

Mortality in Eastern DRC
Results from Five Mortality Surveys
by
the International Rescue Committee
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Executive Summary

To guide health programs and quantify the levels of civilian death and violence in the eastern Democratic Republic of Congo (DRC), the International Rescue Committee (IRC) conducted a series of five mortality surveys. These surveys took place between April 18 and May 27, 2000. The areas surveyed included: the city of Kisangani (in collaboration with MSF Holland), the Katana and Kabare Health Zones, the Kalonge Administrative Zone and approximately 1,000 square kilometers surrounding Moba. These sites represent three of the five eastern provinces within DRC and have a collective population of 1.2 million.

The 1,011 households visited contained 7,339 living residents, who reported 606 deaths among their household members since January 1, 1999. From the information provided the IRC reports that:

- **1.7 million excess deaths or more have occurred over the past 22 months as a result of the fighting in eastern DRC.** This equates to 77,000 deaths per month and of that, 26,000 (34%) are children younger than five years of age.
- **There are many children younger than two years old missing from the demographic profile.** Compared to the number of three and four year olds, there are 30% to 40% fewer children under two years of age than would be expected. The data collected indicate that the particular hardships endured by women may play a role in the shortage of young children. Specifically within the interviewed families, 3% of full-term births resulted in maternal death, and adult death from malnutrition was an almost exclusively female phenomenon.
- **Violent deaths and other “nonviolent” deaths are inseparable in eastern DRC.** Those places and times where infectious disease deaths were highest were the same as where violent death rates were highest. Moreover, the displacements and economic hardships induced by armed combatants play either a direct or an indirect role in all of the excess deaths described.
- **Violence against civilians appears to be inflicted by all sides.** Among the 69 deaths attributed to violence, family members reported that the deaths were committed by the Interahamwe and the RCD at a similar frequency.
- **Violence against civilians appears indiscriminate.** Women and children constituted 47% of the violent deaths reported.
- **Eastern DRC is an unchecked incubation zone for disease.** In the five surveys conducted, both endemic and epidemic illnesses are rampant, with major (suspected to be more than 500 deaths) outbreaks of cholera, shigella and meningitis reported by households. Suspected polio was reported in two of the five areas.
- **The overall mortality rate during the year 2000 is higher than it was in 1999.** Thus, none of the collected information indicates that the rates will decline in the foreseeable future.

The death toll from this war has consistently been woefully underestimated (see New York Times, Feb. 6, 2000), and the humanitarian response to date appears disproportionately small compared to that in other recent crises. It is hoped that those who have influence over the warring parties and over the processes which may bring peace will add a sense of urgency to resolving this conflict. Independently, the humanitarian community needs to increase the level of support to the area. Until then, 2,500 excess civilian deaths per day will mark the time spent waiting for peace.

Background

In 1994, as a consequence of the genocide and civil conflict in Rwanda, more than one million refugees poured across the eastern border of the country, then called Zaire. North and South Kivu, the provinces that are adjacent to Rwanda, had experienced political tensions and volatility for years, in part because of their inaccessibility from the capital, Kinshasa. The arrival of Rwandan refugees in Zaire instigated a new level of tension and instability. In 1995, many of the same individuals who had participated in the genocide in Rwanda and were now residing in Zaire again instigated a campaign of ethnic persecution. The Hutu militia, referred to as the Interahamwe, and members the former Rwandan military (ex-FAR) fomented and induced conflicts with the Zairian Tutsis in the Kivus and carried out violent attacks inside neighboring Rwanda. The government of then President Mobutu Sese-Sekou was, at the least, ineffective at protecting both the Zairian Tutsis and Rwanda, and may have been complicit in the ethnic persecution. As a consequence, a coalition of forces including Zairian Tutsis, and the Rwandan and Ugandan governments, backed an anti-Mobutu revolution that was led by Laurent Kabila. The Kabila forces swept across Zaire and, within months, had overthrown one of Africa's most enduring leaders. In May, 1997, they rechristened the nation as the Democratic Republic of Congo (DRC).

In the months that followed Kabila's rise to power, the relations between the new regime and the Rwandan and Banyamulenge forces that had led it to power underwent a rapid decline, as did the security situation in the Kivus. Thus, in August 1998, an alliance of powers that had once supported Laurent Kabila led a counterrevolution against his regime. The RCD (*Rassemblement Congolais pour la Democratie*), backed by Uganda and Rwanda, took control over much of eastern DRC and fought Kabila's forces as they moved toward the west. The Kabila government sought and received support from Zimbabwe, Angola, Namibia and Chad, thwarting the RCD's chances for a rapid overthrow of the Kinshasa-based administration.

Now, twenty-two months after the start of the anti-Kabila counterrevolution, this conflict continues. While the Kabila forces still control Kinshasa and much of western DRC, the RCD forces generally control the Kivus and much of Orientale, Katanga and Maniema Provinces. Over this period of time, while the lines have remained similar, the civil war has become much more complex. The Rwandan Hutu forces, which in many ways catalyzed this conflict, have received considerable support from the Kabila forces. Moreover, they have become allied with indigenous fighters known as the Mayi-Mayi. Historically, the Mayi-Mayi were a cultlike group of rural warriors. Today, the term *Mayi-Mayi* is used to describe a variety of anti-RCD Congolese forces.

Further complicating the war are the economic interests that have evolved over the course of the conflict, particularly related to diamonds and gold. The priorities have become so blurred that on two occasions in the past year, Rwandan and Ugandan forces, theoretically allies, have fought each other in Kisangani.

