Rwandan Refugee Emergency

Outline of Presentation
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Introduction

- Presidents of Burundi and Rwanda killed in airplane crash in April, 1994
- Civil disturbances follow in which 500,000 to 1,000,000 civilians are killed, mostly ethnic Tutsis
- Rebel army takes control in July
- 500,000 to 800,000 Hutu refugees flee to Goma and vicinity in eastern Zaire in three days
- Refugees are moved into camps after one week

Camp Conditions

- Water, food, shelter, sanitation, and medical support are all inadequate
- Violence is common
- Politically complicated situation

Organizations involved

- Governmental
- Non-governmental
- Coordination

Mortality

- Highest rates in refugee situations in past 20 years
- Average CMR: 20-30 deaths per 10,000 per day
- Normal for prewar Rwanda: 0.6 deaths per 10,000 per day
- Cholera and dysentery are most common causes
- Importance of mortality surveillance

Morbidity

- Cholera: 60-80,000 cases in first month of emergency
- Dysentery: surpassed cholera in number of cases by the first week of August
- Importance of surveillance system

Nutrition

- About 16% of children moderately malnourished
- About 5% severely malnourished

Orphanages

- Severe overcrowding and lack of supplies and personnel
- Highest death rates

Recommendations

- Prompt provision of clean water
- Sanitation
- Effective treatment of ill patients, esp. oral rehydration therapy
- Community outreach to provide medical care to those at risk

Public Health Impact of Rwandan Refugee Crisis
What Happened in Goma, Zaire, July 1994?

The Goma Epidemiology Group*

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SUMMARY

The flight of 500,000 - 800,000 Rwandan refugees into the North Kivu region of Zaire between 14-17 July 1994 overwhelmed the world's response capacity. During the first month after the influx, almost 50,000 refugees died, equivalent to an average crude mortality rate between 20 and 35 per 10,000 per day. This death rate, the highest recorded in a refugee population during the past 20 years, was associated with explosive epidemics of diarrheal disease caused by *V. cholerae* and *S. dysenteriae*, type I. Three to four weeks after the influx of refugees, acute malnutrition rates ranged between 18%-23% among children <5 years of age. Children with a recent history of dysentery and children in households headed by women were at higher risk of malnutrition. A well-coordinated relief program, based on rapidly acquired health data and effective interventions, was associated with a steep decline in death rates to 5-8 per 10,000 per day by the second month of the crisis. The prevention of high mortality due to diarrheal disease epidemics in displaced populations relies primarily on the prompt provision of adequate quantities of disinfected water, basic sanitation, community outreach, and effective case management of ill patients. In the emergency phase, effective, low technology measures include bucket chlorination at untreated water sources, designated defecation areas, active case-finding through community outreach, and oral rehydration. Relief agencies must place increased emphasis on training personnel in relevant skills to address major public health emergencies caused by population displacement. Given the magnitude of this disaster and the inadequate resources available at the time of the influx, it proved impossible to prevent high mortality during the first two weeks. The only effective preventive measures might have been early interventions in Rwanda that addressed the violence and fear that led to this mass population migration.

INTRODUCTION

In April 1994, the presidents of Burundi and Rwanda were killed in an airplane crash near the Rwandan capital, Kigali. Widespread civil disturbances followed throughout Rwanda resulting in the deaths of between 500,000 and 1,000,000 civilians, mostly ethnic Tutsis. In July, the Tutsi-dominated Rwandan Patriotic Front militarily defeated government forces and established a new national government. Between July 14-17, large numbers of ethnic Hutus fled Rwanda and sought refuge in the North Kivu Region of neighboring Zaire; initial estimates ranged as high as 1.2 million. Many refugees entered through the town of Goma, at the northern end of Lake Kivu, and others crossed the border and settled spontaneously in the vicinity of Kibumba camp (**Figure 1**). During subsequent weeks, thousands of refugees died in the streets of the town. Most of those who survived moved out of Goma and were located in camps at Munigi, Kibumba, Katale, and Mugunga. During the first week of August, Munigi was closed and

its residents relocated in the other three camps. An unknown number of refugees settled in smaller groupings to the north of Katale, west of Mugunga, and in the town of Goma.

