Mortality estimates among Liberian IDPs in Monrovia, 2000-2004

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Liberia’s civil war lasted more than fourteen years, ending in August 2003. During the conflict, nationally reported crude death rates increased from pre-conflict levels of the 1980s. However, fighting and insecurity precluded population-based assessments, and minimal information on conflict-related mortality is available. The present study estimated mortality among internally displaced persons (IDPs) in the greater Monrovia area and was based on a sample of 378 households with 2,134 individuals over a recall period from the July 2000 invasion by rebel forces to September 2004. A crude mortality rate of 22/1,000/year (95 CI: 19-25) or 0.6/10,000/day (95 CI: 0.5-0.7) was found among Monrovia IDPs and excess mortality was estimated at 6/1,000/year (95% CI: 3-9). The most deaths occurred in 2003, with the death rate peaking during a cholera outbreak. Of 242 reported deaths, 60% (95 CI: 54-66) were attributed to illness and 33% (95 CI: 27-39) to violence.

Introduction

Population data is an essential element of the response to emergencies that provides a basis for decision making and planning of relief efforts. Organizations providing humanitarian assistance must establish priorities and initiate responses that will save the most lives and quickly reduce the impact of the emergency on those affected. Assessment and continued monitoring of the surviving population
are essential, yet in many in complex emergencies relatively little information on the population status is available. In many cases, assessments are not prioritized because they are seen as diverting resources from the provision of relief and because the technical capacity of organizations is often limited. Additionally, security concerns often prevent organizations from undertaking such assessments, particularly in the context of conflict. The crude mortality rate, which reflects the total number of deaths per 1000 individuals in a population, is a particularly important indicator of population status and is the basis for defining emergencies. When the crude mortality rate exceeds three times the baseline mortality rate or 1/10,000/day in cases where baseline mortality is unknown, the situation is classified as an emergency (Toole and Waldman 1990; The Sphere Project 2004).

There have been few attempts to estimate crude mortality rates during or immediately after conflicts using population based methods, though there are notable exceptions. The International Rescue Committee (IRC) found that 3.3 million Congolese have died as result of conflict, and that the mortality rate in the Democratic Republic of the Congo was higher than United Nations reports for any country in the world (IRC 2003). In Sudan, Médecins Sans Frontières found mortality rates as high as 9.5/10,000/day and reported decreased mortality rates in camps, though the level remained above the emergency benchmark (Depoortere et al. 2004). In Darfur, mortality was estimated by multiple groups but there was difficulty in reaching consensus on the actual number of deaths because of methodological concerns with the disparate estimates. In Iraq, deaths following the American-led invasion were estimated at 655,000 in mid-2006 which accounts for 2.5% of the Iraqi population (Burnham 2006). While the funding and resources for national mortality surveys are often limited, much can be learned from smaller assessments conducted by providers of humanitarian assistance in areas where relief is being provided. Methodologies are not complex nor are they resource- or time-intensive, and they are within the capacity of many relief organizations.

Liberia is an example of a country where no population-based assessments of mortality have been recently been conducted as a
result of continuing conflict and insecurity. Civil war has threatened the Liberian population for over a decade. In addition to large-scale displacement, protracted violence and political instability have disrupted delivery of basic social services and increased the vulnerability of the population to poverty, food insecurity, and disease. In the absence of population-based data, media sources have estimated that more than 200,000 people were killed in Liberia’s civil war and thousands more fled the fighting as refugees or internally displaced persons—IDPs (BBC News 2005). At the end of the conflict in 2003, prolonged fighting had resulted in the internal displacement of an estimated 532,000 people with an additional 335,000 fleeing the country as refugees in Cote d’Ivoire, Guinea, Sierra Leone, Ghana, and Nigeria (UNDP 2004). The number of IDPs rose dramatically in mid-2003 as a result of renewed violence between Charles Taylor’s government and opposition groups. In April 2003, there were an estimated 200,000 IDPs, a figure that increased to more than 500,000 by the end of summer with over 300,000 IDPs residing in camps in the greater Monrovia area (USCRI 2004).

