An analysis of mortality trends among refugee populations in Somalia, Sudan, and Thailand*

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A review of mortality data from refugee camps in Thailand (1979–80), Somalia (1980–85), and Sudan (1984–85) indicates that crude mortality rates (CMRs) were up to 40 times higher than those for the non-refugee populations in the host countries. In eastern Sudan, approximately 5% of the population of eight camps died in the first 3 months of the emergency and daily CMRs as high as 14 per 10,000 were reported. These rates dropped to values comparable with those of the host country within 6 weeks in the Thai camps; however, in Somalia and Sudan this process took 12 months. Mortality rates among under-5-year olds in the early phases, which were as high as 32.6 per 10,000 per day, are six times greater than those in the world’s least developed countries during non-emergency times. Among severely undernourished children in one camp in Sudan, the death rate reached 114 per 10,000 per day. Acute respiratory infections, diarrhoeal diseases, malaria, measles, and undernutrition were the causes of most reported deaths, the majority of which could have been prevented by adequate food rations, clean water, measles immunization, and an oral rehydration programme.

Large-scale movements of refugees across international borders have occurred at least twelve times since 1971 (Table 1). In this context, “refugee” has been precisely defined under international conventions as “any person who, owing to well-founded fear of being persecuted...is outside the country of his nationality...” (6). Concentrations of refugees are usually characterized by low nutritional status and poor environmental conditions (overcrowding, inadequate water, and lack of sanitation), which promote the transmission of infectious diseases (7).

The responsibility for the care and protection of refugees lies with the government of the host country, which is often a developing country with serious problems of poverty, lack of basic services, and high crude mortality rates (CMRs) among its own population. Usually, the host country is forced to appeal for assistance. The basic needs of refugees, including food, water, shelter, and health care, are then usually provided by a number of international, national, and nongovernmental organizations, which are coordinated by the Office of the United Nations High Commissioner for Refugees (UNHCR).

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Host country</th>
<th>Year</th>
<th>Approximate number of refugees</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>India</td>
<td>1971</td>
<td>8 million</td>
<td>(1)</td>
</tr>
<tr>
<td>Laos/Vietnam</td>
<td>Thailand</td>
<td>1975-79</td>
<td>280,000</td>
<td>—</td>
</tr>
<tr>
<td>Zaire</td>
<td>Angola</td>
<td>1977</td>
<td>100,000</td>
<td>(2)</td>
</tr>
<tr>
<td>Burma</td>
<td>Bangladesh</td>
<td>1978</td>
<td>200,000</td>
<td>(3)</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>Pakistan</td>
<td>1979-80</td>
<td>2 million</td>
<td>—</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Somalia</td>
<td>1979-80</td>
<td>700,000</td>
<td>—</td>
</tr>
<tr>
<td>Kampuchea</td>
<td>Thailand</td>
<td>1979-81</td>
<td>300,000</td>
<td>(4)</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Sudan</td>
<td>1976-84</td>
<td>500,000</td>
<td>—</td>
</tr>
<tr>
<td>Chad</td>
<td>Sudan</td>
<td>1984-85</td>
<td>340,000*</td>
<td>—</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Somalia</td>
<td>1984-86</td>
<td>150,000</td>
<td>(5)</td>
</tr>
</tbody>
</table>

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The rapid congregation of tens of thousands of refugees in camps has led to CMRs as high as 9 per 10,000 per day (3, 7, 8), the most common causes of...
death being diarrhoeal diseases, malaria, measles, respiratory infections, tuberculosis, and undernutrition (3, 8, 10, 11).

Despite the extensive experience gained since 1972 by the organizations responsible for emergency relief efforts, CMRs in the camps for Ethiopian refugees in eastern Sudan in 1985 were among the highest ever reported. Here, we examine the magnitude and time trends of crude, age-specific, and cause-specific mortality rates in three refugee emergencies in Somalia, Sudan, and eastern Thailand, for which relatively extensive and reliable data are available.

METHODS

Thailand

Approximately 300,000 refugees from Kampuchea crossed the border into eastern Thailand between October 1979 and December 1980, joining 280,000 refugees already there. An estimated additional million refugees were in camps on or near the Thai-Kampuchean border but did not have official refugee status.