Refugee assistance was provided by a number of United Nations agencies, non-government relief organizations, and military forces, and was coordinated by the Office of the United Nations High Commissioner for Refugees (UNHCR). The arrival of such an enormous number of dependent refugees during a short period overwhelmed the capacity of the host government and those relief organizations already in the field. This report summarizes the public health consequences of this mass exodus of refugees during the first month after their arrival.

METHODS

Mortality surveillance

Mortality rates were estimated by obtaining daily counts of the number of bodies collected and dividing by estimates of the refugee population. Because the ground in the area where most refugees were located consists of hard volcanic rock unsuitable for digging graves, most bodies were left along roads and in other public places to be picked up later by trucks, and taken for burial in mass graves. Information on mortality was based on records maintained by the agencies that supplied these trucks. These agencies reported body tallies to UNHCR daily. During the week of July 18-25, when the truck collection system was first established, several agencies reported that their workers may have been exaggerating the body counts because of the misconception that payment was related to the number of bodies collected. Body counts from this period have been adjusted downward by as much as 40% by comparing truck collection figures on certain days with burial figures collected by the French military on those same days. The problem of over-reporting was resolved by UNHCR on July 26 and figures after this date are felt to be reliable. Where possible, mortality data were also collected from health facilities and centers caring for unaccompanied children.

Morbidity surveillance

Following the onset of the cholera outbreak in Goma, a surveillance system was established in which cases and deaths associated with diarrheal disease were reported daily from most clinics and hospitals in Goma, Munigi, Kibumba, Katale, and Mugunga. Initially, the reporting system did not differentiate between cholera, dysentery, and non-specific dehydration. Laboratory support was provided locally by French ("Bioforce") and Israeli military forces, and by reference laboratories in France and the Netherlands. Commencing on July 31, cases of watery diarrhea and bloody diarrhea were reported separately.

In early August, a more comprehensive morbidity surveillance system was established, covering all health facilities in the

three main camps and in the town of Goma. Cases of watery diarrhea, bloody diarrhea, measles, meningitis, acute respiratory infections, malaria (or unexplained fever), and "other" conditions were recorded daily on a standardized data form. Illness was categorized according to clinical case definitions supplied by UNHCR. Surveillance data were reported weekly to UNHCR, which compiled, analyzed, and disseminated the information in a bulletin. Any suspected case of meningitis was reported immediately to UNHCR and specimens of cerebro-spinal fluid were sent to either the French or Israeli military laboratories in Goma for bacterial culture and antigen detection tests.

Population surveys

Between August 4 and 14, three cluster sample surveys were conducted in the Katale, Kibumba, and Mugunga camps, respectively. Each camp was mapped and divided into segments based on relative size and population density. Thirty clusters were allocated to each camp; the proportion of the 30 clusters assigned to each segment was based on the estimated population. In each cluster, 20 households were sampled randomly to ascertain how many household members had died since arrival in Zaire. Household members that were missing and unaccounted for were not counted as deaths. In addition, 20 children between 6 months and 59 months of age (or <110 cm height) were sampled randomly in each cluster, weighed using Salter scales, and their heights measured using standard measuring boards. Children less than 85 cm were measured in the lying position; taller children were measured standing. The weight-for-height index of each sampled child was compared with the Centers for Disease Control and Prevention/National Center for Health Statistics/World Health Organization reference population (1).

Additional information gathered by some or all surveys included probable cause of death, adequacy of shelter, presence or absence of adult males in the household, access to distributed food rations and local markets, size of household food reserves, history of diarrheal disease, and access to health care. Survey data from each of the three camps were analyzed separately.