In August 2003, a peace agreement ended 14 years of civil war and prompted the resignation of former president Charles Taylor. A transitional government composed of rebel, government, and civil society groups was established and assumed control in October 2003 with a two-year mandate to oversee efforts to rebuild the country until national elections were held in late 2005. The United Nations Mission in Liberia continues to maintain a presence, and the security situation remains volatile but is gradually improving. In the course of a field trial of a point-of-use water treatment product that was conducted between June and September 2004 in IDP camps around Monrovia, we conducted a retrospective mortality assessment. The objective was to characterize mortality among this population of IDPs over a four year-period of renewed conflict and quantify the consequences of warfare on a subset of the civilian population. We recognized that the group of IDPs surveyed may not be representative of other populations in Liberia. Nevertheless we felt this type of information would provide important insights on the experience mortality of a population which has been affected by prolonged conflict.
Methods

Mortality data was collected in two IDP camps, Last Displaced Camp and Morris Farm, in Paynesville. This is an administrative area within greater Monrovia area that hosted numerous IDP camps. The data were collected for monitoring and evaluation purposes in an effectiveness trial of a point-of-use water treatment product (Doocy 2006). The study population includes a systematically selected sample of 200 households from each camp, with a total sample of 400 households. Study sites were identified based on water supply characteristics because the original study focused on point-of-use water treatment and were restricted to the greater Monrovia area due to security concerns.

Last Displaced Camp is a relatively large camp, with approximately 3,000 households or a total population of around 17,000. Last Displaced Camp is organized into seven blocks; of these, three blocks were selected to participate in the study because they were reported to have the worst access to water and sanitation. Morris Farm is a smaller camp with approximately 1,015 households and 5,800 individuals with one primary water source. Children were expected to benefit from point-of-use water treatment more than older age groups so, to be eligible for participation in the study, at least one household member had to be less than five in years age. The vast majority of camp households met this criterion. A systematic sample of Last Displaced Camp households in participating blocks and all households in Morris Farm was identified by selecting every nth household in the respective areas for participation.

Data on household composition, including the age and sex of current household members, was obtained at the beginning of the point-of-use water trial. This information was verified in the exit survey and retrospective mortality data was collected. The recall period for mortality was four years and two months and began in July 2000. This was a widely recognized time point when the Liberians United for Reconciliation and Democracy (LURD) forces invaded Northwest Liberia from Guinea and conflict was renewed. Households reported births, deaths, and both in- and out-migration from the LURD invasion through September, 2004. In-migration
was defined as people that moved into the household and were also members of the household at the time of the survey; out-migration was defined as people who moved out of the household and did not return. Respondents classified the cause of death into four categories (sickness, violence, conflict, or none of these); verbal autopsies were not attempted.

The exit survey was conducted by six project staff who oversaw the point-of-use water trial. Staff received one week of training prior to the point-of-use water trial and also received instruction in interview techniques and data collection over the course of the trial. A mid-interval population for the recall period was determined using standard methods (current population – ½ births + ½ deaths – ½ in-migrations + ½ out-migrations) and was employed as the denominator for all rates. Data analysis was performed using STATA Version 8 (Stata Corp, College Station, TX) and SPSS Version 12.0 (SPSS Inc., Chicago, IL). The study was approved by the Committee for Human Research at Johns Hopkins School of Public Health and the Liberian Ministry of Health.

Results

Demographic and mortality data were collected from 400 households, though implausible data was reported by 22 households that were subsequently excluded from the analysis. Demographic and mortality findings are based on results from 378 households with a total population of 2,134 individuals at the time of the interview in July, 2004. Average household size at the time of the survey was 5.7 (95 CI: 5.5-5.8) and a mid-interval population of 2,644 was calculated. A total 569 births were reported with 79% (95 CI: 74-83) of households reporting one or more births and an average of 1.5 (SD = 1.2) births per household. Deaths were reported in 37% (95 CI: 32-42) of households, with an average of 0.6 (SD=1.1) deaths per household and a total of 242 reported deaths. In and out migration were reported in 36% (95 CI: 31-42) and 82% (95 CI: 78-87) of households, respectively. Over the recall period, a total of 216 in-migrations and 1,562 out-migrations were reported with an average of 0.6 (SD = 1.1) in-migrations and 4.2 (SD = 3.3) out-migrations per household.
A population pyramid was constructed for the displaced population of study. Because of the relatively small sample size and selection factors that shaped the composition of IDP populations and the sample, the population pyramid of the study population does not approximate that of the Liberian population as a whole (Figure 1). When compared to Liberian national pyramid, the sample IDP pyramid shows fewer adult males and more adult females which results in skewing of the pyramid; in addition, the sample population had a larger proportion of young children than the project Liberian population.

