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THE PUBLIC HEALTH ASPECTS OF COMPLEX EMERGENCIES AND REFUGEE SITUATIONS*

MJ Toole[1] *and RJ Waldman*[2]
[1]Macfarlane Burnet Centre for Medical Research, Melbourne, Australia;
e-mail: toole@burnet.mbcmr.unimelb.edu.au
[2]The BASICS Project, United States Agency for International Development, Arlington, Virginia 22209

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ABSTRACT

Populations affected by armed conflict have experienced severe public health consequences mediated by population displacement, food scarcity, and the collapse of basic health services, giving rise to the term *complex humanitarian emergencies*. These public health effects have been most severe in underdeveloped countries in Africa, Asia, and Latin America. Refugees and internally displaced persons have experienced high mortality rates during the period immediately following their migration. In Africa, crude mortality rates have been as high as 80 times baseline rates. The most common causes of death have been diarrheal diseases, measles, acute respiratory infections, and malaria. High prevalences of acute malnutrition have contributed to high case fatality rates. In conflict-affected European countries, such as the former Yugoslavia, Georgia, Azerbaijan, and Chechnya, war-related injuries have been the most common cause of death among civilian populations; however, increased incidence of communicable diseases, neonatal health problems, and nutritional deficiencies (especially among the elderly) have been documented. The most effective measures to prevent mortality and morbidity in complex emergencies include protection from violence; the provision of adequate food rations, clean water and sanitation; diarrheal disease control; measles immunization; maternal and child health care, including the case management of common endemic communicable diseases; and selective feeding programs, when indicated.

INTRODUCTION

Disasters may quickly reverse the substantial gains made during the past two decades by primary health care initiatives in developing countries. A disaster may be defined as a relatively acute situation created by man-made, geophysical, weather-related, or biological events that adversely impacts on the health and economic well-being of a community to an extent that exceeds the local coping capacity. In the case of acute natural disasters such as earthquakes and hurricanes, the direct public health effects are immediate and often devastating. Most deaths and injuries occur during the first few hours following impact and any secondary public health effects are related to displacement of the affected population, destruction of public utilities, and disruption of basic health services. Following the acute response phase of search and rescue, surgical triage, and management of injuries, the public health priorities consist of infrastructure repair, restoration of health services, and rehabilitation of public utilities, especially water supplies. Long-term public health consequences have only occurred following those natural disasters–such as floods– that have destroyed food crops or led to prolonged population displacement in unsanitary camps or settlements. Outbreaks of communicable diseases are rare following acute natural disasters. These problems have not been documented in industrialized countries such as the United States; however, outbreaks of diarrheal disease, hepatitis, and malaria have occurred following some acute natural disasters in developing countries, such as devastating floods in the Sudanese capital of Khartoum in 1988 (58). In this paper, we focus on the public health issues related to populations affected by armed conflicts.

Armed Conflict

Severe public health consequences have been documented following most emergencies related to armed conflict, especially in developing countries. Since 1980, approximately 130 armed conflicts have occurred worldwide; 32 have each caused more than 1000 battlefield deaths (15). Between 1975 and 1989, civil conflicts were estimated to have caused approximately 750,000 deaths in Africa, 150,000 in Latin America, 3,400,000 in Asia, and 800,000 in the Middle East (61). Since the end of the cold war in 1991, the toll has increased as new wars have flared or old conflicts reignited in Angola, Somalia, Burundi, Rwanda, Afghanistan, Tajikistan, Sudan, Sierra Leone, Liberia, Sri Lanka, the former Yugoslavia, Azerbaijan, Georgia, and Chechnya. In 1993 alone, 47 conflicts were active, of which 43 were internal wars (55). Armed conflicts have increasingly targeted civilian populations, resulting in high casualty rates, widespread human rights abuses, forced migration, and in some countries the

total collapse of governance. This trend is demonstrated by UNICEF's estimate that 1.5 million children have been killed in wars since 1980 (49).

The indirect, or secondary, public health effects of conflicts have been caused by population displacement, food shortages, and collapsed basic health services. Recent examples of mass population movements that attracted widespread media attention have included the Kurdish exodus from northern Iraq in 1991; widespread internal displacement and migration to neighboring countries by Somalis in 1992–93; the displacement of several million persons in the former Yugoslavia between 1992 and 1995; and the migration of up to two million Rwandans in 1994. A new term–*complex emergency*–has been coined to describe situations affecting large civilian populations that usually involve a combination of factors including war or civil strife, food shortages, and population displacement, resulting in significant excess mortality.

Complex Emergencies

The evolution of complex humanitarian emergencies follows a relatively consistent sequence: domination of government by one political faction, discrimination against minority ethnic or religious groups or against majority groups by ruling minorities (e.g. Burundi), widespread human rights abuses, leading to civil unrest, violence, and open armed conflict. The destruction of infrastructure, diversion of resources away from social services, and general economic collapse lead to a deterioration in primary health care services, especially prevention programs such as child immunization and antenatal care. Hospitals and surgical facilities may be overwhelmed by the needs of war wounded and general medical services suffer from lack of staff and shortages in essential medical supplies. For example, the major hospital in the central Bosnian city of Zenica reported that the proportion of all surgical cases associated with trauma steadily increased from 22% in April 1992, at the beginning of the war, reaching 78% in November of the same year (13).

Deliberate diversion of food supplies by various armed factions, disruption of transport and marketing, and economic hardship often cause severe food deficits. Farmers may be unable or unwilling to plant or harvest crops in the midst of a war; the supply of seeds and fertilizer may be disrupted; irrigation systems may be damaged by the fighting; and crops, food stores, or animal herds may be intentionally destroyed or looted by armed soldiers. In countries that do not normally produce agricultural surpluses, the impact of these factors on the nutritional status of populations may be severe, particularly in sub-Saharan Africa. When adverse climatic factors have intervened, as in drought-prone countries such as Sudan, Somalia, Mozambique, and Ethiopia, the outcome has been catastrophic. Food shortages and hunger are usually complicating

factors rather than primary causes of population migration. For example, a severe drought in Somalia during 1992 exacerbated rather than initiated the flow of refugees fleeing the civil war across the border into Kenya.