RESULTS

Mortality

UNHCR records from the truck collection system showed that a total of 48,347 bodies were collected between July 14 and August 14. This figure represents a minimum estimate for mortality in this population because an unknown, though probably small, number of refugees who died during the first few weeks were buried privately and, therefore, not counted by the body collection system. The estimation of mortality rates was complicated by the lack of a reliable total population figure for refugees in the Goma area, since neither a census nor a registration procedure was performed. Although early estimates put the total number of refugees at more than one million, later population estimates

ranged between 500,000 and 800,000, based on water and food ration distribution figures and on mapping exercises by relief agencies.

The average crude mortality rate (CMR) from July 14 to August 14 was between 19.5 and 31.2 per 10,000 per day, based on population estimates of 800,000 and 500,000, respectively. Even if a population figure of 1.2 million is used, the average CMR would have been 13.0 per 10,000 per day. By comparison, the baseline, prewar CMR in Rwanda was approximately 0.6 per 10,000 per day (2). An overall mortality rate was calculated for the period July 14-31 because many bodies were left uncollected during the early days of the emergency and not counted until later. During this period, the average CMR was between 28.1 and 44.9 per 10,000 per day; by the week of August 8-14, it had dropped to 5.0 - 8.1 per 10,000 per day **(Figure 2)**.

Mortality reporting systems were unable to differentiate between age groups. However, unaccompanied children, a particularly high risk group of more than 10,000 children, experienced extremely high death rates. Between July 23 and August 12, for example, CMRs in certain centers for unaccompanied children ranged between 20 and 120 per 10,000 per day. Among unaccompanied infants, average daily death rates ranged from 100-800 per 10,000.

Population surveys in Katale (August 4), Kibumba (August 9), and Mugunga (August 14-15) estimated the proportion of the population that died between the time of the influx and the date of the surveys to be 8.3% (95% CI 7.1-9.5), 7.3% (95% CI 6.2-8.4), and 9.1% (95% CI 7.9-10.3), respectively. These estimates correspond to average daily CMRs of 41.3, 28.1, and 29.4 per 10,000, respectively, which are consistent with the range of estimates derived from body counts (**Table 1**). According to the surveys, between 85% and 90% of deaths reported by household respondents were associated with diarrheal disease. In most refugee emergencies, death rates among children under 5 years of age are several times higher than in older age groups (3). However, the Katale survey reported that 8.0% (95% CI 5.2-10.8) of children <5 years died during the 20 day recall period, compared with 8.4% (95% CI 7.1-9.7) of persons >5 years, suggesting that diarrheal diseases equally affected all age groups (4).

Morbidity

Following the diagnosis of the first case of cholera on July 20, there was an explosive increase in diarrheal disease, reaching a peak of more than 6,000 cases reported on July 26 (**Figure 3**). Laboratories isolated *Vibrio cholerae* 01, biotype El Tor, serotype Ogawa, which was resistant to tetracycline and doxycycline, but sensitive to furazolidone and ciprofloxacin.

The total number of cases of cholera, including those presenting to clinics, and those not presenting, was approximated in order

to calculate the overall cholera attack rate. Between July 14 and August 12, a total of more than 62,000 cases of diarrheal disease were reported from health facilities. If we assume that 57% of these cases were cholera (the Mugunga survey found that 57% of diarrheal deaths were due to watery diarrhea), then approximately 35,500 (57% of 62,000) patients with cholera presented to health facilities (assuming that the case-fatality ratios for cholera and dysentery were approximately equal). Estimation of the number of cholera cases never seen at health facilities is more difficult. According to the Mugunga survey, about 88% (41,800) of the 47,500 deaths which occurred in this period were associated with diarrheal disease, and 57% of diarrheal deaths (23,800) were due to cholera. Among the 23,800 cholera deaths, 47% (11,200) were in patients who had never sought health care. If we assume, based on anecdotal information, that the cholera CFR among those who never received medical attention was between 25% and 50%, a further 22,400 to 44,800 cases of cholera may have occurred among patients who never presented at health facilities. Overall, therefore, between 58,000 and 80,000 cases of cholera may have occurred in the first month after the influx, for an attack rate between 7.3% (58,000 cases in 800,000 refugees) and 16% (80,000 cases in 500,000 refugees).