**Figure 1: Liberian Population Pyramids**

*Bars represent five year age categories with the 0-5 age group at the bottom of the pyramid. Males are depicted on the left side of the pyramid and females on the right side of the pyramid. The number corresponding to each bar indicates the percent of the total of the population comprised by individuals of the respective sex in the five year age category. The projected population pyramid is based on data from the US Census Bureau International Database (2005).*
The crude mortality rate between July 2000 and September 2004 in the IDP population sampled was 22/1,000/year (95 CI: 19-25) or 0.6/10,000/day (95 CI: 0.5-0.7). Deaths among children under five years of age accounted for 26% (95 CI: 21-32) of all deaths. There was no significant difference in the probability of death by county of origin (p = .869), ethnic group (p = .651), length of displacement (p = .334), or prior residency in other IDP camps (p = .328).

Of reported deaths, 60% (95 CI: 54-66) were attributed to sickness, 33% (95 CI: 27-39) were due to violence or conflict, and 7% (95 CI: 4-11) were the result of other causes. Males accounted for a slight majority of deaths at 56% (95 CI: 50-69) of reported deaths. Violence and conflict accounted for significantly more deaths among males as compared to females: 42% (95 CI: 34-50) of male deaths were due to violence as compared to 21% (95 CI: 14-30) among females. Violence was 2.7 (95 CI: 1.5-4.7) times more likely to be the reported cause of death among males as compared to females.

Deaths were not constant over the four-year period between July 2000 and September 2004. While the average crude mortality rate during the interval did not exceed the threshold of 1/10,000/day used to classify situations as emergencies, this benchmark was surpassed five times between July 2000 and September 2004 (Figure 2). The death rate peaked in the third quarter of 2003 at 2.1/10,000/day (95

Figure 2: Mortality Among Liberian IDPs in the Greater Monrovia Area (July 2000-September 2004)
CI: 1.8–2.3); the increased mortality in this interval can be attributed to a cholera epidemic in addition to a rebel incursion on Monrovia during this period (CDC, 2003). In three of the five quarters where death rates reached emergency levels, more deaths were attributed illness than violence. In the remaining two quarters with elevated death rates, mortality due to sickness and violence were comparable.

**Discussion**

Crude mortality rates among Liberian IDPs in two camps in the greater Monrovia area exceeded the humanitarian emergency threshold level of 1/10,000/day multiple times between 2000 and 2004. The majority of deaths were disease-related, which is not entirely unexpected given squalid living conditions. In other conflict settings, indirect causes of death such as inadequate access to water, sanitation, and health services have accounted for most civilian deaths (Toole 1990; Roberts 2003; Sapir 2006). The highest crude mortality rate coincided with the July 2003 cholera outbreak. Diarrheal disease outbreaks have previously been associated with significant mortality among displaced populations in camps settings. The most notable example is of Rwandan refugees in Goma, Zaire in 1994 when 50,000 refugee deaths over a one month period were attributed to cholera and shigella outbreaks (Goma Epidemiology Group 2004). Deaths from sickness peaked during the third quarter of each year with the exception of 2001 where the deaths from illness were greatest in the second quarter. These annual spikes coincide with the rainy season and are likely represents deaths from diarrheal illness and malaria. A recent survey of Liberian IDPs estimated that diarrhea and malaria account for 18% and 11% of all cause mortality, respectively and reported the majority of deaths occurred in the third quarter months of July and August (Valderrama 2002).

The crude mortality rate estimated in the present study, 22/1,000/year (CI:19-25), is statistically similar to but slightly higher than national estimates for 2002 reported by the UNDP and World Bank at 19/1,000/year in 2000 and 20/1,000/year (UNDP 2004; World Bank 2004). The higher death rate observed in the study population may be attributable to increased vulnerability resulting from displacement and
poor living conditions in addition to differences in population structure. A rigorous comparison of study mortality rates with national mortality estimates is not appropriate because of the limited size and representativeness of the sample however, it is illustrative an important point regarding the paucity of mortality assessments in conflict settings.

National figures, such as those cited above from UNDP and World Bank, are typically based on census projections and estimated mortality rates, often with adjustments for increased deaths resulting from conflict. These estimates are rarely, if ever, based on data collected during conflict and are not designed to track rapid changes in death rates that are commonly observed in emergencies. Population-based assessments are the ideal method for estimating mortality and provide a more complete estimate of deaths than passive surveillance methods such as vital events reporting. One recent study found that, aside from Bosnia, there was no conflict situation in which passive surveillance recorded more than 20% of deaths measured in population-based methods. Moreover, deaths recorded by facility-based methods underestimated events by a factor of ten or more when compared with population-based estimates (Burnham 2006).