Population Displacement

Mass migration and food shortages have been responsible for most deaths following civil conflicts in Africa and Asia. *Refugees* are defined under several international conventions as persons who flee their country of origin through a well-founded fear of persecution for reasons of race, religion, social class, or political beliefs (51). The number of dependent refugees under the protection and care of the United Nations High Commissioner for Refugees (UNHCR) steadily increased from approximately 5 million in 1980 to more than 20 million in late 1994 (Table 1) (53). Several of the world's largest ever mass migrations have taken place in recent years; for example, more than 600,000 refugees fled Burundi for Rwanda, Tanzania, and Zaire during a two-week period in late October and early November 1993. Between April and July 1994, an estimated two million Rwandan refugees fled into Tanzania, eastern Zaire, and Burundi provoking the most serious refugee crisis in 20 years. In addition to those persons who meet the international definition of refugees, an estimated 25 million people have fled their homes for the same reasons as refugees but remain *internally displaced* in their countries of origin. Most internally displaced persons are found in sub-Saharan Africa, the Middle East, the former Yugoslavia, and in the republics of the former Soviet Union. The reasons for the flight of refugees and internally displaced persons are generally the same: war, civil strife, persecution, and the search for security.

PUBLIC HEALTH CONSEQUENCES OF POPULATION DISPLACEMENT

In general, the major health problems of refugees and internally displaced persons are similar in nature. However, the health status of the internally displaced may be worse because access to these populations by international relief agencies is often difficult and dangerous. Also, internally displaced persons may suffer more injuries because they are usually located closer to zones of conflict than are refugees; however, both refugees and internally displaced persons are often victims of landmines, particularly as they cross international borders.

Mortality

The crude mortality rate (CMR) most accurately represents the health status of emergency-affected populations. Mortality rates have been estimated from

Table 1 Refugee populations of greater than 100,000, December 1994

Country of asylum	Countries of origin	Estimated number
Iran	Afghanistan, Iraq	2,220,000
Zaire	Rwanda, Angola, Burundi, Sudan	1,527,000
Jordan	Palestinians	1,232,000
Pakistan	Afghanistan	1,200,000
Tanzania	Rwanda, Burundi, Mozambique	752,000
Gaza Strip	Palestinians	644,000
Guinea	Liberia, Sierra Leone	580,000
Sudan	Eritrea, Ethiopia, Chad	550,000
West Bank	Palestinians	504,000
Russian Federation	Tajikistan, Georgia, Azerbaijan	451,000
Lebanon	Palestinians	338,000
Syria	Palestinians	332,000
India	China, Sri Lanka, Bangladesh, Bhutan	327,000
Uganda	Sudan, Zaire, Rwanda	323,000
Cote d'Ivoire	Liberia	320,000
Yugoslavia	Croatia, Bosnia and Herzegovina	300,000
China	Vietnam, Burma	297,000
Armenia	Azerbaijan, Georgia	296,000
Azerbaijan	Armenia, Uzbekistan	279,000
Kenya	Somalia, Sudan, Ethiopia	257,000
Ethiopia	Somalia, Sudan, Eritrea	250,000
South Africa	Mozambique	200,000
Croatia	Bosnia and Herzegovina	188,000
Burundi	Rwanda	165,000
Algeria	Western Sahara, Mali, Niger	130,000
Iraq	Iran, Palestinians	120,000
Bangladesh	Burma	116,000
Ghana	Togo, Liberia	110,000
Nepal	Bhutan, China	104,000
Liberia	Sierra Leone	100,000

Source: United States Committee for Refugees (53).

burial site surveillance, hospital and burial records, community-based reporting systems, and population surveys. The many problems in estimating mortality under emergency conditions include: (*a*) poorly representative population sample surveys; (*b*) failure of families to report all deaths for fear of losing food ration entitlements; (*c*) inaccurate estimates of affected populations for the purpose of calculating mortality rates; and (*d*) lack of standard reporting procedures. In general, however, mortality rates have tended to be underestimated because deaths are usually underreported or undercounted, and population size is often exaggerated (9). The most reliable estimates of mortality rates have come from well-defined and secure refugee camps where there is a reasonable

level of camp organization and a designated agency has had responsibility for the collection of data. The most difficult situations have been those where internally displaced persons have been scattered over a wide area and where surveys could take place only in relatively secure zones. These safe zones may have sometimes acted as magnets for the most severely affected elements of a populations; for example, the Somali town of Baidoa was the site for the storage and distribution of massive amounts of relief food in 1992 and became known as the "famine epicenter" (28). On the other hand, it is possible that the worst-affected communities have been in areas that have been inaccessible by those performing the surveys. In either case, it has proved difficult to extrapolate the findings of surveys on mortality conducted in specific locations to broader populations in conflict-affected countries. Extensive differences in mortality survey methods have been identified; for example, an evaluation of 23 field surveys performed in Somalia between 1991 and 1993 found wide variation in the target populations, sampling strategies, units of measurement, methods of rate calculation, and statistical analysis (3).

Early in an emergency, when mortality rates are elevated, it is useful to express the CMR as deaths per 10,000 population per day. In most developing countries, the baseline annual CMR in nonrefugee populations has been reported between 12–20 per 1000, corresponding to a daily rate of approximately 0.3–0.6 per 10,000 (49). A threshold of 1 per 10,000 per day has been used commonly to define an elevated CMR and to characterize a situation as an emergency (9). During the past 20 years, crude mortality rates as high as 30 times baseline rates have not been unusual during the first month or two following an acute movement of refugees (Table 2). While the situation appeared to improve among refugees during the first few years of the current decade, mortality rates among Rwandan refugees in 1994 were among the highest ever documented. Following the massive influx of Rwandan refugees into the North Kivu region of eastern Zaire in July 1994, the daily CMR based on body counts ranged between 25 and 50 per 10,000 per day (20). The difficulty in estimating the size of the refugee population (the denominator for rate calculations) accounted for the wide range of estimates. Population surveys conducted in the refugee camps, which provided mortality estimates independent of population size, found that between 7% and 9% of the refugees died during the first month after the influx.