Within this setting, the International Rescue Committee has been working in South Kivu, DRC, since 1996. Most of the IRC's activities have been related to supporting the fledgling health care system, improving infrastructure through construction projects, and preventing disease outbreaks through vaccination campaigns, water source improvements and improving sanitary conditions. In February 1999, the IRC conducted a mortality survey in Katana Health Zone which revealed a measles outbreak that had killed 1,400 children. The survey results instigated a rapid allocation of funds by OFDA (the U.S. Office for Foreign Disaster Assistance) and enabled the IRC to conduct a vaccination campaign with the Ministry of Health. This year, IRC Bukavu sought to conduct similar surveys in three health zones, two where IRC is presently working and a third where it intends to begin work soon. The results will hopefully be used to guide health policy. In an attempt to obtain insight into the mortality conditions throughout eastern DRC, two additional populations were surveyed in locations where IRC has no immediate plans to work. The results of these five surveys are contained herein.

Methods

Two approaches were employed for selecting households for inclusion in the surveys. When the approximate population size and location were known, a systematic sample proportional to population was employed. When the size and location of the population were not well known, a systematic spatial sampling regime was employed.

Systematic Sample Proportional to Population, Two-Stage Cluster (for Kisangani, Kabare, Moba)

a) A sample size was selected to enable the detection of a doubling of mortality above the baseline rate over a one-year period. Baseline mortality was assumed to be 1.5/1,000 pop./mo. This calculation made the assumption that visiting clusters of five households each would have the effect of reducing the statistical power of the sample (the "design effect") by 50%. For example, including 20 clusters of five houses (100 households) was assumed to result in a sample with equal statistical power to a random sample of 50 households.

b) Clusters of five houses were assigned to specific clinic areas by a systematic assignment technique, which allocated a number of clusters proportional to the population of each clinic area. A list of the clinic area populations was constructed with a cumulative total listed beside each entry on the list. The total population to be surveyed was divided by the number of clusters sought in order to define the sampling interval. A random number was selected between 1 and the sampling interval. Where that number fell in the cumulative list was assigned a cluster. The sampling interval was repeatedly added to that number, and the clinic areas corresponding to the cumulative sums were assigned clusters (as with the WHO, EPI methodology). The population figures were provided by local authorities or from the IRC's experience in the area.

c) Within each clinic area, a crude map was made, usually by measuring the distance across the clinic area with a GPS (global positioning system) unit. An imaginary grid system was superimposed on the map. Random numbers were selected, which corresponded to a location on the imaginary grid. For example, if an area was 1.00 km north-south by 1.00 km east-west, and the reference point (0,0) was the south-west corner, two numbers between 001 and 100 would be chosen. The first number would correspond to how many tens of meters north interviewers would go from the reference point, and the second number would correspond to how many tens of meters east they would move to the starting point. The distance and magnetic heading to that location were calculated, and a GPS unit was used to guide investigators to that point (± 10 meters). The five households closest to the chosen location were visited.

d) If no one was home or if a household refused to be interviewed, that house was skipped and the next was visited. The age and gender of each household member was recorded. If there was a question about whether someone was part of a family, only those who had slept in that household on the preceding night were included. Interviewees were asked if anyone in their household had died since Christmas 1999 or during the year 1999. The age of the decedent at the time of death, month of death and cause as reported by the family were recorded. If someone did not know the age of an individual or the exact month of a death, the interviewee was asked to give a best estimate.

Spatial Sampling (for Katana)

- 1) A random starting location was chosen on the main north-south road within the southernmost 7 km of the health zone.
- 2) At that location on the road, investigators chose a random number between 1 and 1,000 and went east that many meters. That spot will be referred to as the first sampling point.
- 3) The five households closest to that point were interviewed. Houses were asked the same questions as in d) above. The distance from the fifth (farthest) hut to the first sampling point was estimated. This distance will be referred to as the radius of the sampling point. Thus, the radius defines the size of a circle that would need to be placed around the sampling point in order to include five households. This was done to ensure during the analysis that the oversampling of rural populations, as commonly occurs with spatial sampling, was not creating a systematic bias.
- 4) Using a GPS unit, the second sampling point was identified 1.00 km east of the first sampling point. Steps 3 and 4 were repeated. This process of moving 1.00 km east and interviewing five households was repeated until interviewers reached the shores of Lake Kivu.
- 5) Interviewers returned to the first sampling point and began to move in increments of 1.00 km to the west, interviewing five households and measuring the radius of the sampling point at each location. This process continued until security constraints prevented further westward movement. A line of sampling points will be referred to as an east-west transect.
- 6) Steps 2 through 6 were repeated at increments of 7 km north and south up and down the road. This resulted in east-west transects running parallel across the study area. A spacing of 7 km was initially chosen in an attempt to have a sample size of 1,600 individuals.

Empty households that did not appear abandoned at the time of the visit were assumed to be of the same household size as the others in the sampling radius and were included in the estimated population within the radius.

Spatial Sampling (Kalonge Displaced)

The exact location of IDPs (internally displaced persons) within Katana, Kabare and Bukavu is not known. Moreover, indications from the Red Cross and IRC local staff were that many of those registered as displaced to receive food rations were actually local residents. The issue became so problematic at the time of the survey that after receiving death threats, the Red Cross ceased all distributions to the displaced in Bukavu. Interviewers felt that because of the unique dialect of Mashi spoken by the residents of Kalonge they were able to confirm the true residents through interviews in lieu of identifying the displaced through official registration lists.