Mortality data in the refugee camps were obtained from camp hospital registries, records of Thai public health authorities, and private burial contractors. During the first few weeks, most deaths in one large camp occurred outside the hospital, and the causes of death were not recorded. Using weight-for-height as an anthropometric index, we calculated undernutrition prevalence data from either community-based random sample surveys or systematic sampling of children aged less than 5 years who were routinely screened. Undernutrition was defined as a weight-for-height less than 80% of the median of the WHO/NCHS/CDC reference population (12).

Somalia

Refugees from Somali and Oromo ethnic origins moved from the Ogaden region of Ethiopia to the Gedo, Hiran, and North-west regions of Somalia between late 1978 and mid-1981. The official estimate of the refugee population was 700,000 in 1981, and a new influx of approximately 150,000 refugees occurred between late 1984 and mid-1986.

The availability of mortality data from Somali camps between 1979 and late 1980 is limited. Two retrospective mortality surveys conducted by the Centers for Disease Control (CDC) in May and September 1980 were based on random samples of 1–5% of households in 11 of the 35 refugee camps situated in three regions of the country (13). The first survey provided data on deaths among children under 6 years of age after the arrival of families in the camps, while the second dealt with deaths among all ages during the month before the survey. After 1981, mortality data were obtained from the monthly camp surveillance system established by the Somali Ministry of Health’s Refugee Health Unit (RHU). Information on deaths was gathered from family members when burial shrouds and digging tools were issued from a central place in the camp. Also, two mortality surveys were conducted in 1984 and 1986 on large random samples of the Somali refugee population.

Data on nutrition were collected by random cluster sample surveys performed in a uniform manner (13, 14), with the same definition of undernutrition as used in Thailand.

Sudan

An estimated 340,000 Eritreans and Tigrayans left Ethiopia and sought assistance in the refugee camps of eastern Sudan between October 1984 and April 1985. Sudan was already host to almost 500,000 refugees from Ethiopia prior to October 1984.

Mortality data from the eight largest camps in eastern Sudan were obtained from a surveillance system established by the Health Unit of the Office of the Commissioner for Refugees (COR) and the private voluntary organizations working in the camps. The system employed watchmen 24 hours a day at designated burial sites to gather information on deaths from relatives.

Malnutrition prevalence rates were calculated using the same sampling methods, definitions, and reference tables as in Somalia and Thailand. Because of the emergency nature of refugee situations, mortality data are often incomplete, especially in the early months of a crisis. Also, reported causes of death are often ascertained by a history taken from relatives, with obvious potential for inaccuracies. The term “emergency phase” in this article refers to the early period after refugees arrive in a camp when CMRs are often high and basic services are being created de novo.

The most comprehensive set of data from refugee populations in recent times are examined in this article. Cited national, non-refugee CMRs are best estimates prepared by the United Nations Population Division and are based on internationally comparable sources, including national surveillance systems and retrospective mortality surveys (15). While mortality rates are conventionally expressed as deaths per 1000 per year in non-refugee populations, this is not suitable for use in disasters, when mortality indices need to be sensitive to frequent changes. In these circum-

Table 2. Crude mortality rates in selected refugee camps and national populations of host countries in Somalia, the Sudan, and Thailand

<table>
<thead>
<tr>
<th>Country</th>
<th>Refugee camp</th>
<th>Date</th>
<th>Mortality rate (deaths per 1000 per month)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somalia:</td>
<td>Las Dhure</td>
<td>August 1980</td>
<td>14.2</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Bur Dhube</td>
<td>August 1980</td>
<td>23.3</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Ali Matan</td>
<td>August 1980</td>
<td>33.8</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Non-refugees</td>
<td>—</td>
<td>1.8</td>
<td>(15)</td>
</tr>
<tr>
<td>Sudan:</td>
<td>Wad Sherife</td>
<td>December 1984</td>
<td>24.3</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Fau Ill</td>
<td>February 1985</td>
<td>28.6</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Wad Kowli</td>
<td>January 1985</td>
<td>30.4</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Non-refugees</td>
<td>—</td>
<td>1.4</td>
<td>(15)</td>
</tr>
<tr>
<td>Thailand:</td>
<td>Kamput</td>
<td>November 1979</td>
<td>25.8</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Sakeo</td>
<td>October 1979</td>
<td>31.9</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Non-refugees</td>
<td>—</td>
<td>0.7</td>
<td>(15)</td>
</tr>
</tbody>
</table>

Mortality rates are conventionally expressed as deaths per 10 000 per day (4, 8, 16, 17), which facilitates monitoring the effectiveness of relief programmes. Consequently, mortality rates for refugee populations are generally expressed here as deaths per 10 000 per day for short intervals and as deaths per 1000 per month when considering trends over a 12-month period.