Refugees are usually at highest risk of mortality during the period immediately after their arrival in the country of asylum, reflecting long periods of inadequate food and medical care prior to, or during, their flight. For example, the severe deprivation suffered by Mozambican refugees prior to fleeing their country is illustrated by death rates in Zimbabwean refugee camps. During July and August 1992, the daily CMR among Mozambican refugees who had been

Table 2 Estimated crude mortality rates (deaths per 1000 per month) in selected refugee populations, 1990–1994

Date (reference)	Country of asylum	Country of origin	Crude mortality rate
July 1900 (42)	Ethiopia	Sudan	6.9
June 1991 (42)	Ethiopia	Somalia	14.0
March-May 1991 (8)	Turkey	Iraq	12.6
March-May 1991 (2)	Iran	Iraq	6.0
March 1992 (42)	Kenya	Somalia	22.2
March 1992 (24)	Nepal	Bhutan	9.0
June 1992 (9)	Bangladesh	Burma	4.8
June 1992 (11)	Malawi	Mozambique	3.5
August 1992 (11)	Zimbabwe	Mozambique	10.5
December 1993 (14)	Rwanda	Burundi	9.0
August 1994 (44)	Tanzania	Rwanda	9.0
July 1994 (20)	Zaire	Rwanda	59–94

in Chambuta camp for less than one month was 8 per 10,000 population. This was four times the death rate of refugees who had been in the camp between 1 and 3 months, and 16 times the death rate normally reported for nondisplaced populations in Mozambique (11). The rate at which mortality rates have declined among refugee populations has varied significantly. For example, high initial death rates among Cambodian refugees in Thailand declined to almost baseline levels within one month (9). Even among Rwandan refugees in Goma, the extremely high mortality rate recorded during the first month decreased relatively quickly (Figure 1). On the other hand, the crude and under-five death rates among Somali refugees in Ethiopia in 1988 actually increased over time and remained high for almost 18 months after the initial influx (Figure 2) (38). The different rate of improvement has been associated with the adequacy and promptness of the international assistance program. An apparent stabilization of mortality rates may be due to extremely high mortality rates among the most vulnerable. For example, a survey in Baidoa, Somalia, found that approximately 75% of displaced children under 5 years died within a six-month period and the proportion of children under 5 in the displaced population fell from 18.3% to 7.8% during this period (28).

The limited data available suggest that death rates have been extremely high among internally displaced populations. Mortality rates among populations displaced inside Somalia in 1992 and southern Sudan in 1993 were particularly high (Table 3). During the period 1991–1993, the excess mortality due to fighting and famine in Somalia has been estimated at 240,000 deaths in a population

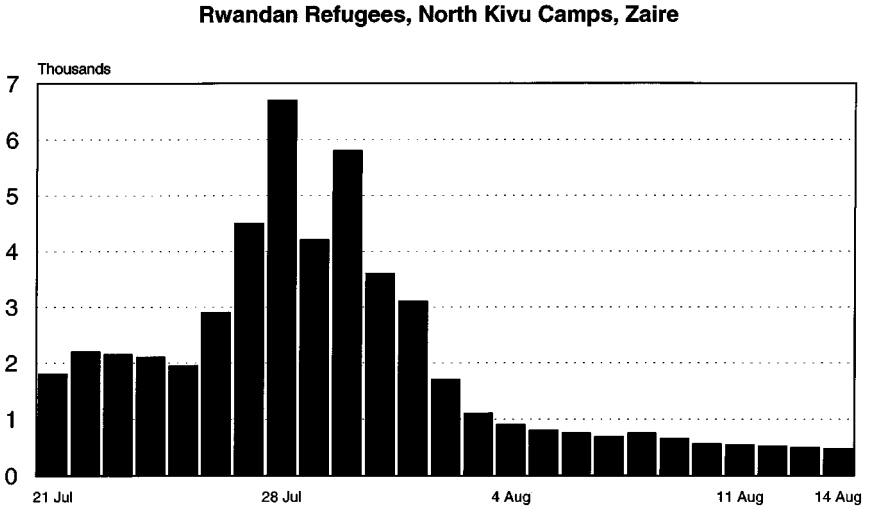

Figure 1 Number of deaths per day, July 21–August 14, 1994. Source: UNCHR (Reference 20)

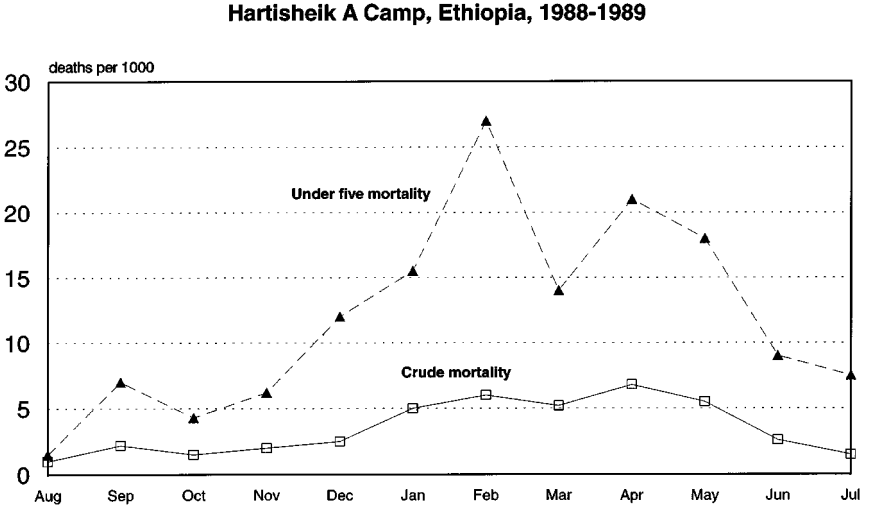

Figure 2 Crude and under-five mortality rates, Somali refugees. Source: Save the Children Fund; UNCHR; Ethiopian Ministry of Health (Reference 38)

Table 3 Estimated monthly crude mortality rates (deaths per 1000 per month) among internally displaced persons, 1990–1994

Date (reference)	Country	Crude Mortality Rate
January–December 1990 (9)	Liberia	7.1
April 1991–March 1992 (23)	Somalia (Merca)	13.8
April–November 1992 (28)	Somalia (Baidoa)	50.7
April–December 1992 (28)	Somalia (Afgoi)	16.5
April 1992–March 1993 (12)	Sudan (Ayod)	23.0
April 1992–March 1993 (12)	Sudan (Akon)	13.7
April 1992–March 1993 (39)	Bosnia (Zepa)	3.0
April 1993 (13)	Bosnia (Sarajevo)	2.9
May 1995 (45)	Angola (Cafunfo)	24.9
February 1996 (48)	Liberia (Bong)	16.5

of approximately 6 million (21). However, it is not known how many of these deaths occurred among the internally displaced. In Bosnia, CMRs reported in Muslim enclaves during the height of the war in 1993 were approximately four times prewar rates (39).