The center of the cholera outbreak was probably Goma town. Surveillance data indicate that 57% of all cases of diarrheal disease between July 21-27 were reported in health facilities in Goma, and an additional 21% were reported from Munigi camp, only 10 km from the town. Nevertheless, the lack of geographically precise population figures during this period prevent any comparison of incidence rates in different locations. According to surveillance reports, the CFR among diarrhea cases seen in clinics reached as high as 22% on July 23 (when most cases were probably cholera), decreasing to 3% - 5% between July 27 and August 12. The CFR for treated diarrhea and dysentery was 6.7% between July 21 and August 12. The World Health Organization suggests that the cholera CFR should be as low as 1%; however, in most cholera epidemics in refugee camps during the past decade, the CFR has been between 2-3% (3,5). Since the early surveillance system did not differentiate between bloody and non-bloody diarrhea and since most deaths occurred outside health facilities, it is not possible to estimate the overall cholera-specific CFR in this epidemic.

Bloody diarrhea emerged as a major public health problem, surpassing watery diarrhea in number of reported cases, by July 31 in Mugunga, August 2 in Kibumba, and August 4 in Goma and Katale. Laboratories identified *Shigella dysenteriae* type 1 (Sd1) as the causative organism, which was resistant to most commonly used antibiotics, including nalidixic acid, but sensitive to ciprofloxacin. The UNHCR morbidity surveillance system reported 15,543 cases of dysentery between August 8-14,

for a weekly incidence rate of 2%-3%, twice the rate of watery diarrhea reported during the same period. The case definition for dysentery was clinical, and since some health workers may not have verifyied blood in the stool of patients, there may have been over-reporting of this condition in certain health facilities. According to the Mugunga survey, almost 40% of all deaths during the first month after the influx were associated with bloody diarrhea.

Between August 1-16, the surveillance system detected a total of 162 patients with suspected meningitis; 83 (52%) were confirmed as having meningitis caused by *Neisseria meningitidis*, group A, sensitive to penicillin and chloramphenicol. To decide whether to proceed with mass immunization, a threshold incidence rate of 15 cases per 100,000 per week per camp was established as predictive of a meningitis outbreak (6). In Kibumba camp, four cases were reported during the first week of surveillance, followed by 34 cases during the second week, the latter being equivalent to a weekly incidence rate of 19 per 100,000. Consequently, mass immunization against meningococcal meningitis was instituted in this camp.

Nutritional status

The three population surveys conducted between August 4-14 indicated that the prevalence of acute protein-energy malnutrition among children 6 months to 59 months of age was between 18% - 23% (**Table 2**). Acute malnutrition prevalence in non-refugee populations in Africa is normally between 5-8% (3). In the two surveys that performed the analysis, both found a significantly higher prevalence of acute malnutrition among children in female-headed households (defined as households not having at least one male 18 years or older). In Mugunga, the only survey that asked about a history of diarrheal disease, 36% of children who had dysentery since arriving in Zaire were acutely malnourished, compared with 12% of those children with no recent history of dysentery (relative risk 3.09; 95% CI 2.29,4.16). Each of the three surveys found that more than 25% of households had inadequate water-resistant shelter. The Mugunga survey indicated that significantly fewer female-headed households reported having received food rations compared with households headed by males.

DISCUSSION

The data gathered during the first month after the influx of Rwandan refugees into Zaire describe a public health disaster of major proportions. While early surveillance data on diarrheal cases and deaths varied in quality and representativeness, three rapid population surveys collected comparable data using similar methods and provided relatively consistent information on mortality, nutrition, and program indicators. By early August, a standardized surveillance system was established, allowing relief agencies to monitor disease trends, reassess priorities, and

evaluate the effectiveness of interventions. This combination of rapid surveys and standardized surveillance needs to be a routine element of emergency relief programs.