The method by which the displaced were sought was different in Bukavu City than it was in the rural settings of Katana and Kabare. In Bukavu, more than 90% of the displaced were reported by the Red Cross to be in two large neighborhoods. Interview teams went to the geographic centers

of those neighborhoods, as defined by our local driver, and walked on a compass heading until the edge of the neighborhoods. The direction was usually chosen to be perpendicular to the road on which the car had arrived. As the teams proceeded, they inquired about the presence of the displaced from Kalonge. When an individual or family was identified, the interviewers engaged them in informal conversation about their home village, how long they had been in Bukavu, etc. When the interviewers were convinced that the family was truly from Kalonge, they explained why the IRC was there and asked if family members would be willing to respond to a few questions. Interviewers walked two opposite directions in the slum of Kadutu and three directions in Ibanda. Thus, the sample size was not fixed and was determined by the chance direction chosen. There was no attempt to re-interview the few displaced who were not at home at the time of the visit.

When encountered, the displaced in Katana and Kabare were identified in those locations where residents were interviewed for the ongoing mortality surveys. In Katana, this means that the displaced were sought in small areas (approximately a 400-meter radius) in a systematic spatial sample. Among residents of Katana, there had been a dramatic gradient in mortality rates during the IRC's 1999 mortality survey, with the northernmost latitudes experiencing more than twice the mortality of the southernmost reaches. The displaced were sought out until a quota was achieved for each range of latitude in proportion to the Red Cross estimates of the Kalonge displaced in each area. In Kabare, the same process of visiting the displaced in the vicinity of resident household clusters was followed, except that the resident clusters were identified using the WHO, EPI survey methodology (systematic, proportional to population). Never were more than 10 displaced households visited within the same 400-meter radius and usually fewer than three were in the same location. IDPs were asked the same three questions as described in d) above.

Mortality rates were reported for both the Bukavu displaced and the Kabare and Katana displaced in combination. Overall mortality estimates were weighted according to the estimated displaced in the urban versus rural areas as estimated at a meeting of the NGO community. The best estimate was that the Bukavu estimate comprised 31% of the weighed estimate. As no displaced in Walungu were interviewed, it was assumed that their mortality experiences were similar to those displaced in Katana and Kabare.

Cause of death data and age breakdown data were not weighted according to whether the displaced are presently living in Bukavu versus Katana and Kabare. This is because i) the causes of death appeared to be generally similar between zones, and ii) the numbers of deaths from any given cause were small.

Confidence intervals were calculated assuming that the design effect of the cluster sampling was two. Because the sample of displaced persons from Bukavu represented 45% of the households interviewed but only 31% of the Kalonge displaced, the mortality among the Bukavu displaced was weighted to contribute only 31% to the overall mortality estimates. Likewise, the number interviewed in Bukavu was reduced by 45% ($45\% \text{ of sample} / 31\% \text{ of true population} = 1.45$). Both of these assumptions for the creation of confidence intervals are believed to be conservative and to credit the sample with less power than it really possesses.

Analysis

Crude mortality rate (CMR) was defined as [the number of deaths/the number of living + dead people in the population during the recall period – those not born at the midpoint of the recall period] X 1,000/the recall period. Mortality in this report is expressed as deaths/1,000

population/month. (For comparison to the “emergency” mortality unit of “deaths/10,000/day”, 3 deaths/1,000/mo. = 1 death/10,000/day.)

Because the recall period was typically 16 months, the <5 CMR was calculated to compensate for the fact that children born five years and four months before the interview would no longer be considered <5 (in our denominator) but had the opportunity to die as four-year-olds during the recall period. Thus, for a 16-month recall, the denominator should include those children presently <5, plus some fraction of the recall period when those children presently 5.00 years to 5.33 years were at risk of being included as 5 deaths. Thus, to compensate, the <5 deaths were reduced by 4 mo./60 mo. or by 6.7%. It was assumed that the number of children born during any period equaled the number of children turning five during any period. While this is usually not a valid assumption, a review of the results will show that it may be valid in eastern DRC. Thus, <5 CMR = deaths (adjusted down 6% to 7% depending on the recall period)/number of living children <5 + number <5 who died (adjusted down 6% to 7%) during the recall period X 1,000/recall period.

Because the under 1 mortality was typically based on data from a 16-month period, the rate was assumed to be (<1 deaths during 1.33 years of recall/1.33) / (children <1 + [deaths<1/1.33]) X 1000 / 12 months. The factor of 1.33 was used for the surveys occurring around May 1, the numerator for other studies was divided by the true recall period (e.g. 1.35 years, 1.4 years, etc.).

Confidence intervals were calculated assuming that the design effect of the cluster sampling was two. That is, if there were 1,000 people in the sample, for estimating the confidence interval, the sample was only given credit for possessing 500 people. This is believed to be conservative and to credit the sample with less power than it really possesses.

Individual Survey Results

Kisangani (conducted in conjunction with MSF-Holland)

Households visited:	220 (5 refusals)
Sample population:	2,305 (average HH size = 10.5)
Population <5 years of age:	15.7% (at the time of interview)
CMR* for 1/99 – 4/00:	2.6/1,000/mo. (est. 95% CI= 1.75 – 3.6) (102 deaths)
<5 CMR:	4.8/1,000/mo. (est. 95% CI = 3.6 – 6.0)
<1 mortality:	9.1/1,000/mo. (11% per year)

*CMR was measured in three health zones; the above rate is weighted by zone population.

