, was 0.38 deaths per 1,000 per month (95 per cent confidence interval (95% CI): 0.35-0.41). Using the total number of organisation-reported deaths, the overall CMR of 0.31 deaths per 1,000 per month (95 per cent CI: 0.29–0.34) was significantly lower (t-test, $P<0.001$).

Ten (83 per cent) of the 12 HISs constituting 27 (60 per cent) of the 45 camps reported the age of the deceased. Overall, deaths of children under five years old were equally as likely to be reported as deaths of older people (age-specific mortality reporting ratios of 94 and 93 per cent, respectively; chi-squared, $P=0.7$). In camps which over-reported deaths, however, deaths of people less than 5 years of age were significantly more likely to be reported than deaths of people five and older (see Table

Table 1 Characteristics of the 12 HISs with the number of identified and reported deaths and the mortality-reporting ratio during the three-month study period, November 1998–March 2000

HIS	*No. of camps*	*Average population**	*No. of identified deaths*	*No. of reported deaths*	*% difference*	*Mortality-reporting ratio***
1	7	19,193	17	12	42%	71%
2	11	238,250	284	191	49%	67%
3	1	3,339	3	5	-40%	167%
4	7	98,101	88	88	0%	100%
5	2	19,378	22	22	0%	100%
6	2	68,032	96	82	17%	85%
7	3	94,029	86	78	10%	91%
8	2	10,837	17	17	0%	100%
9	2	16,602	22	20	10%	91%
10	5	47,303	71	61	16%	86%
11	1	27,667	23	20	15%	87%
12	2	10,988	13	16	-19%	123%
Total	45	653,718	742	612	21%	83%

* Calculated by adding the three-monthly midpoint population estimates for each camp and then dividing by three.
** The number of organisation-reported deaths divided by the number of investigator-identified deaths multiplied by 100.

2). The mortality-reporting ratio did not differ between age groups in those camps that under-reported (79 and 81 per cent, respectively; chi-square, P=0.8).

Eight (67 per cent) of the 12 HISs constituting 22 (49 per cent) of the 45 camps reported the sex of the decedent. Among the 305 organisation-reported deaths with a known sex, the female to male ratio was 1.00 to 0.94, while among the 325 investigator-identified deaths in those same camps, the ratio was 1.00: 1.04 (chi-square, P<0.001). In HISs that recorded decedents' sex, the mortality reporting ratio for women was higher than for men (see Table 2). This was also true for those camps that under-reported deaths (98 and 77 per cent, respectively; chi-square, P<0.001), as well as for those which over-reported deaths (100 and 67 per ccent, respectively; chi-square, P=0.02).

Three (25 per cent) of the 12 HISs constituting 10 (22 per cent) of the 45 camps reported where the death occurred. Overall, the mortality-reporting ratio for deaths in health facilities was similar to that for deaths outside of health facilities (see Table 2). In contrast, in camps that over-reported, the mortality-reporting ratio was higher for deaths within than for deaths outside of health facilities; however, this difference was not statistically significant (100 and 55 per cent, respectively; P=0.09). No camps that under-reported deaths recorded the location of death.

Three (25 per cent) of the 12 HISs constituting 20 (44 per cent) of the 45 camps used centralised mortality registers for recording deaths. The mortality-reporting ratio in HISs using centralised registers was higher than in HISs that did not use them (see Table 2). This was also true for camps in which deaths were under-reported (85 and 62 per cent, respectively; chi-square, P<0.001) but less so for camps in which deaths were over-reported (91 and 81 per cent, respectively; chi-square,

Table 2 Mortality-reporting ratios according to specific characteristics of the deceased or the HIS, November 1998–March 2000

Characteristics	*No. of HISs collecting data (no. of camps)*	*No. of investigator-identified deaths*	*No. of organisation-reported deaths*	*Mortality-reporting ratio**	*Chi-square P-value*
Age group	10 (27)				
Under 5		214	200	93%	0.7
5 and over		226	209	92%	
Camps that over-reported (7)					
Under 5		40	54	135%	0.003
5 and over		36	37	103%	
Sex	8 (22)				
Female		159	157	99%	<0.001
Male		166	148	89%	
Location of death	3 (10)				
Inside health facility		34	38	112%	0.8
Outside health facility		71	66	108%	
Presence of a central register	12 (45)				
Yes		271	259	96%	0.001
No		471	353	75%	

* The number of organisation-reported deaths for which specific characteristics were reported divided by the number of investigator-identified deaths for which the same characteristics were reported multiplied by 100.

P=0.2). Overall, only two (17 per cent) of 12 HISs reported all three characteristics of deaths: age, sex and location; eight (75 per cent) reported two of three characteristics; one (8 per cent) reported one characteristic; and one (8 per cent) reported none.

Discussion

The level of mortality reported by these 12 HISs was low. The addition of the 130 more investigator-identified deaths to the 612 organisation-reported deaths increased the overall CMR for all camps from 0.31 to 0.38 deaths per 1,000 persons per month. It is unlikely that humanitarian organisations would make major programmatic changes if the CMR increased by such a relatively small margin. Therefore, the current HISs appear adequately to estimate the CMR in these post-emergency displaced persons camps. However, in some individual camps with higher CMRs, if deaths had been reported more accurately, the CMR might have exceeded one death/10,000

persons/day, the threshold that indicates an emergency. This designation often results in an increase in political interest, media attention and, consequently, in more money being provided to the camp.