RESULTS

Crude mortality rates and trends

Crude mortality rates (CMRs) during the emergency phase in refugee camps in Somalia, Sudan, and Thailand are shown in Table 2. Rates varied between 14.2 and 33.8 per 1000 per month; on an annual basis, these are equivalent to 170 per 1000 per year and 406 per 1000 per year, respectively. On certain days in early 1985, CMRs were as high as 14 per 10 000 (42 per 1000 per month or 504 per 1000 per year) in Sudanese camps.

Fig. 1 shows the pattern of mortality decline in selected camps in eastern Thailand (1979–80) and eastern Sudan (1985). Although CMRs were initially high in both populations, the rates of decline differ. Mortality rates in Thai camps fell within 6 weeks to levels comparable with the Thai national rate, whereas in the Sudanese camps this did not occur until 12 months after they had been opened. In six major camps for Kampuchean refugees with an average population of 120 000, an estimated 1100 deaths (less than 1%) occurred during the first 12 months, approximately 800 (73%) of which were in the first 3 months. By contrast, 19 383 deaths (9% of the mean population of 220 000) were reported in the eight largest camps in eastern Sudan during 1985; of the total deaths, 55% occurred in the first 3 months.

Data from Somalia show that CMRs were high 4–12 months after the camps were established. A retrospective survey with a 1-month recall period carried out in September 1980 reported CMRs of 14.2, 23.3, and 5.9 per 1000 per month in three camps that were in operation for 4, 8, and 11 months,
in eastern Sudan during 1985 varied: a gradual decline with upward fluctuations in mortality occurred in a large, unplanned border camp (camp A) characterized by poor sanitation and water supply and repeated waves of new arrivals, while a more rapid and steady decline was observed in two stable, planned camps (camps B and C) with limited influx of refugees.

**Age-specific mortality**

High CMRs mask higher mortality rates for certain age groups. For example, in all three study populations the rates for children less than 5 years of age were far greater than those for older age groups (Table 3). The lack of standardized data, however, means that the results from different situations are not directly comparable. The rates listed in Table 3 were recorded during the emergency phase.

By 1982 in Somalia, mortality rates had fallen considerably from the levels recorded in 1980. For example, in 1982 the infant mortality rate was 86 per 1000 live births in the refugee camps, compared with 155 per 1000 reported for the non-refugee Somali population in 1983 (15). Retrospective mortality surveys, however, showed no significant change in the infant mortality rate between 1983 (80 per 1000) and 1985 (86 per 1000) in the camps.

Certain groups of children suffered extremely high mortality; for example, in one Sudanese camp children aged less than 5 years in therapeutic feeding centres for the severely malnourished (<70% median weight-for-height) had mortality rates as high as 114 per 10 000 per day. In most situations, the

![Fig. 2. Mortality rates by month in three selected camps in eastern Sudan, 1985.](image)

Table 3. Age-specific mortality rates in selected refugee populations during the emergency phase

<table>
<thead>
<tr>
<th>Age range (years)</th>
<th>&lt;5</th>
<th>&lt;1</th>
<th>1–4</th>
<th>15–44</th>
<th>Crude rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and date</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>November 1979</td>
<td>8.9</td>
<td>10.7</td>
<td>7.6</td>
<td>2.2</td>
<td>3.8</td>
</tr>
<tr>
<td>(Camp A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somalia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 1980</td>
<td>28</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>September 1980</td>
<td>—</td>
<td>27</td>
<td>14</td>
<td>2.6</td>
<td>4.7</td>
</tr>
<tr>
<td>(North-west camps)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sudan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March 1985</td>
<td>22.2–32.6</td>
<td>NA</td>
<td>NA</td>
<td>8.6–14</td>
<td></td>
</tr>
<tr>
<td>(Several eastern camps)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camp D</td>
<td>—</td>
<td>5.6</td>
<td>23.8</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* NA = not available

![Fig. 3. Crude mortality rates (all ages) and mortality rates among under-5-year olds in a camp in Sudan, February-March 1986.](image)
rates for infants aged less than 1 year were higher than those for children aged 1–4 years, with the exception of one camp in Sudan, where the reported rate for children in the latter age group in January 1985 during a measles outbreak was 4–6 times higher than that for infants aged less than 1 year. This was probably due either to higher measles-specific death rates among the 1–4-year olds or to a reporting artefact.