The major causes of death for children < 5 years of age are shown in Figure 1. Major causes of death for those five years of age and above are shown in Figure 2. No one or two causes dominated the mortality profile, although malaria was the most commonly reported cause of death in both children and those five years and older. Of particular note is that five deaths were reported from meningitis and nine from malnutrition. No local officials reported meningitis as a problem over the preceding year in Kisangani. The five meningitis deaths in this sample of 0.57% of the population imply that many ($5/.0057 = 872$ estimated deaths, 95% CI = 40 - 1,800) meningitis deaths have recently occurred in Kisangani where there is little surveillance capacity to detect such problems.

Kabare

Households visited:	205 (1 refusal)
Sample population:	1,273 (average HH size = 6.2)
Population <5 years of age:	19%
CMR for 1/99 – 4/00:	2.7/1,000/mo. (est. 95% CI= 1.7 – 3.7) (57 deaths)
<5 CMR:	5.8/1,000/mo. (est. 95% CI = 3.6 – 6.0)
<1 mortality:	20.0/1,000/mo. (24% per year)

Over the entire recall period, the <5 CMR was 5.8/1,000/mo., but a disproportionate amount of this mortality was among those <1, who had a mortality of 20/1,000/mo. This means that 24% of children born during, or in the months before the recall period died in their first year of life. Figure 3 shows the causes of death among children <5 years of age. The major cause of death was the practice of uvulectomy, the removal of the uvula by traditional healers. One 12-year-old also died from an uvulectomy. In this culture, children with throat or respiratory infections often have their uvula removed in the belief that this will cure their illness. Most of the deaths resulted from secondary infections associated with the surgery or from blood loss. The next most common causes of death among children were diarrhea and respiratory infections. “Other” deaths were distinguished as suspected infectious and non-infectious. The cause of death among those five years and older is shown in Figure 4.

Katana

Households visited:	170 (0 refusals)
Sample population:	1,219 (average HH size = 7.2)
Population <5 years of age:	14%
CMR for 1/99 – 4/00:	2.7/1,000/mo. (est. 95% CI= 1.7 – 3.7) (54 deaths)
<5 CMR:	6.9/1,000/mo. (est. 95% CI = 5.3 – 8.5)
<1 mortality:	11.7/1,000/mo. (14% per year)

Half of the deaths (27) reported by families were among children younger than five, with malaria (26%), malnutrition (22%) and diarrhea (11%) being the most commonly reported causes of childhood death (see Figure 5). Among those five years of age and older, the most common causes of death were violence (26%), malaria (19%), malnutrition and cholera (15% each) (see Figure 6). As with the survey conducted the preceding year, there was a trend of higher mortality the farther north in the health zone people lived (see Figures 7 and 8). A majority of the Katana residents in general, and of our sample population in particular, live in the south (where the east-west expanse is wider – thus allowing for more clusters per transect). Thus, the effect of insecurity in the north has little effect on the overall survey mortality estimate. For example, only 238 (20%) of the population surveyed lived in the northern Kalehe Administrative Zone (the most northerly 25 km) although they had a mortality of 4.7/1,000/month. This movement of the high mortality zone farther to the north as compared to last year is believed to reflect a movement of the zone of conflict farther from Bukavu since then.

Comment

While appearing contradictory, violence over the past year has become a more significant cause of death, while living conditions and access to the area has improved. There are at least two reasons for this contradiction: In late 1998, the Mayi-Mayi controlled the northern half of Katana, with the RCD controlling the south. Thus, a front cut Katana in half, across which little north-south travel was possible. Today, the RCD controls and patrols all of the main north-south road

in Katana, and truck traffic and commerce have recommenced. Second, during the February 1999 survey, concerned residents discussed violence between the Mayi-Mayi forces and the Rwandese or RCD forces. The violence described this year was largely attributed to the Interahamwe against the resident citizens. While the Mayi-Mayi and Interahamwe forces are allied, their effect on the residents of Katana may not be similar.

Kalonge Displaced

Households visited:	216 (0 refusals)
Sample population:	1,330 (average HH size = 6.2)
Population <5 years of age:	18%
CMR for 1/99 – 4/00:	6.4/1,000/mo. (est. 95% CI= 4.9 – 8.5)
<5 CMR:	14.1/1,000/mo. (est. 95% CI =)
<1 mortality:	17.0/1,000/mo. (21% per year)

In November 1999, a dramatic upturn in violence in the Kalonge “Collective” within Bunyakiri Territory resulted in more than 90% (estimated) of the population fleeing south and east to the areas near Bukavu. Thus, this newly displaced population provided the IRC with the opportunity to survey a population from the largely inaccessible interior of South Kivu. Moreover, it gave investigators access to a population that had experienced the level of violence commonly reported in Shabunda, Fizi and other areas where NGOs presently cannot travel.

Sixty-five households, containing 437 Kalonge displaced, were interviewed in Katana, along with 56 households, containing 345 individuals in Kabare, and 95 households with 548 individuals in Bukavu. The mortality of family members as reported by the interviewees presently living in Kabare and Katana, and the mortality among those presently in Bukavu is shown in Table 1.

Table 1: Crude Mortality Expressed as Deaths/1,000/mo. for Kalonge Displaced.

Period of Recall	Katana and Kabare	Bukavu
Jan. – Oct. 1999	3.8	2.9
Nov. – Dec. 1999	6.8	15.0
Jan. 1 - May 9, 2000	8.6*	18.9*

*Denotes a statistically significant difference, which could happen by chance less than 5% of the time.