Demographic Risk Factors

Most deaths in refugee populations have occurred among children under 5 years of age; for example, 65% of deaths among Kurdish refugees on the Turkish border occurred in the 17% of the population less than 5 years of age (8). Among newly arrived Mozambican refugees in Malawi in 1992, the age-specific death rate for children under 5 years of age was 4 to 5 times the CMR, suggesting that most refugee deaths were occurring in this age group (11). An exception to this trend was documented in the Rwandan refugee camps of eastern Zaire where under-5 death rates were no higher than CMRs during the first 4 weeks after the influx–probably because most deaths in this population were caused by cholera, which has high attack rates and high case-fatality rates among all age groups (32). Nevertheless, the risk of mortality in the Rwandan refugee population was highest among the more than 10,000 unaccompanied children, mostly orphans, who were registered in North Kivu. Daily death rates in this group during the first six weeks after the influx were 20 to 80 times higher than Rwandan estimates for under-five mortality before the crisis (18). In most emergency situations, gender-specific mortality data has not been collected. However, in the Gundhum II camp in Bangladesh, the death rate among Burmese refugee girls less than 1 year of age was almost twice the rate for boys; among refugees older than 5 years, the female-specific death rate was 3.5 times that for males (9). Among Kurdish refugees on the Turkey-Iraq border in 1991, however, the death rate among males and females was approximately equal (8). Despite the

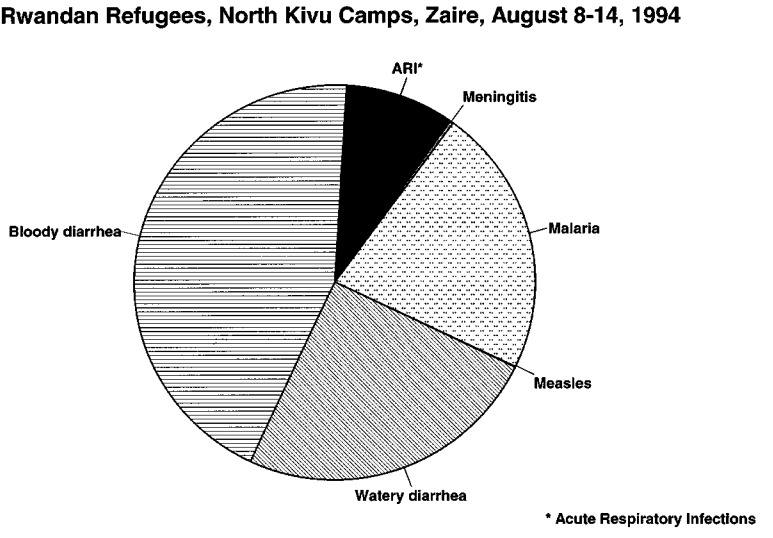

Figure 3 Reported causes of morbidity, outpatient clinics. Source: UNCHR (Reference 20)

lack of data on women's health in emergency situations, a number of authors have described increased risk of both morbidity and mortality among women in refugee and displaced populations (59).

Causes of Mortality and Morbidity

The most common reported causes of death among refugees during the early influx phase have been diarrheal diseases, measles, acute respiratory infections, malaria, and other infectious diseases (41). These diseases have been the most critical causes of morbidity and the focus of most public health interventions. The major causes of morbidity among Rwandan refugees in the Zaire camps in August 1994 are typical of those conditions commonly reported in the acute phase of a refugee emergency (Figure 3). High prevalences of acute protein-energy malnutrition have contributed to elevated case-fatality rates for communicable diseases and to overall high mortality rates. In some settings, most deaths could be attributed to one or two communicable diseases. In the Goma camps of eastern Zaire, for example, more than 90% of the estimated 50,000 deaths in the first month after the refugee influx were caused by either watery or bloody diarrhea (20).

DIARRHEAL DISEASES Epidemics of severe diarrheal disease have been increasingly common among refugee populations. When approximately 400,000 Kurdish refugees fled Iraqi cities in 1991 and found refuge in squalid camps

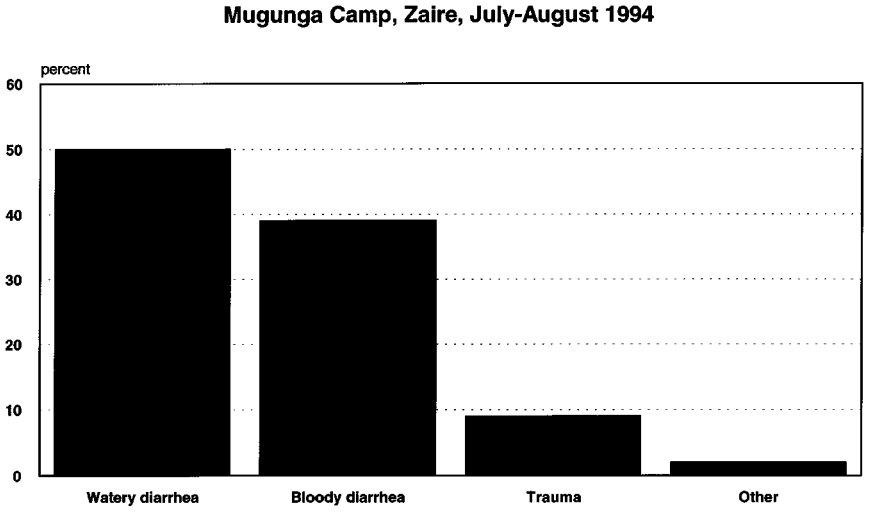

Figure 4 Major causes of death among Rwandan refugees, all ages. Source: CDC/UNCHR survey (Reference 20)