Between 6% and 10% of the refugee population may have died during the month after their arrival in Zaire, representing a death rate two to three times the previously highest rates reported among refugees in Thailand (1979), Somalia (1980), and Sudan (1985) (3). This high mortality was due almost entirely to an explosive epidemic of diarrheal diseases. Epidemics of diarrhea and dysentery have caused high rates of morbidity and mortality in several recent refugee and displaced populations; e.g., among Kurdish refugees in 1991 (7), displaced Somalis in 1992 (8), and Burundian refugees in Rwanda in 1993 (9). While long-term solutions require considerable time and resources to put in place, the excess mortality associated with diarrheal disease outbreaks may be mitigated by promptly implementing several effective measures that depend more on human than technological resources. These measures include the organization of chlorination brigades at untreated water sources, the designation of physically isolated defecation fields, community outreach to identify and treat patients outside of clinics, and oral rehydration therapy. In addition, greater emphasis needs to be given to education on personal hygiene and the provision of soap, both essential elements in the prevention of diarrheal diseases.

Following the July 14 influx into Goma, many of the refugees were located near a large body of water, Lake Kivu; however, at the time there were no available means to purify and transport sufficient quantities of water. While efforts were made by some agencies to chlorinate water in containers as refugees removed it from the lake, coverage was inadequate and most refugees consumed untreated water. The diarrhea epidemic had already peaked before July 29, when the relief operation was able to provide an average of only one liter of purified water per person per day . UNHCR recommends a minimum of 15 to 20 liters of water per person per day (10).

At least 58,000 cases of symptomatic cholera occurred in this population. Given the usual high ratio of asymptomatic to symptomatic infections (up to 10:1), it is likely that most refugees in the Goma area were infected with *V. cholerae*, and that few infections were prevented (11). The rapidity of transmission and high clinical attack rate of cholera in Goma was related to the common practise of drinking untreated lake water (the likely common source of infection), crowding, poor personal hygiene, and the debilitation of this refugee population. Once significant numbers of refugees were infected by drinking lake water, it is likely that considerable secondary contamination of other water sources and storage containers occurred in the area. This situation was exacerbated by inadequate sanitation, due in part to the rocky, volcanic nature of the soil in the Goma area

formation of an expert committee to consider treatment options. After comparing the risks of untreated shigellosis to the risks of treating large numbers of patients, including young children for whom there are theoretical risks from fluoroquinolones, the committee decided to advocate a policy of carefully monitored treatment with ciprofloxacin for certain high risk groups, including children less than 5 years of age, pregnant women, persons older than 55 years, and patients with severe illness. The emergence of dysentery caused by antibiotic-resistant strains of *Sd1* as a major public health problem among refugee populations in central Africa indicates the need for operational research to develop more effective prevention and case management strategies.

By the third week of the influx, the international community's response began to have a significant impact. Routine refugee relief measures such as measles immunization, vitamin A supplementation, standardized disease treatment protocols, and community outreach programs were established in each camp, and the water distribution system provided an average of 5 to 10 liters per person per day. A consensus was quickly reached on standardized information gathering, and a high level of cooperation and coordination of public health programs was achieved, under the leadership of UNHCR.

The high prevalence of acute malnutrition among children, as identified by population surveys, was probably related to the high incidence of diarrheal diseases and to a food distribution system that was controlled by Rwandan political leaders and which was unable to distribute food rations directly to refugee families. Children in households headed by women were at high risk of malnutrition. The survey findings led to recommendations for supplementary and therapeutic feeding programs, systematic registration of refugees, and changes in distribution procedures to allow for more equitable access to relief food. However, changes in the food distribution procedures were difficult to implement because of the insecure situation in the camps and resistance by former Rwandan political and military leaders who exercised stringent control over the refugee population. Lack of security has been a feature of several recent refugee operations; therefore, effective means of preventing the misuse of relief items need to be developed by the international community.