However, no population-based assessment of conflict-related mortality in Liberia has been conducted to date and estimates of conflict mortality that are representative of the national population and indicative of trends over time are not available. This presents a challenge to providers of humanitarian assistance in that key demographic characteristics of beneficiary populations (size, mortality rate, cause of death, etc.) that are important in the planning and prioritization of humanitarian assistance are often unavailable. The present study is an example of how basic population data can be collected in the program context with minimal additional cost, time requirements, or technical skills. Methodologies and toolkits designed for larger scale population-based mortality assessments by humanitarian assistance providers have also recently been developed; one example is the Standardized Monitoring and Assessment of Relief and Transition (SMART) Initiative (The SMART Initiative 2006). Assessments of demographics and population status can be successfully nested in program activities or surveys that are routinely car-
ried out by NGOs. Not only are these feasible in challenging contexts such as conflict-affected areas, they also can provide current information for planning relief efforts.

While no national estimate of conflict related mortality exists, it is possible to use study findings to estimate mortality among the displaced population in the Monrovia area. There were approximately 200,000 IDPs in the Monrovia area in late 2003 (Humanitarian Information Centre 2003). Mortality estimates in this study were based on an adjusted population of 2,644 IDPs or 1.3% of the total IDP population in the greater Monrovia area. Assuming that mortality rates of Monrovia IDPs are similar to that of the sample, excess mortality among IDPs can be estimated. Prior to conflict, Liberia’s crude mortality in the late 1980s was 16/1,000/year; the rate increased through the 1990s and has remained elevated. If death rates in the Monrovia IDP population were similar to the national average in the late 1980s, the excess death rate for the 2000-2004 survey period is an estimated 6.0/1,000/year (95 CI: 3.2-8.8). Applying this rate to the Monrovia IDP population of 200,000, there would have been an estimated 18,480 total deaths and 5,040 excess deaths between July 2000 and September 2004.

The primary limitations of this study relate to sampling. First, the study sample was drawn from only two IDP camps in the Monrovia area, which potentially limits the generalizability of findings. Most Monrovia IDP camps were established within a relatively short time frame, which hopefully served to limit potential biases that could arise from selection factors such as migration patterns and length of time residing in camps. Second, only households with children under five were included in the sample. While the vast majority of IDP households fell into this category, such criteria potentially could result in 1) a skewed study population that over-represented younger age groups; 2) overestimation of the crude mortality rate due to higher death rates among children than in the general population; and 3) an observed proportion of conflict-related deaths that is lower than the actual proportion of conflict deaths because of the over-representation of children in the sample and the exclusion of individuals (notably males of fighting age) not residing in established camps. Converse to the possibility of over-reported deaths due to the sample design, survivor bias is a real concern in this study, particularly
with 15% of households reporting caring for orphans, which may have resulted in the underestimation of mortality where households with no adult survivors were excluded from the study.

Conclusions

The crude mortality rate among displaced populations in Monrovia, Liberia between July 2000 and September 2004 was found to be 0.6/10,000/day (95 CI: 0.5-0.7). The threshold of 1/10,000/day used for classifying emergencies was surpassed five times during the interval, with crude mortality peaking at 2.1/10,000/day (95 CI: 1.8-2.3) in late 2003 during a cholera outbreak. Sickness accounted for the majority of deaths, with one-third of fatalities attributed to conflict. The highest death rates were consistently reported during the rainy season, indicating a need for increased attention to sanitation and environmental health issues by relief organizations during this period of the year in particular. When extrapolating study findings to the displaced population in the Monrovia area, there were an estimated 5,040 excess deaths among displaced households between July 2000 and September 2004.

In complex emergencies there is often a paucity of information on population status. Mortality is one such measure of population well-being that can be used in the targeting and planning of humanitarian assistance. Assessments that incorporate demographic, population, and health indicators can be conducted by NGOs and other providers of humanitarian assistance, either in the context of ongoing programs or as population-based surveys, with few additional resources and at a relatively low cost. Characterizing and understanding the status of target beneficiary populations should be a priority of NGOs and would improve their ability to provide effective humanitarian assistance.

References