on the Turkish border, more than 70% of deaths were associated with diarrhea, including cholera (8). Cholera epidemics have occurred in refugee camps in Malawi, Zimbabwe, Swaziland, Nepal, Bangladesh, Turkey, Afghanistan, Burundi, and Zaire (9, 20). In the Goma area of eastern Zaire, an explosive cholera outbreak occurred within the first week of the arrival of refugees. This outbreak was associated with rapid fecal contamination of the alkaline water of Lake Kivu, which was the primary source of drinking water for the refugees. As the cholera outbreak subsided, an equally lethal epidemic of dysentery occurred. Consequently, over 90% of deaths in the first month after the influx were attributed to diarrheal disease (Figure 4). Cholera case-fatality rates in refugee camps have ranged between 3% and 30%, depending on the degree of preparedness. Outbreaks of dysentery caused by *Shigella dysenteriae type I* have been reported since 1991 in Malawi, Nepal, Kenya, Bangladesh, Burundi, Rwanda, Tanzania, and Zaire (9, 20). Dysentery case-fatality rates have been as high as 10% in young children and the elderly (14).

MEASLES Outbreaks of measles within refugee camps were common prior to 1990 and caused many deaths. Low levels of immunization coverage, coupled with high rates of undernutrition and vitamin A deficiency, played a critical role in the spread of measles and the subsequent mortality within some refugee camps. Measles has been one of the leading causes of death among children in

refugee camps; in addition, measles has contributed to high malnutrition rates among those who have survived the initial illness. Measles infection may lead to or exacerbate vitamin A deficiency, compromising immunity and leaving the patient susceptible to xerophthalmia, blindness, and premature death. In early 1985, the measles-specific death rate among children under 5 in one eastern Sudan camp was 30 per 1000/month; the case-fatality rate (CFR) based on reported cases was almost 30% (35). Large numbers of measles deaths have been reported in camps in Somalia, Bangladesh, Sudan, and Ethiopia (40). Since 1990, mass immunization campaigns have been effective in reducing the measles morbidity and mortality rates in refugee camps; for example, in Kenya, Tanzania, Burundi, and Malawi. In other large refugee populations (e.g. Somalis in Ethiopia in 1989; Iraqis in Turkey in 1991; Rwandans in Zaire and Tanzania in 1994), measles outbreaks did not occur probably because immunization coverage rates were already high in the countries of origin of the refugees (42, 20).

Since 1990, high measles-associated death rates have been reported more commonly in internally displaced populations (e.g. Somalia and Sudan) than among refugees. Population surveys conducted at four different sites in southern Somalia in 1992–93 found that between 50% and 84% of all deaths were associated with either measles or diarrhea (3). One example of a measles outbreak following an acute natural disaster occurred following the eruption of Mt. Pinatubo in the Philippines in 1991. Among the more than 100,000 people displaced into evacuation camps, more than 18,000 cases of measles were reported. Measles was associated with 22% of deaths reported during the three months following the eruption among this displaced population, most of whom were members of a tribal group that resisted efforts to vaccinate children against measles (10).

MALARIA Malaria has caused high rates of morbidity and mortality among refugees and displaced persons in countries where malaria is endemic, such as Thailand, eastern Sudan, Somalia, Kenya, Malawi, Zimbabwe, Burundi, Rwanda, and Zaire (9, 20). Malaria-specific mortality rates have been especially high when refugees from areas of low malaria endemicity have fled through, or into, areas of high endemicity. Recent examples include the movement of Cambodian refugees through highly endemic areas into Thailand in 1979, the influx of highland Ethiopians into eastern Sudan in 1985, and the exodus of highland Rwandans into Zaire in 1994. The severity of malaria outbreaks in Africa has been exacerbated by the rapid spread of chloroquine resistance during the 1980s; in addition, resistance to sulfadoxine-pyrimethamine (Fansidar^{R}) has also been reported among Rwandan refugees in eastern Zaire since 1994 (Médecins sans Frontières, Holland, unpublished data).

ACUTE RESPIRATORY INFECTIONS Acute respiratory infections (ARIs) have been consistently reported among the leading causes of death in refugee populations. In Thailand (1979), Somalia (1980), Sudan (1985), Honduras (1986), and Malawi (1989), ARIs were cited among the three main causes of mortality in refugee camps, particularly among children (9). The crowding, poor ventilation, inadequate shelter, and prolonged exposure that refugees and internally displaced persons often experience are common risk factors for respiratory infections with poor outcomes.

MENINGITIS The crowding associated with refugee camps places refugees at high risk of meningococcal meningitis in endemic areas, particularly in countries within or near the traditionally described "meningitis belt" of sub-Saharan Africa (29). Based on experience elsewhere in Africa, a threshold incidence of 15 cases per 100,000 population per week in two successive weeks has been used to predict a full-blown epidemic. Outbreaks have been reported in Malawi, Ethiopia, Burundi, and Zaire; however, mass immunization has proved to be an effective epidemic control measure in these situations and meningococcal morbidity and mortality rates have been relatively low. In the Zairian camp of Kibumba, the incidence reached 19 per 100,000 during the week of August 8–14, 1994, resulting in a mass vaccination campaign that successfully averted a wider epidemic (20).

HEPATITIS Outbreaks of hepatitis E infection among refugees in Somalia (1986), Ethiopia (1989), and Kenya (1991) have led to high attack rates and CFRs among pregnant women as high as 17% (5, 25). This disease has only recently been introduced to Africa; therefore, most adults have not been exposed to the disease. Since previous exposure to hepatitis A and B is relatively common in this region, any epidemic of hepatitis-like illness in Africa with high attack rates among adults is likely to be caused by infection with the hepatitis E virus. The virus is enterically transmitted and is often associated with contamination of water supplies; the role of person-to-person spread is not yet clear, but may not be an important mode of transmission.