While mortality rates for under-5-year olds were often high during the emergency phase, the decrease among these children was frequently more rapid than that of other age groups. Fig. 3 illustrates the mortality rate for under-5-year olds in one camp in Sudan, which fell from 30.5 per 10 000 per day (three times the crude rate at that time) to 3.3 per 10 000 per day (a rate equal to the crude rate) within 6 weeks.

**Causes of death**

In Thailand, acute respiratory infections, diarrhoeal diseases, malaria, and undernutrition were the four main causes of death in the camp with the highest reported mortality rates (camp A). In the first 5 months, deaths from these causes accounted for 51% of all deaths and 92% of those with a specified cause. In the largest Thai camp (camp B), where death rates were relatively lower (4), the main causes of death were the same as those for camp A. Measles was not reported as a major cause of death among Kampuchean refugees in Thailand, perhaps because a major immunization programme against this disease was mounted soon after the arrival of the refugees. The only important recorded outbreak of measles was in camp B, where 15 deaths occurred among 658 cases admitted to the hospital.

In Somalia, surveys carried out in May 1980 revealed that the most frequently reported causes of death were acute respiratory infections, diarrhoeal diseases, and measles, which together caused 95%, 88%, and 60% of the deaths in the North-west, Gedo, and Hiran regions of the country, respectively. A large but unspecified number of deaths from acute respiratory infections were attributed to whooping cough (13). Following a mass immunization campaign in early 1981, measles ceased to be a significant cause of death; surveys in 1984 and 1986 showed measles as the cause of only 1% of deaths among children aged less than 5 years. Between 1982 and 1985, when CMRs had decreased, surveillance data revealed that acute respiratory infections and diarrhoeal diseases caused 48–55% of all deaths and 50–75% of all child deaths. During the same period, malaria accounted for 2–5% of all deaths.

In eastern Sudan, the main causes of death during the first 3 months of the emergency were acute respiratory infections, diarrhoeal diseases, and measles (Fig. 4). Measles was the most common cause of death in four of the major camps during this period, and measles-specific death rates as high as 4.4 per 10 000 per day (or 10 per 10 000 per day for children aged <5 years) were reported in one camp in February 1985. At least 2000 deaths from measles were recorded in this camp between February and May 1985. Diarrhoeal deaths comprised between 25% and 50% of all deaths, while malaria and acute respiratory infections accounted for smaller proportions. High death rates from dysentery, identi-
fied as *Shigella dysenteriae* type I, were reported from camps in Sudan.  

Although undernutrition rates were high among the refugee populations, undernutrition was recorded as a primary cause of death only among those in Thailand. In the Somali and Sudan camps, the prevalence rates for undernutrition remained high throughout the first 12 months (Fig. 5). For example, the initial rate in one camp in Sudan was 51.9%, while 6 months later it was still remarkably elevated at 41%; however, the rate fell to 19.8% after 11 months. Also, in a camp in Somalia, the rate of 28% in the first month rose to 39.4% at 6 months, and fell to 17.6% at 10 months. Finally, in a Thai camp, an initial rate of 18% dropped rapidly to 4% after 4 months and remained low thereafter.

Other less frequently reported causes of death included cholera, viral hepatitis, meningitis, relapsing fever, tuberculosis, and typhus. Perinatal deaths of unknown cause and maternal deaths were also recorded.

Small outbreaks of cholera were reported in two camps in Thailand, with few cases and a low case fatality rate of 1.8%. By contrast, a cholera outbreak in a new camp in the North-west region of Somalia in March 1985 resulted in 3962 cases and a case fatality rate (CFR) of 25%. An additional 2600 cases and 76 deaths (CFR = 2.9%) occurred in other Somali camps in 1985. An outbreak in 21 camps in eastern Sudan between May and July 1985 resulted in 5385 cases and 154 deaths (CFR = 2.8%).