The estimated overall (weighted) mortality among the Kalonge displaced from January through October 1999 was 3.5/1,000/mo. (95% confidence interval (CI): 2.0 – 5.0). From November – December 1999, the estimated CMR was 9.3 (95% CI: 3.9 - 14.7), and during 2000, it was 11.8 (95% CI: 7.7 - 15.9). Thus, combining these last two periods since the recent upturn in violence, the CMR has been 11.0 (95% CI: 7.7 – 14.3), or over the past half-year, 7% of the family members of these displaced have died.

Figure 9 shows the causes of death, as reported by the family members, for the period January – October 1999. Figure 10 shows the same information for the period after the increase in violence during November 1999. Of note in these two figures is the fact that the increased rate of violent death was also associated with an increase in mortality from other causes. The causes of <5 mortality over the entire recall period are shown in Figure 11.

Comments

The Kalonge IDPs who are currently residents of Bukavu experienced far more death, and presently have smaller families, compared to those displaced who are now in Katana and Kabare. It is possible that the people now living in Bukavu are, as a whole, more traumatized and less likely to go back to Kalonge. This implies that IDPs can partition themselves according to their pasts and/or futures. This example should be held up as evidence that: a) different services may be required for different segments of the same population, and b) great care needs to be taken in collecting information and drawing conclusions from IDPs.

Related to this last point, of the five mortality surveys described herein, this survey appears the most fraught with methodological limitations. The shortcomings of this survey include:

- Few NGO or MOH workers have been to Kalonge in the past six months, and we primarily have the word of the fleeing refugees that virtually everyone had left during April. If the fraction of the population left in Kalonge was small compared to the number of displaced, then the displaced constitute the main experience of the Kalonge population over the past 16 months. The IDP estimates in the Greater Bukavu area during April 2000, add-up to the pre-crisis estimate of the entire Kalonge population. It is likely that the old population estimates were used at the time by Red Cross and government officials to estimate how many displaced were in the Bukavu area. Evidence that the April displaced population figures were influenced by the knowledge of the former Kalonge population is revealed in the fact that the Kalonge IDP estimate (59,000) was exactly equal to the government's former estimate of the population, in spite of the fact that 7% of the interviewed families' members have died in the past six months, and 10.5% in the past 16.2 months.
- Violence appears to cluster by household. There were a couple of households where everyone had died except for the interviewee. Thus, it is likely that entire families were killed in the recent violence. This would mean that the mortality measured among the IDP families underestimates the mortality experience of the Kalonge residents over the past 16 months. (That is, if the entire family was killed, no one would be left to interview in the Bukavu area, creating a survivor bias in our sample.)
- The sample was not a verifiably representative sample in that the location of the population of IDPs was not well-known; thus, how well the sample we took represents the entire population of displaced is not well-known. The dramatic difference between the mortality experience of the IDPs now in Bukavu compared to those now in Katana and Kabare demonstrates the potential problems in only sampling certain segments of the displaced population.
- The method of conducting a spatial sampling, and then asking people if there were any displaced in this area, opens up the potential for bias in the identification process. For example, it is more likely that people would know of entire households of IDPs rather than one or two individuals living at a relative's house. Moreover, locations with groups of IDPs may have been better known, thus mentioned to us more often. Given that the worst household histories were among the individuals and small households, this again may mean that our methodology underestimated the true mortality rate among the Kalonge displaced.

Moba

Households visited: 200 (0 refusals)

Sample population:	1,212 (average HH size = 6.1)
Population <5 years of age:	16%
CMR for 1/99 – 4/00:	11.5/1,000/mo. (est. 95% CI= 9.6 – 13.6) (260 deaths)
<5 CMR:	24.5/1,000/mo. (est. 95% CI = 18.1 – 30.8)
<1 mortality:	39.3/1,000/mo. (47% per year)

Security concerns limited the survey area to a swath 25 km north to south, and extending 40 to 45 km west of Moba Port. The estimated population within this area was 100,000, and clusters were visited in 11 villages. The mortality rate during 1999 (9.8, 95% CI = 7.7 – 11.9) appears to be lower than during 2000 (15.7, 95% CI = 11.4 – 20.0). Aside from the staggering estimate that 47% of children less than one year of age died in their first year of life, children 12 to 23 months of age were estimated to have a 29% annual mortality rate.

Eight women died related to childbirth, primarily due to hemorrhaging, although one death was reported to be tetanus related. At least three of these women were displaced and hiding in the bush at the time of death. Based on the number of live and deceased <1 and one-year-olds, it is estimated that 10.8% of full-term pregnancies during the past 16.8 months resulted in maternal death.

Figure 12 shows the causes of death among children under five years in age. Figure 13 shows the mortality breakdown for those five and older. Of note is that almost 1% of the sample households reportedly died from each of the following: cholera (13 deaths), dysentery (11), TB (12) and violence (12).

Specific Findings Based on all Five Surveys

Several issues either a) occur too rarely to be evaluated within any one of the five surveys, given the small sample size of each survey, or b) occurred in most settings and can best be discussed collectively. Because these five surveys do not necessarily represent all of eastern DRC, caution should be taken before extrapolating these findings to the entire population. These issues include:

There are not enough small children. The number of children by age within each of the five samples is shown in Figure 14 (a-e). Included is a “typical” <5 breakdown adapted from the book MSF Refugee Health (MSF, Paris, 1999). In each of the five sample populations, there are fewer children <1 and one-year old than there are children three and four years of age. Depending on how the projections are done, 30 to 40% fewer <1 and one-years-olds are in the sample than there should be when compared to the number of three and four year-olds. This unusual demographic pattern could potentially be explained by four possibilities: increased rates of child mortality, reduced maternal fertility and/or increased rates of adverse reproductive outcomes, 4) reduced rates of reproductive activities.