CMRs are generally much higher in the emergency than in the post-emergency phase (CDC, 1992; Spiegel, 2000). The former is usually much more chaotic; surveillance systems are generally of poorer quality than in the post-emergency phase, and population estimates are usually less accurate (Elias, 1990; Crisp, 1999). Consequently, the degree of under-reporting of deaths in the emergency phase is most likely higher than the 21 per cent found in this study. Therefore, implementation of the recommendations stated below could have a larger effect on the magnitude of the CMR reported by organisations if they are incorporated into HISs at the beginning of a complex humanitarian emergency.

Although the CMRs based on deaths reported by the HISs may adequately reflect the actual death rates in the 45 camps, other characteristics of deaths are not reported precisely or completely. Some HISs did not report the sex or age of the decedents, a majority did not report the location of the death, and few reported all three characteristics. The results of such incomplete data may have important implications for programmes. For example, if women constitute 55 per cent of a certain camp's population but account for only 25 per cent of patients dying in hospital and 75 per cent of people dying at home, access to medical care for woman needs to be investigated. Furthermore, except for categorising deaths into the crude age groups of under five years and five years and over, few HISs reported the exact age of the decedent. As a result, HISs could not calculate more age-specific mortality rates. Age-specific mortality rates among neonates, infants and the elderly are often helpful in detecting vulnerable groups (Davis, 1996) and directing health programme decision-making (Elias, 1990; Burkholder, 1995).

For the reasons stated above, we recommend that each death be recorded with a minimum of the following information: name, address or location of residence, date of death, date of birth (or age at death if date of birth is unknown), sex, nationality (displaced person, local), cause of death and location of death. These data will provide sufficient information to describe important mortality patterns to identify vulnerable groups.

Mortality-reporting ratios that exceeded 100 per cent resulted when organisation-reported deaths were misclassified. Camps that over-reported deaths did so mainly in children under five, possibly because of the inclusion of late-term abortions and stillbirths as deaths. This was verified when we examined reporting forms and MCH death registers and interviewed health-care personnel. Although recording and following the number of abortions and stillbirths are important, inclusion of such events in mortality report forms or registers will artificially increase the CMR and age-specific mortality rates for children. Over-reporting of deaths may also have resulted from 'double counting', when the same death has been independently counted more than once. This error appeared to be more frequent when the person responsible for the HIS collected numerous lists of deaths in the camp from different reporting sources but did not collate the deaths on to a central mortality register. Improvement in the training of health staff involved in collecting and reporting data is necessary to avoid the inclusion of late abortions and stillbirths and to prevent double counting.

Camps that under-reported deaths did so primarily among men. The investigators may have identified more men who died than were reported to HISs because men may seek access to health-care facilities less often than women. HISs in most camps did not actively collect mortality information at the community level, that

is, outside health-care facilities. HISs should be expanded to include sources of mortality not only from health facility-based personnel in the camp, but also from different members and groups within and outside of the community, including camp leaders, women's groups, local police, military, health clinics and referral hospitals outside the camp. Differential health-care access by sex and bias towards reporting deaths that occur primarily within the health-care system should be further explored by other studies.

Central-mortality registers improved the accuracy of reporting of deaths in camps. Health personnel in camps with central registers reported spending less time and resources on data collection and reporting. These personnel also reported less confusion and frustration with the HIS. Based on observations of many types of central registers, those that functioned well had at least the three following characteristics:

- the registry documented certain characteristics of decedents, described above;
- one person in charge of the register co-ordinated the roles of all people involved in data collection; and
- weekly meetings were held to discuss each reported death before its inclusion in the official report.

Overall, central mortality registers appear to improve the accuracy of mortality reporting by reducing double counting, by allowing for easy recognition and removal from the register of late-term abortions and stillbirths, and by providing a single place where all people involved in collecting data can record, clarify and compare the number and characteristics of deaths. Implementation of this and all other recommendations in this article will require appropriate training and supervision by the responsible organisation.

Our study has several limitations. In many places, referral hospitals neither recorded the nationality of persons who died nor reported such deaths to the health organisation in the camp. Therefore, we were frequently unable to record displaced persons' deaths from those institutions. Furthermore, other deaths may have occurred within or outside of the camps that we and the HISs did not detect. This may have resulted in an artificially low CMR and — depending upon the magnitude of the number of deaths missed — an artificially low mortality-reporting ratio as well. Moreover, official population figures in displaced persons camps are generally higher than the actual number (Crisp, 1999). However, because the same population estimate was used as the denominator for both organisation-reported and investigator-identified death rates, population over-estimates would equally affect each rate, and this factor would not bias our estimates of the mortality-reporting ratio. As with all retrospective studies, recall bias may have occurred. We tried to minimise this bias by using numerous sources and triangulating the information on each death whenever possible.

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