By 1985, 12% of all deaths (26% of adult deaths) in Somali camps were reportedly due to tuberculosis, compared with 7% in 1982. Also, in eastern Sudan, 38–50% of all deaths in two camps were reported to be from tuberculosis 9–10 months after they opened; however, the actual rate of deaths from tuberculosis had, in fact, not increased. Small numbers of deaths from meningitis were reported among refugees in both Thailand and Sudan. Since 1985, relapsing fever and non-A non-B hepatitis (18) have been cited as important causes of death in camps in the North-west region of Somalia; in eastern Sudan, typhus has become a problem.

**DISCUSSION**

**Quality of data**

The collection of reliable surveillance data during the early phases of a refugee emergency is difficult; however, we believe that the data presented here are as accurate as the conditions allowed. In Thailand, the overall number of deaths is probably accurate, since multiple sources of information were used. Data on cause of death were only recorded for those deaths that occurred in camp hospitals, where this could be ascertained by a qualified physician or nurse.

In Somalia, survey data from the early phase of the emergency relied on recall periods of between 1 month and 2 years, with the possibility of errors in recalling age and cause of death. Mortality data from later phases are probably more reliable, having been gathered by either trained community health workers who lived among the refugees, or in two large random sample mortality surveys, each with a recall period of 1 year.

Data from Sudan were obtained almost exclusively from the families of the deceased, soon after death, in interviews at the designated burial site. The overall numbers of deaths are probably more reliable than the age or cause of death; however, the interviewers were well trained in ascertaining the cause of death from a family history, using common terminology in the vernacular of the refugees. The fact that "other" causes of death were infrequently reported in the early months, but more frequently in later months, corroborates the observations of health workers in health care facilities and points to some consistency in reporting.

Therefore, although there are shortcomings in information collected under emergency conditions, it is probable that the data we have reported here are the best available on refugee populations during the emergency phases of relief programmes.

**Mortality rates and trends**

This is the first time that such extremely high and prolonged CMRs have been documented from various refugee emergencies. Specific public health interventions need to be promptly implemented if such mortality is to be prevented in the future.

The reported rates for the three emergencies studied are 8–40 times higher than those for the non-refugee populations in the host countries. The magnitude of mortality rates (up to 14 per 10 000 per day) in the most recent emergency in eastern Sudan (1985) is of particular concern. This high rate, although not maintained for 12 months, is equivalent to an annual rate of 51%. In any case, the majority of deaths in the first year in each of the populations studied occurred during the first 3 months.

The high mortality and prevalence of undernutrition during the first 1–4 weeks in each emergency may be partly explained by the conditions experienced by refugees prior to leaving their homeland and during the journey to the host country. Certainly, refugees who left Kampuchea in 1979 and Tigray in

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8 R. Steketee, 1985, unpublished.
9 Somali Refugee Health Unit annual report, 1985.
1984–85 underwent serious food shortages and, most likely, high rates of undernutrition, although the latter were not documented. In addition, on their journey to Thailand those Kampuchean refugees who were eventually housed in Sakaeo camp passed through an area of southern Kampuchea where malaria was hyperendemic (4), thus contributing to the high number of deaths from this disease during their first month at the camp. Deaths reported as having been caused by acute respiratory infections, diarrhoeal diseases, and measles were probably precipitated by environmental conditions within the camps.

The difference between the rates of improvement among the refugees in Thailand and in Africa discussed here can probably be explained by the greater availability of resources—food in particular—in Thailand. General food rations in camps for refugees in Thailand were rapidly augmented to give an adequate daily content averaging 2125 kilocalories per refugee (2), whereas several reports cite average daily caloric intakes of between 1100 and 1400 for rations in Somalia (13, 14, 19) and Sudan (5) for extended periods during the first year of emergency relief operations. The quality and quantity of the water supply were inadequate in some camps in the Sudan throughout much of 1985 (9), and in many Somali camps during 1980 (13, 14). By contrast, both water supply and sanitation in the camps in Thailand reached satisfactory standards quite rapidly (4).