It is believed that increased child mortality is the primary reason for this demographic pattern given the high mortality rate among young children. Table 2 shows <1 and <5 mortality for the five populations surveyed.

Location	% dying before the age of 1	<5 CMR, deaths/1,000/mo.
Kisangani	11%	4.8
Kabare	23%	5.8
Katana	14%	6.9

Kalonge	21%	14.1
Moba	47%	24.5
Zaire 1995, from UNICEF, State of the World's Children 1997		3.1*

*UNICEF estimates <5 mortality as a function of births, i.e., via a different technique. Thus, the calculated <5 CMRs presented are not exactly comparable to the UNICEF value.

The child mortality rates alone cannot explain the deficiency of young children in Kisangani and Katana (although the Katana survey last year found an <5 CMR of 10/1,000/mo.). It is likely that fertility and reproductive outcome issues are playing a part. Minor evidence of this includes: i) while not asked about, five women reported having full-term stillborn children (which were not included as deaths in this report), ii) an estimated 3% of full-term pregnancies in the sample population resulted in a maternal death and iii) adult malnutrition appears to be a disproportionately female phenomenon. (In the five surveys, of 15 deaths attributed to malnutrition in people five years of age and older, 11 (73%) were women with a median age of 25, while only four (27%) were males with a median age of nine years.) In the “attribution” of maternal mortality, the two pregnant women who died of heart attacks during military attacks (one while being shot at, one while running), and the woman who was too pregnant to run from attackers and was strangled during/after being raped, were classified as deaths from violence. The woman in Kisangani who died of an induced abortion had her death classified as “other non-infectious.” The reason for mentioning these four deaths is to note that there are risks in the DRC associated with being pregnant that are not captured by the epidemiological concept of maternal mortality.

Eastern DRC is an unchecked incubation zone for disease. Several major disease outbreaks were detected during the course of these five surveys, which had not received a significant response (if any) from the health community. Examples of this include: an estimated 870 suspected meningitis deaths in Kisangani (95%, CI = 40 – 1,800), family-reported death rates in Moba from cholera and dysentery of approximately 1% of the sample population, reports of multiple measles deaths in three of the five surveyed populations, suspected polio deaths reported in Kalonge (our diagnosis, not the families) and seven polio cases last year reported by the Moba physical rehabilitation center.

Violence and infectious disease deaths are inseparably linked. The rates of death from violence versus the rates of death from all other causes are shown in Figure 15. There is an apparent association between the areas with the most violence-related mortality and the most “other” mortality. This was seen most dramatically in Kalonge, where when violent deaths increased dramatically (5.5-fold) during the period after October 1999, the malaria-specific mortality rate simultaneously went up 3.5-fold. Many of the Kalonge displaced and the Moba residents reported that their family members died of malaria or diarrhea while hiding in the forest after their village was attacked. Their statements included that they had no food in the forest, which may have played a large role in their immunological susceptibility

Violence against civilians involves both sides and is somewhat indiscriminate. Over the course of the five surveys, 69 deaths from violence were reported. Figure 16 shows the age and gender profile of those killed. Of note is the fact that only 53% of those killed were males over 14 years in age. The most common mechanism of murder in all of the age and gender groups was by shooting except for girls five to 14 years old, whose four deaths were attributed to being burned in their hut, a shooting, an abduction with the body found later and one poisoning. Figure 17 shows those to whom the interviewees attributed the deaths. While the numbers of reported deaths from violence are small, there seems to be a similar rate of participation in civilian murders by both sides. In support of the idea that “all sides are complicit and indiscriminate” are the facts that i)

two of three households that had experienced multiple episodes of deaths from violence had the RCD conduct the murders during one round and the Interahamwe conduct the murders during the other round; thus, these families could not have been true “enemies” of either, and ii) of 12 RCD-attributed murders, three (25%) were females, while, similarly, of 18 Interahamwe attributed murders, five (28%) were women.

Overall Mortality in Eastern DRC

There is a dearth of health and mortality data for eastern DRC. Articles in the media and statements by political figures have implied that a quantitative documentation of the war death toll has occurred, although these estimates seem to be largely speculative. While the 1.2 million people within the sampling universe of the five IRC studies are not representative of the approximately 20 million people in eastern DRC, these surveys probably represent the best broad-based data available. Thus, the IRC feels an obligation to provide an estimate of the number of people who have died due to this conflict. This attempt to extrapolate these findings to eastern DRC is done somewhat reluctantly and will systematically attempt to extrapolate conservatively (to give minimal excess mortality) to avoid these findings later being discredited as exaggerated or hyperbolic.

Three approaches will be employed to estimate the mortality toll of this conflict. The third, or “best judgment” approach will be assumed to be the best, but the other two approaches will provide insight into the dependence of the outcome on the underlying assumptions. For all three approaches, the following will be used as inputs:

a) Baseline mortality = 1.5 deaths/1,000 population/mo.

b) <u>Place</u>	<u>Population of Sample Universe</u>	<u>Mortality 1/99 – 4/00</u>	<u>Other</u>
Kisangani	613,000	2.6/1,000/mo.	
Kabare	130,000	2.7/1,000/mo.	
Katana	305,000	2.7/1,000/mo.	
Kalonge	59,000	6.4/1,000/mo.	1-10/99 = 3.5
Moba	100,000	11.4/1,000/mo.	

c) Province Population (1996*)

Orientale	5.691 million
N. Kivu	3.515 million
S. Kivu	3.028 million
Maniema	1.353 million
Katanga	6.319 million

Total = 19.906 million

* From Zaire Bureau of Statistics, Bukavu, 1996.