The high mortality rates experienced by Rwandan refugees in eastern Zaire were almost unprecedented in refugee populations and the world must take note of the lessons this disaster offers. While the immediate, medical cause of most deaths was diarrheal disease, the underlying causes were those historical, ethnic, demographic, socio-economic, and political factors that led to the collapse of Rwandan society in April and, later, to this mass population migration (14). Recent correspondence in this journal pointed out that extensive information on the deteriorating

conditions in Rwanda had been published during the past 20 years (15). However, the international community has been unable to develop effective strategies to prevent the collapse of small, vulnerable nation-states like Rwanda, Liberia, and Somalia. The data generated by early warning information systems, where they exist, is often ignored, especially if the immediate political interests of wealthy nations are not threatened.

While generally proven interventions against diarrheal disease were implemented in Goma, they were insufficient relative to the scale of the disaster. The world was simply not prepared for an emergency of this magnitude. The leaders of wealthy nations tend to wait until public opinion forces them to respond to disasters with enormous resource infusions. Although this delayed response has recently included the deployment of military forces with their formidable logistic capability, the mobilization of military resources is very expensive. Because military deployment depends on political decisions, it cannot always be integrated into disaster preparedness planning. Therefore, while continuing to explore ways of improving the efficiency and cost-effectiveness of the military role in emergency relief, donor nations would be wise to invest funds in strengthening the existing network of relief organizations. These agencies need resources to implement early warning systems, maintain technical expertise, train personnel, build reserves of relief supplies, and develop their logistic capacity. Unless global action is taken urgently to improve the state of emergency preparedness, there will be more public health disasters like the one we have described in Goma.

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Table 1: Comparison of crude mortality estimates derived from body counts and from three population surveys, Rwandan refugee population, North Kivu, Zaire, 1994

Camp/area	Period (days)	Estimated population	CMR*	% population dying during period (95% CI, surveys only)
Katale survey	14/7-4/8 (20)	80,000	41.3	8.3 (7 1,9 5)
Body count (all areas)	14/7-7/8 (24)	500,000 800,000	37.9 23.7	9.1 5 7
Kibumba survey	14/7-9/8 (26)	180,000	28 1	7.3 (6.2,8.4)
Mugunga survey	14/7-13/8 (30)	150,000	29.4	9 1 (7.9,10 3)
Body count (all areas)	14/7-14/8 (31)	500,000 800,000	31.2 19 5	9.7 6.0

* crude mortality rate in deaths per 10,000 per day (normally approximately 0.5 - 0.6 per 10,000 in sub-Saharan African countries)

Table 2: Prevalence of acute malnutrition according to population surveys, children 6 months to 5 years of age, Rwandan refugee population, three camps, North Kivu, Zaire, 1994.

Camp	Date	Sample size	moderate* malnutrition	severe** malnutrition	overall rate (95% CI)
Katale	4/8	567	16.6%	6 5%	23.1% (18.3,28.7)
Kibumba	9/8	694	17.1%	3 0%	20 2% (16.1,25.0)
Mugunga	14/8	723	14 4%	3 3%	17 7% (15,21)

* weight-for-height z-score less than -2 but greater than -3 (between 2 and 3 standard deviations below the reference population mean).