TUBERCULOSIS In complex emergencies when basic health services have been disrupted, treatment of patients with active tuberculosis may be inadequate or incomplete, leading potentially to increased transmission in affected communities. Since the war began in Bosnia and Herzegovina in 1991, the incidence of new cases of tuberculosis has reportedly increased fourfold (39). Likewise, in Somalia during the civil war and famine of 1991–1992, routine case-finding, treatment, and follow-up of tuberculosis patients almost ceased. Consequently, there was a marked increase in both the incidence of new cases and the tuberculosis-related CFR (37). Tuberculosis is well recognized as a

health problem among refugee and displaced populations. The crowded living conditions and underlying poor nutritional status of refugee populations may foster the spread of the disease. Although not a leading cause of mortality during the emergency phase, tuberculosis often emerges as a critical problem once measles and diarrheal diseases have been adequately controlled. For example, among adult refugees in Somalia and eastern Sudan in 1985, 26% and 38%, respectively, of deaths were attributed to tuberculosis (9). The high prevalence of HIV infection among many African refugee populations may contribute to the high rate of transmission.

HIV INFECTION AND OTHER SEXUALLY TRANSMITTED DISEASES Although there is no reason to believe that refugees are at higher risk of HIV infection than nonrefugee populations, several recent mass population migrations have taken place in areas where HIV infection prevalence rates are high; for example, in Burundi, Rwanda, Malawi, Ethiopia, and Zaire. In one of the few refugee populations studied for this infection, the HIV prevalence among adult male Sudanese refugees in western Ethiopia in 1992 was 7%; the prevalence of infection among commercial sex workers living in the vicinity of the camp was greater than 40% (CDC, unpublished data, 1992). Serological surveys in this population also revealed high rates of previous infection with syphilis and chancroid. The contribution of HIV infection to morbidity and mortality among refugees has not been documented, but may be significant. In the former Yugoslavia, there have been many reports of sexual assault and increasing prostitution; in addition, high rates of violence-related trauma have increased the rate of blood transfusions (39). In this setting, where shortages of laboratory reagents to test blood for HIV are widespread, the risk of increased transmission of HIV is high, though this trend has not yet been confirmed by studies.

Nutritional Deficiencies

PROTEIN-ENERGY MALNUTRITION The prevalence of moderate to severe acute malnutrition in a random sample of children less than 5 years of age is generally a reliable indicator of this condition in a population. Since weight is more sensitive to sudden changes in food availability than height, nutritional assessments during emergencies focus on measuring weight-for-height. Also, weight-for-height is a more appropriate measurement for ongoing monitoring of the effectiveness of feeding programs. Moderate to severe acute malnutrition is defined as either a weight-for-height more than 2 standard deviations below the mean of the CDC/NCHS/WHO reference population (Z-score less than -2) or weight-for-height less than 80% of the reference population median (9). Severe acute malnutrition is defined as weight-for-height more than

3 standard deviations below the reference mean (Z-score less than −3) or less than 70% of the reference median. All children with edema are classified as having severe acute malnutrition.

As a screening measurement, the mid-upper arm circumference (MUAC) may also be used to assess acute undernutrition, although there is not complete agreement on which cutoff values should be used as indicators. Field studies indicate that a MUAC between 12.0 cm and 12.5 cm correlates with a weight-for-height Z-score of −2; the lower figure (12.0 cm) is more appropriate in children less than 2 years of age (57).

Prevalence rates of acute malnutrition among children less than 5 years of age in various refugee populations have been as high as 50% among Ethiopian refugees in eastern Sudan (1985), 45% among Sudanese refugees arriving in Ethiopia during 1990, 29% among Somali refugees in Kenya in 1991, and 48% among Mozambicans in Zimbabwe (1992) (42). In some settings, refugee children who were adequately nourished upon arrival in camps have developed acute malnutrition due either to inadequate food rations or to severe epidemics of diarrheal disease. In the Hartisheik refugee camp in eastern Ethiopia, for example, the prevalence of acute malnutrition increased from less than 10% to almost 25% during a six-month period in late 1988 and early 1989 due to inadequate food rations (38). Although the prevalence decreased in mid-1989 following improvements in the ration distribution system and supplementary rations for all children under 5 years, six years later the situation again deteriorated. Surveys in March 1995 in Hartisheik found an acute malnutrition prevalence of 13.7% (45).

In early 1991, the prevalence of acute malnutrition among Kurdish refugee children aged 12 to 23 months increased from less than 5% to 13% during a two-month period following a severe outbreak of diarrheal disease (60). Surprisingly, the malnutrition prevalence among children less than 12 months of age was less than 4%; however, a survey revealed that the diarrhea-associated death rate in this age group was three times higher than the death rate among children 12–23 months of age. Thus, it is likely that most malnourished infants died, resulting in a deceptively low malnutrition prevalence among the survivors (60).

The prevalence of acute malnutrition was between 18% and 23% in Rwandan refugee camps in eastern Zaire, following the severe cholera and dysentery epidemics during the first month after the influx (20). Children with a history of dysentery within three days prior to the survey were three times more likely to be malnourished than those with no history of recent dysentery. Also, children in families with no adult male present were at significantly higher risk of malnutrition than those children in households headed by an adult male (20). Prevalence rates of acute malnutrition among the internally displaced have tended to be

Table 4 Prevalence of acute malnutrition* among children <5 years of age in internally displaced and conflict-affected populations, 1988–1995

Date (reference)	Country (region)	Population affected	Prevalence of acute malnutrition
1988 (9)	Sudan (South Darfur)	80,000	36%
1992 (42)	Southern Somalia	3,000,000	47%–75%
1993 (12)	Sudan (Ame)	47,000	81%
1994 (43)	Sudan (Bahr el Ghazal)[1]	345,000	36.1%
1994 (43)	Ethiopia (Gode)[1]	35,000	35.6%
1994 (44)	Afghanistan (Sarashahi)[2]	163,000	18.6%
1995 (45)	Angola (Cafunfo)[3]	10,000	29.2%
1995 (45)	Liberia (Goba town, Margibi)[2]	N/A	11.7%
1995 (46)	Sierra Leone (Bo)[3]	250,000	19.8%
1995 (46)	Sudan (Labone)[3]	38,000	22.6%
1996 (48)	Zaire (Masisi)[2]	100,000	31.0%