Approach 1: Straight Average

Assume that the five independent surveys conducted represent five measures of mortality, which represent eastern DRC. Also assume that the rate over the past 22 months has been the same as the rate over the survey recall periods of 15.7 to 16.8 months. Thus, the average

mortality rate of our five surveys (5.2/1000/mo.) minus the baseline mortality will be applied to eastern DRC over 22 months.

(5.2/1,000/mo. – 1.5/1,000/mo.) X 19,900,000 X 22mo. = 1.6 million excess deaths

Approach 2: Apply area rates to area populations

Assume that the Kisangani mortality experience represents that of Orientale Province.

Assume that the Moba mortality experience represents that of Katanga Province.

Assume that the population-weighted average mortality rate of the three S. Kivu-based surveys (3.14/1,000/mo.) represents the average mortality rate in S. Kivu, N. Kivu and Maniema.

Assume that the rate over the past 22 months has been the same as the rate over the survey recall periods of 15.7 to 16.8 months.

Orientale: 2.6 – 1.5 deaths/1,000/mo. X 5.691 mill. X 22 mo.	= 138,000
Katanga: 11.4 – 1.5 deaths/1,000/mo. X 6.319 mill. X 22 mo.	= 1,376,000
Central: 3.14 – 1.5 deaths/1,000/mo. X 7.896 mill. X 22 mo.	= 285,000
Total	= 1.8 million

Approach 3: Apply results from different settings to the most similar areas (best conservative judgment)

Assume that the IRC, UN and other aid workers have a reasonable idea which areas within South Kivu are most like the six settings for which mortality was measured (five surveys with the Kalonge pre-violence and Kalonge overall mortality experiences being considered as separate possible scenarios).

Assume that the Kisangani mortality experience represents that of Orientale Province.

Assume that the Moba mortality experience represents that of Katanga Province, except that one-third of the population has escaped Katanga and is somewhere else, having never experienced excess mortality from this war.

Assume that N. Kivu and Maniema have experienced a mortality rate similar to that of S. Kivu.

Orientale: 2.6 – 1.5 deaths/1,000/mo. X 5.691 mill. X 22 mo.	= 138,000
Katanga: 11.4 – 1.5 deaths/1,000/mo. X 4.213 mill. X 22 mo.	= 918,000
S. Kivu: 5.16 - 1.5 deaths/1,000/mo. X 3.028 mill. X 22 mo.	= 244,000
N. Kivu 5.16 – 1.5 deaths/1,000/mo. X 3.515 mill. X 22 mo.	= 283,000
Maniema 5.16 – 1.5 deaths/1,000/mo. X 1.353 mill. X 22 mo.	= 109,000

Total excess mortality = 1.7 million deaths
= 77,000/month for 22 months

Discussion

It is believed that this projection of 1.7 million deaths due to this war in eastern DRC is a very conservative estimate. This is believed to be true because:

- Our surveys clearly occurred in safer and more accessible areas than the average location in eastern DRC. Interviewers, local officials and the IRC's local staff consistently criticized our activities during the surveys as being focused on the safest and healthiest areas. Both Kisangani and Moba were considered safe havens surrounded by zones of violence. Given the consistent relationship between insecurity and higher mortality, it is very likely that the criticism that we underestimated mortality is, in fact, valid. While

extrapolating from the safe havens to the larger zones of conflict involves speculating about unknown health conditions where NGOs have no access, there is knowledge about the security conditions in these zones, and security is a close proxy to mortality in eastern DRC.

- Kisangani is likely to have a lower mortality rate than Orientale Province, but no better data presently exist on which to base the province-wide experience. This is because Kisangani is a major urban area with considerable economic activity compared to rural areas, in spite of the war. The highly visible diamond trade and Middle Eastern and European merchants related to it are reportedly focused in Kisangani. Unlike soldiers encountered elsewhere, the Uganda soldiers (who were the apparent majority at the time of our visit) were paid regularly and were commonly seen in bars and restaurants spending money. Finally, according to the provincial medical inspector, the health care system in all of Orientale Province has virtually collapsed except for the Kisangani area.
- It is not likely that 2 million in Katanga have escaped unscathed given the lack of Congolese refugees in Tanzania and Zambia, and the presumed poor conditions behind the lines of the Kabila forces. For example, the IRC in Tanzania reports that there are only 85,000 Congolese refugees in the Kigoma Region, the focal area for refugees in southwestern Tanzania. An OCHA evaluation of western Katanga, behind the Kabila lines, was released May 2000. It portrayed an image of “widespread malnutrition, prolonged displacement of civilians and severe economic depression” (see IRIN-CEA Update 934 for the Great Lakes Region, Tuesday, May 30).
- The Moba area was reported by the priests and civil officials to be a relatively safe haven within Katanga.
- If entire families were killed, they would not have representatives to be included in our survey, resulting in a survivor bias in our surveys and an underestimate of mortality. Unfortunately, this is most likely to occur in the areas where the most violence occurred, and these locations are the most important in estimating the excess mortality. Equally problematic is the potential that families who had experienced many deaths (with one or two survivors) would no longer constitute a household and would move in with relatives or neighbors, or reside in non-traditional structures, and be less likely to be included in our interviews. In the case of those living with relatives, this underreporting would occur because we would usually interview the “head” mother of that family, who would discuss deaths in her household and those of the new arrivals since they became part of her household. To make sure that people were not describing the death of a sister who lived a kilometer down the road, we usually confirmed that a death was from within the household by asking, “Were they living with you at the time?” This would consistently exclude the family members of the new arrivals.
- The only location surveyed for which mortality data exist from before our recall period (Katana) experienced a dramatic increase in mortality beginning in August 1998 and subsiding some months later. The mortality of these first few months of the war was not covered by these five surveys, and the assumption that mortality from August – December 1998 was the same as the period since then probably causes an underestimation of mortality. Admittedly, this last conclusion is based on only one location.