**weight-for-height z-score less than -3 (more than 3 standard deviations below the reference mean) or edema.

Fig. 1

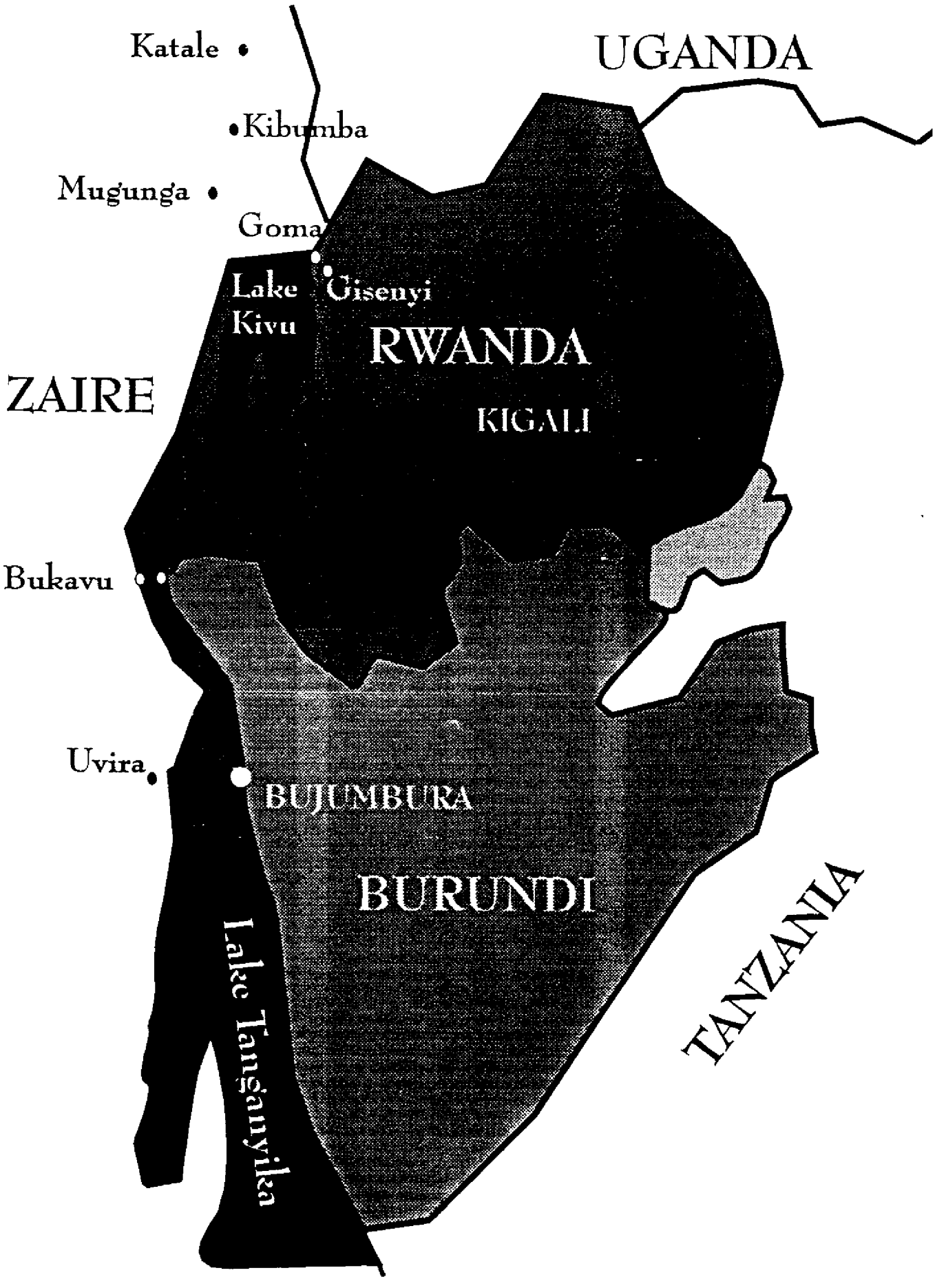
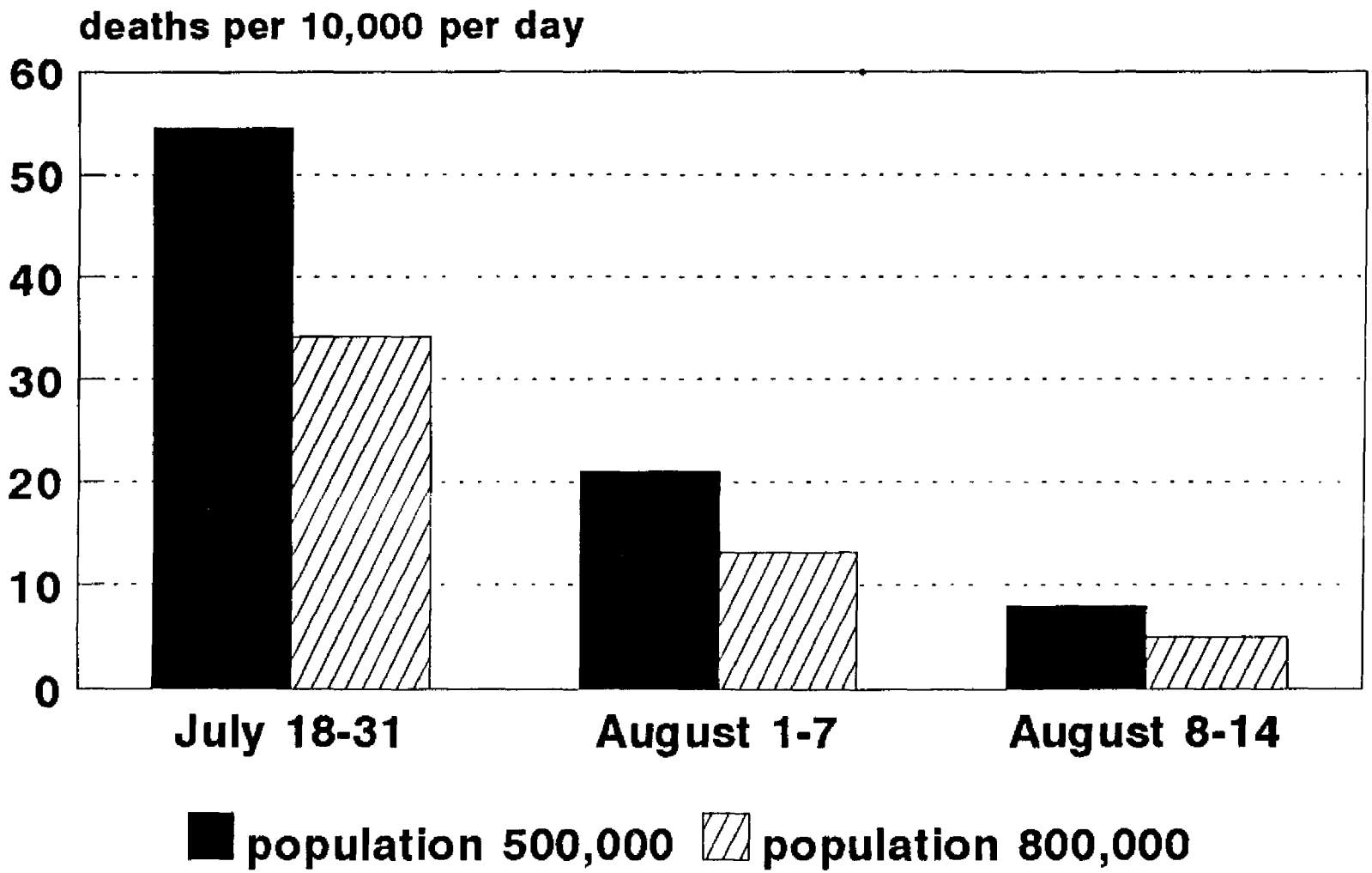

Katale
UGANDA
Kibumba
Mugunga
Goma
Lake Kivu
Gisenyi
RWANDA
ZAIRE
KIGALI
Bukavu
Uvira
BUJUMBURA
BURUNDI
Lake Tanganyika
TANZANIA

Fig 2

Estimates of crude mortality rate
Rwandan refugee population*
North Kivu, Zaire, July-August 1994



* rates calculated on basis of
body counts & two population estimates

Fig 3

Cases of diarrheal disease reported (cholera, dysentery, dehydration) Health facilities, N. Kivu, Zaire, 1994