*Acute malnutrition defined either as weight-for-height 2 standard deviations below the reference mean or less than 80% of the reference median.
[1]Survey conducted by Médecins sans Frontières (Belgium).
[2]Survey conducted by Médecins sans Frontières (Holland).
[3]Survey conducted by Action Internationale contre la Faim.

extremely high. In southern Somalia during 1992, the prevalence of acute malnutrition among children less than 5 years in displaced persons camps in Marka and Qorioley was 75%, compared with 43% among town residents (23). In March 1993, approximately 70% of internally displaced children in several sites in southern Sudan were acutely malnourished (12). Acute malnutrition prevalences documented by sample surveys among various internally displaced populations are presented in Table 4.

MICRONUTRIENT DEFICIENCY DISEASES High incidence rates of several micronutrient deficiency diseases have been reported in many refugee camps, especially in Africa. Frequently, famine-affected and displaced populations have already experienced low levels of dietary vitamin A intake and, therefore, may have very low vitamin A reserves. Furthermore, the typical rations provided in large-scale relief operations lack vitamin A, putting these populations at high risk. In addition, those communicable diseases that are highly incident in refugee camps, such as measles and diarrhea, are known to rapidly deplete vitamin A stores. Consequently, young refugee and displaced children are at high risk of developing vitamin A deficiency. In 1990, more than 18,000 cases of pellagra, caused by food rations deficient in niacin, were reported among Mozambican refugees in Malawi (7). Numerous outbreaks of scurvy (vitamin C deficiency) were documented in refugee camps in Somalia, Ethiopia, and Sudan between 1982 and 1991. Cross-sectional surveys performed in 1986–1987

reported prevalence rates as high as 45% among females and 36% among males; prevalence increased with age (17). The prevalence of scurvy was highly associated with the period of residence in camps, a reflection of the time exposed to rations lacking in vitamin C. Outbreaks of scurvy and beriberi were also reported among Bhutanese refugees in Nepal during 1993 (46). Iron deficiency anemia has been reported in many refugee populations, affecting particularly women of childbearing age and young children (47).

Other Health Effects

In addition to high prevalence of nutritional deficiencies and a high incidence of communicable diseases, injuries related to war trauma and landmines have been common, especially among internally displaced persons and those who have been trapped in zones of conflict. In Bosnia, excess mortality reported among the displaced or in besieged Muslim enclaves has been associated mainly with war-related trauma. In the capital of Sarajevo, for example, an estimated 6800 deaths (57% of all mortality) and 16,000 injuries were attributed to war trauma between April 1992 and March 1993 (13). The CMR in the city increased almost fourfold between 1991 (prewar) and 1993. Population surveys in southern and central Somalia determined that between 4% and 11% of deaths during April 1992–January 1993 were caused by war-related trauma (3). Sexual assault of displaced women has been increasingly common; for example, reports from the former Yugoslavia estimate that at least 20,000 Bosnian, Serbian, and Croatian displaced women have been raped (1). The Office of the United Nations High Commissioner for Refugees (UNHCR) documented 192 cases of rape of Somali refugee women in Kenyan camps during a seven-month period during 1993; in addition, several thousand rapes were estimated to have been unreported (52). The psychosocial problems of refugees have not been extensively documented, except for several studies conducted on refugees who have been resettled in industrialized countries. One review of such studies conducted in Canada, the United States, and Sweden found that between 30% and 75% of refugee children and adolescents demonstrated symptoms and signs of posttraumatic stress disorder (26). Increases in neonatal mortality rates and in deaths associated with inadequately treated chronic diseases have also been reported in the former Yugoslavia, where basic medical services have been severely disrupted by the war and related economic collapse (39).

PREVENTION OF PUBLIC HEALTH EFFECTS OF COMPLEX DISASTERS

The prevention of the public health consequences of complex disasters can be classified into three categories: primary, secondary, and tertiary.

Primary Prevention

Primary prevention is the basic strategy of public health, and epidemiology is one of its essential tools. In situations of armed conflict, however, epidemiology can be practiced safely and reliably in very few areas. Hence, the traditional documentation, monitoring, and evaluation elements of disease prevention may be ineffective in these situations. The provision of adequate food, shelter, potable water, sanitation, and immunization has proved problematic in countries disrupted by war. Primary prevention in such circumstances, therefore, means stopping the violence.

More effective diplomatic and political mechanisms need to be developed that might resolve conflicts early in their evolution prior to the stage when food shortages occur, health services collapse, populations migrate, and significant adverse public health outcomes emerge. The notion of national sovereignty embodied in the United Nations Charter has sometimes forced the international community to stand by and watch extreme examples of human rights abuses until a certain threshold of tolerance has been crossed and strong action has been taken, as in the case of Somalia. By the time such action has been taken, however, the conflict has often advanced to a stage where any involvement by outside forces is costly and dangerous. Cautious, neutral, but determined diplomacy of the kind practiced by the Atlanta-based Carter Center in Ethiopia, Sudan, Haiti, and Bosnia-Herzegovina might serve as a model for future conflict resolution efforts. Epidemiologists and behavioral scientists might play a role in this process by systematically studying the dynamics and characteristic behaviors that sustain conflict situations and by seeking to identify measures that might reduce the level of tension between opposing sides.

Secondary Prevention

Secondary prevention involves the early detection of evolving conflict-related food scarcity and population movements, preparedness for interventions that mitigate their public health impact, and the development of appropriate public health skills to enable relief workers to work effectively in emergency settings.