Age-specific mortality

Age-specific mortality data reveal the extreme vulnerability of under-5-year-olds during an emergency. The median mortality rate for this age group reported by UNICEF for the 40 least developed countries in the world in 1983 was 220 per 1000, which is equivalent to 6 per 10 000 per day (15). Rates for refugee emergencies range up to five times higher. Public health programmes for refugees therefore need to give additional focus to this most vulnerable age group.

The observations from the Somali data that the infant mortality rate did not decrease between 1983 and 1985 suggest that improvement beyond a certain level is difficult. Survey data indicate that a large proportion of the infant deaths after 1982 (33% in 1985) occurred during the perinatal period when their prevention is difficult (20). Nevertheless, maintenance of the infant mortality rate among the refugee population at one-half that of the national rate in Somalia for more than 5 years is a considerable achievement for the refugee health programmes. Undernutrition prevalence rates in Somalia continue to be higher than among refugees aged less than 5 years, and thus may be associated with the failure to achieve further improvement in infant mortality after 1982. Although the decreases in mortality between 1980 and 1982 are encouraging, further improvement might require technological interventions that cannot be sustained in the long term by local health services.

Major causes of death

The major causes of death—acute respiratory infections, diarrhoeal diseases, measles, and undernutrition—in all three study populations are largely preventable through low-cost primary health care interventions. Up to 80% of deaths in the camps in Somalia and Sudan during emergency phases were due to diarrhoeal diseases and measles alone, with major outbreaks of the latter occurring in most of the major camps in eastern Sudan (5) and almost all the camps in Somalia (13). Immunization was very effective in reducing measles mortality in the Somali camps after 1980, and in 1981 immunization coverage was 86–97%, as determined by standard WHO coverage survey methods. In 1986 the estimated coverage rate for refugee children in the country was 78% (RHU, personal communication, September 1986). Also, in Thailand, early immunization was effective in preventing large outbreaks of measles.

The decline in CMRs was slower in the refugee populations in Somalia and Sudan, where undernutrition prevalence rates remained high longer and where the caloric value of food rations was lower. Undernutrition probably was a major factor in child mortality in all three refugee populations.

Diarrhoeal diseases accounted for a large proportion of deaths in the refugee populations studied, in particular among children aged less than 5 years. Whereas measles was a major cause of death mainly in the first few months, diarrhoeal diseases continued to cause high mortality for a much longer period. A sustained oral rehydration programme should therefore form an essential component of refugee relief interventions.

Malaria and acute respiratory infections were fre-

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* Refugee Health Unit (Somalia) nutrition report, October 1986

* International Rescue Committee public health reports, Wad Kowli and Fao camps, eastern Sudan, February and March 1985, Swiss Red Cross report from Wad Sherife camp, January 1985; CDC field epidemiologist report (Sudan), February 1985.

* Refugee Health Unit (Somalia) newsletter, March 1982.
quently reported causes of death, the former being particularly important in Thailand. The frequency of malaria deaths varied geographically and seasonally in the three case studies. For both acute respiratory infections and malaria, deaths are largely preventable through interventions such as chemoprophylaxis of vulnerable groups and presumptive treatment for malaria, as well as early diagnosis and prompt, standardized treatment of pneumonia with antibiotics. Reports from both Somalia (13) and Sudan of whooping cough outbreaks indicate the need for early diphtheria–pertussis–tetanus toxoid (DPT) immunization of children aged less than 5 years, although such immunization has a lower priority than that for measles.

Other communicable diseases (cholera, meningitis, relapsing fever, tuberculosis, and typhus) contributed to mortality in the three refugee populations. Of these, cholera has been the most important in terms of frequency and extent of outbreaks in recent years, particularly in Africa. Reports from Somalia (27) indicate that CFRs for cholera were low in those camps where an established primary health care system existed and the trained refugee health workers identified cases rapidly, instituted early treatment with oral rehydration therapy, and promptly referred serious cases. Tuberculosis control in refugee camps poses major organizational problems and is best addressed once the emergency phase has passed.

The epidemiological trends common to refugee emergencies suggest that the following interventions are of the highest priority and should be commenced immediately: adequate food distribution, measles immunization, the provision of clean water, and diarrhoeal disease control.