The validity of the number of deaths reported by families within the sample population is believed to be very high. Interviewers and local IRC staff assured investigators that people would not lie or inflate the mortality reports, because of both the gravity of the family experience and a widespread superstition that speaking negative untruths about your family will make those things come true. When an adult death was reported, it almost always corresponded to a void among the living family members with regard to the usual family structure (i.e. a reported adult female death

usually corresponded with a family devoid of a mother). Moreover, the level of sincerity, and the tears that often accompanied the descriptions of violent deaths, made interviewers incredulous toward investigator inquiries about the validity of the reports. Finally, the <5 demographic profile is perhaps the most powerful statement of the hardship this war has wrought, and this is established primarily by people who are not reporting deaths.

It is suspected that the validity for much of the reported causes of death is low. That is, the ability of a family to diagnose malaria, meningiti, or cholera is suspect. Combining the issue of family diagnosis with the small sample size of our surveys for rare events makes extrapolation of specific disease rates or profiles problematic.

People had little trouble recalling the dates of deaths in the household, with a large fraction remembering the exact days. Nonetheless, because there is the potential for people to recall traumatic events as being more recent than they really were, there is little emphasis placed on the relative rates within the 16-month recall period within this report, with the exception of Kalonge. In Kalonge, everything changed in November 1999, with most of the population fleeing their homes. Thus, comparing the pre-violence and post-violence Kalonge rates seems both scientifically palatable and socially important.

In eastern DRC, war means disease. Attempts to disaggregate violent deaths from other excess mortality for attribution of blame by any political party would display a profound ignorance of war and social function. Zairians survived before the recent two wars with a mortality below the assumed regional baseline of 1.5/1,000/mo. according to UNICEF data, and the IRC Katana mortality survey of 1999 showed that mortality there elevated when the August 1998 war began. All 1.6 million+ civilian deaths documented in this report are directly attributable to the warring parties and their backers, not just the approximately 200,000 where the mechanism of death was a man with a weapon. The primary problems for the people of eastern DRC are related to economic hardship and the lack of social support induced by war. The dozens of adults who reportedly died of malaria while displaced had certainly survived malaria in the past. Yet, while at home, they could eat and drink water while ill, and perhaps could have paid the few cents needed for a course of chloroquine. One girl from Kalonge told us how five of her eight family members died of malaria within the same month (November 1999) while they were in the forest. During the Moba survey, only 12 violent deaths blamed on armed individuals were reported, while 31 deaths were reported by people hiding from armed forces (that is, not fleeing to another location, but waiting in the bush before returning home). While this is an extreme form of social disruption, it exemplifies the “nonweapon” nature of the war-related deaths in eastern DRC. Other people, citing the unusual economic circumstances in explaining deaths, often stated that their local clinic had no medicines or that they could not presently afford the cost of going to a clinic. In places like Kabare, there is very little violence, and yet the mortality is double what it should be, and infant mortality is three to four times what was normal when economic activity was occurring.

The state of ethnic and social relations in eastern DRC seems exceedingly grim. Given the assumption that the war in eastern DRC is an indirect consequence of the 1994 genocide in Rwanda, several issues that arose in this survey were particularly disturbing. First, when describing the people who had killed their family members, interviewees never used the term RCD, they always used the word Tutsi. This is particularly unnerving because only a minority of RCD soldiers are ethnic Tutsis. Moreover, military and local officials encountered during the surveys repeatedly showed outright hostility toward the local populations. For example, while describing the local population, the *chef de post* in Moba used the term hypocrites four times and

ignorant three times during our security briefing. The poor government / civil relationship, and the way that these problems are intertwined with ethnic tensions, implies that the ongoing civil strife in Congo may only be incubating future regional problems.

Finally, collectively within the five populations surveyed, mortality in the year 2000 was higher than in 1999. Thus, the monthly death toll of 77,000 attributed to this war shows no sign of declining. An estimated 34%, or 26,000, of these monthly fatalities are children younger than five years of age. The acceptance of the status quo in DRC or the tolerance of slow diplomatic solutions implies an acceptance of these ongoing deaths.

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Finally, in an increasingly paranoid and unfriendly world, the people of eastern DRC have more rights to be fearful and unhappy than virtually any other population. Yet smiles, welcomes and trusting, inquisitive children were the main thing encountered at these 200 randomly chosen points in space. I thank them for that, and for John Keys, the IRC's Great Lakes regional director, who saw the need to document the suffering of these people as a service in and of itself, and made it happen. This project was funded by the IRC, New York, with support from the Bill and Melinda Gates Foundation.