Establishment of a surveillance system for illnesses and deaths as soon as refugee camps are opened should ensure that the effectiveness of public health programmes is monitored and that any unexpected trends are detected early. Collection and analysis of crude, age-specific, and cause-specific mortality data are essential in planning and allocating appropriate resources to these programmes. Such a system should be standardized for all camps in a country and be coordinated by the designated lead agency for the refugee health programme, in cooperation with the host country’s health authorities. The surveillance system should collect only those data that are useful in evaluating existing interventions and planning new programmes. The collection of information on deaths, vaccine-preventable diseases, and potential outbreak diseases, e.g., cholera, viral hepatitis, meningitis, and typhus, is essential.

Mortality data are the most reliable indicator of the health status of a refugee population and should be collected from the beginning of a crisis. Round-the-clock surveillance of officially designated burial sites by paid staff is probably the most effective method of gathering information on the greatest number of deaths in a camp, as long as the staff are well trained in conducting short interviews of families of the deceased. Causes of death are best described using symptom complexes; for example, fever and cough for acute respiratory infections (22). Alternatively, the free distribution of burial shrouds and grave-digging tools has at times proved to be an effective means of contact with families of the deceased soon after death. After the emergency phase, information on deaths is probably best obtained by trained refugee health workers residing in the communities.

It should be noted that any monitoring system that relies heavily on voluntary notification of death by a family may be unreliable, since this can lead to a decrease in ratios for the family if these are distributed on a per capita basis. Furthermore, neonatal and infant deaths, which are sometimes not accorded any special burial ceremony and may pass unnoticed, are often not reported.

Cross-sectional surveys, using appropriate sampling methods, may be valid ways of estimating mortality if the recall period is short, and for this purpose periods of between 1 month and 2 years have been used in both refugee and non-refugee populations (23). Large sample sizes—which are necessary to estimate rates with narrow confidence limits—may be constraints to surveys of recent mortality. However, the great advantage of surveys is their ability to estimate rates in the absence of accurate population figures, as demonstrated in Somalia, where CMRs calculated from survey data were more reliable than those determined from information provided by monthly surveillances (20).

conclusions

Several specific public health measures are needed to deal with future refugee emergencies in order to prevent the high mortalities that have occurred in the past. In this respect, the single most important intervention is measles immunization. The timely provision of measles vaccine, cold chain equipment, other supplies, and technical personnel is the responsibility of the relief coordinating agency, which, in most cases, is UNHCR. Measles immunization should be instituted immediately and must not await an outbreak, by which time its effectiveness can become problematic.

Adequate food rations, clean water, and sanitation are essential for the immediate and long-term well-
being of refugees. Also, earlier recognition and response to movements of refugees would prevent delays in relief assistance in countries such as Somalia and Sudan, where food and equipment for the water supply system were imported from Europe and North America.

Delays in providing food, clean water, and sanitation do not justify inappropriate medical programmes that rely on hospitals, sophisticated drugs, or large numbers of expatriate medical personnel. On the contrary, a programme that ensures early diagnosis of common prevailing diseases, delivers oral rehydration therapy, provides standard antibiotic treatment for acute respiratory infections, and presumptive therapy for malaria, as well as allowing for referral and follow-up of serious cases, will significantly reduce the type of mortalities we have described here. For example, significant success was achieved in Somalia when thousands of community health workers were trained and provided primary care in the refugee camps.\(^4\)

While much emphasis has been placed on supplementary feeding programmes that address the problem of undernutrition, their effectiveness has not been demonstrated in the absence of prompt and reliable delivery of general food rations (24).

Finally, an essential component of any refugee health programme is a mortality surveillance system. This should be established promptly and should be used to monitor the effectiveness of public health interventions and detect outbreaks of potentially important fatal diseases such as cholera, meningitis, and typhus.


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RÉSUMÉ

UNE ANALYSE DES TENDANCES DE LA MORTALITÉ DANS LES POPULATIONS DE RÉFUGIÉS EN SOMALIE, AU SOUDAN ET EN THAILANDE


En Thaïlande, les données relatives aux décès ont été recueillies dans les dossiers de l’hôpital du camp auprès des autorités thailandaises de santé publique et auprès des entreprises de pompes funèbres. En Somalie, elles ont été tirées d’enquêtes rétrospectives et du système de surveillance mensuelle; au Soudan, la surveillance permanente des lieux de sépulture officiellement assignés aux camps a permis de rassembler ces mêmes données en s’adressant aux familles. La présente étude a essayé de mettre en évidence à la fois les tendances communes et les différences ressortant de ces trois populations de réfugiés. On a recueilli des données concernant la prévalence de la dénutrition à partir d’enquêtes sur le rapport poids-taille chez les enfants de moins de 5 ans effectuées sur des échantillons aléatoires. Ici, la dénutrition a été définie par un rapport inférieur à 80% de la valeur médiane pour la population de référence OMS/NCHS/CDC.

Pendant les trois premiers mois de la situation d’urgence, les taux de mortalité bruts (TMB) allaient de 14,2 à 33,8 pour 1000 personnes et par mois. Au Soudan, le TMB a
même atteint 14 pour 10 000 personnes et par jour (soit 42 pour 10 000 personnes et par mois) dans certains camps; à titre de comparaison, les TMB de la population normale de ces trois pays hôtes étaient situés entre 0,7 et 1,8 pour 10 000 personnes et par mois.

Bien que les TMB initiaux aient été élevés dans les trois populations de réfugiés, ils n'ont pas baissé à la même vitesse. En Thaïlande, ils ont rejoint un niveau comparable à celui du pays hôte en six semaines, alors qu'il a leur fallu 12 mois en Somalie et au Soudan. On a trouvé des taux de prévalence de la dénutrition—qui ont également été plus lents à s'améliorer—plus élevés en Somalie et au Soudan qu'en Thaïlande. Ces taux ont atteint 52% au Soudan et 39% en Somalie, et sont demeurés dans certains camps supérieurs à 20% pendant 10 mois. En Thaïlande, le taux est tombé de 18% à 4% en 5 mois.

Chez les enfants de moins de 5 ans, les taux de mortalité ont été extrêmement élevés, allant de 8,9 pour 10 000 personnes et par jour (Thaïlande) à 32,6 pour 10 000 personnes et par jour (Soudan), soit six fois plus que ceux notifiés par le FISE pour les enfants de ce groupe d’âges dans les populations normales des pays les moins développés.

Les principales causes de décès notifiées ont été: les infections respiratoires aiguës, les maladies diarrhéiques, le paludisme, la rougeole et la dénutrition. La rougeole a été une cause très importante de décès en Somalie et au Soudan; par contre, en Thaïlande, un programme de vaccination instauré précocement a probablement évité de nombreux décès dus à cette maladie. Les maladies diarrhéiques et la rougeole ont été à elles seules provoqué 80% des décès dans les camps soudanais pendant les 3 premiers mois. Les autres causes de décès notifiées ont été les suivantes: choléra, hépatite virale, méningite, bfrédiose, tuberculose et typhus. Plusieurs grandes épidémies de choléra se sont déclarées dans les camps somaliens et soudanais depuis le début de l’année 1985. Dans ces camps, les principales causes de décès pourraient être évitées par un approvisionnement rapide en rations alimentaires suffisantes et en eau propre, par des mesures d’assainissement et par l’application de mesures peu coûteuses de soins de santé primaires. De plus, la reconnaissance précoce des mouvements de réfugiés et la mise en place d’une structure d’accueil permettraient d’éviter les retards apportés à l’assistance d’urgence que l’on a vu se produire au Soudan oriental et en Somalie.

Dans les camps de réfugiés, un système de soins de santé qui assurerait une vaccination immédiate contre la rougeole et le diagnostic précoce des maladies les plus courantes, qui instaurerait un traitement de réhydratation par voie orale, fournirait un traitement antibiotique standard pour les infections respiratoires aigües et un traitement présomptif pour le paludisme, tout en permettant une évacuation et un suivi des cas graves, contribuerait à réduire sensiblement les causes de mortalité décrites dans cet article. On n’a pas pu démontrer l’efficacité des programmes d’alimentation complémentaire en l’absence d’un approvisionnement rapide et fiable en rations alimentaires normales. Enfin, un élément essentiel de tout programme de santé s’appliquant aux réfugiés est l’établissement d’un système de surveillance de la mortalité, qui devait être mis en place rapidement, de façon à contrôler l’efficacité des interventions de santé publique.

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