EARLY DETECTION Disaster detection activities in the form of early warning systems have existed for some time; however, these systems have tended to focus on monitoring natural rather than man-made hazards. Such systems, implemented by a range of United Nations agencies and US Government–supported programs, routinely monitor crop yields, food availability, staple cereal prices, rainfall, and household income in a number of African countries, as well as conducting periodic vulnerability assessments. The information generated is published and disseminated widely in periodic bulletins and has proven useful in predicting natural disasters, such as drought throughout southern Africa in

1992. Nevertheless, these systems have generally not developed early indicators related to human rights abuses, ethnic conflict, political instability, and migration. Other groups such as Africa Watch, Physicians for Human Rights, Amnesty International, and African Rights have conducted assessments of vulnerability in countries, such as Burundi, relatively early in the evolution of civil conflict. The problem with such assessments is that the results are often ignored by the governments of those nations able to intervene unless their security interests are perceived to be threatened. Early in 1992, for example, reports by several nongovernmental organizations (NGO) on the deteriorating situation in Somalia were largely ignored by the international community. Epidemiologists might play an important role in developing and field testing the sensitivity and predictive value of a broad range of early public health emergency indicators.

CONTINGENCY PLANNING The inability of the world to promptly address the explosive epidemic of cholera among Rwandan refugees in eastern Zaire, in July 1994, underscored the lack of emergency preparedness planning at a global level. This epidemic highlighted the inadequate reserves of essential medical supplies and equipment for establishing and distributing safe water, as well as revealing a lack of technical consensus on the most appropriate interventions. Agencies that did have the appropriate skills and experience, such as Oxfam and MSF, lacked the necessary resources, and those agencies with the resources and logistics, such as the United States military, lacked the technical experience in emergency relief. Preparedness planning needs to take place both at a coordinated international level and at the level of countries where complex emergencies might occur. Relief agencies need resources to implement early warning systems, maintain technical expertise, train personnel, build reserves of relief supplies, and develop their logistic capacity. At the country level, all health development programs should have an emergency preparedness component that should include the establishment of standard public health policies (e.g. immunization and management of epidemics), treatment protocols, staff training, and the maintenance of reserves of essential drugs and vaccines for use in disasters.

PERSONNEL TRAINING Front-line relief workers in complex emergencies are often volunteers recruited by NGOs who sometimes lack specific training and experience in emergency relief. They require knowledge and practical experience in a broad range of subjects, including food and nutrition, water and sanitation, disease surveillance, immunization, communicable disease control, epidemic management, and maternal and child health care. They should be able to conduct rapid needs assessments, establish public health program priorities, work closely with affected communities, train local workers, coordinate with

a complex array of relief organizations, monitor and evaluate the impact of their programs, and efficiently manage scarce resources. In addition, they need to function effectively in an often hostile and dangerous environment; such skills are specific to emergencies and are not necessarily present in the average graduate of a medical or nursing school. Therefore, relief agencies need to allocate more resources to relevant training and orientation of their staff, as well as providing adequate support in the field. Indigenous health workers in emergency-prone countries, while often familiar with the management of common endemic diseases, also need training in the particular skills required to work effectively under emergency conditions.

Tertiary Prevention

Tertiary prevention involves prevention of excess mortality and morbidity once a disaster has occurred. The health problems that consistently cause most deaths and severe morbidity as well as those demographic groups most at risk have been identified. Most deaths in refugee and displaced populations are preventable using currently available and affordable technology. Relief programs, therefore, must channel all available resources toward addressing measles, diarrheal diseases, malnutrition, acute respiratory infections, and, in some cases, malaria, especially among women and young children. The challenge is to institutionalize this knowledge within the major relief organizations and to ensure that relief management and logistical systems provide the necessary resources to implement key interventions in a timely manner.

Initially, both refugees and displaced persons often find themselves in crowded, unsanitary camps in remote regions where the provision of basic needs is highly difficult. Prolonged exposure to the violence of war and the deprivations of long journeys by refugees cause severe stress. Upon arrival at their destination, refugees–most of whom tend to be women and children–may suffer severe anxiety or depression, compounded by the loss of dignity associated with complete dependence on the generosity of others for their survival. If refugee camps are located near borders or close to areas of continuing armed conflict, the desire for security is an overriding concern. Therefore, the first priority of any relief operation is to ensure adequate protection and camps should be placed sufficiently distant from borders to reassure refugees that they are safe.

To diminish the sense of helplessness and dependency, refugees should be given an active role in the planning and implementation of relief programs. Nevertheless, giving total control of the distribution of relief items to so-called refugee "leaders" may be dangerous. For example, leaders of the former Hutu-controlled Rwandan government took control of the distribution system in Zairian refugee camps in July 1994, resulting in relief supplies being diverted to young male members of the former Rwandan Army. Surveys indicated that

households headed by single women had diminished access to food and shelter material, leading to elevated malnutrition rates among children in those households (20).

In the absence of conflict resolution, those communities that are totally dependent on external aid for their survival because they have either been displaced from their homes or are living under a state of siege must be provided the basic minimum resources necessary to maintain health and well-being. The provision of adequate food, clean water, shelter, sanitation, and warmth will prevent the most severe public health consequences of complex emergencies. It would seem that the temporary location of refugees in small settlements or villages in the host country would have fewer adverse public health consequences than their placement in crowded, often unsanitary camps. Although studies to compare health outcomes among refugees in camps and in free settlements have not been possible, surveillance data from Guinea and Malawi indicate that refugees in local villages have fared better than those in camps (54).

Relief Measures

The following measures represent the basic elements of emergency response:

PROVISION OF ADEQUATE FOOD RATIONS General food rations should contain at least 2000 kilocalories of energy per person per day (more in cold climates), as well as the minimum daily allowances of protein and micronutrients recommended by the United Nations (47). Food should be distributed regularly to family units, taking care that socially vulnerable groups such as female-headed households, unaccompanied minors, and the elderly receive their fair share. In addition, adequate cooking fuel, utensils, and facilities to grind whole-grain cereals need to be distributed. In children less than 2 years of age, breastfeeding will provide considerable protection against communicable diseases, including diarrhea; attempts to introduce or distribute breastmilk substitutes and infant feeding bottles should be strongly opposed in an emergency situation. The evidence that vitamin A deficiency is associated with increased childhood mortality and disabling blindness is now so convincing that supplements of vitamin A should be provided routinely to all refugee children under 5 years of age at first contact and every 3–6 months thereafter (30).

Although *supplementary feeding programs* are often popular with relief agencies, their effectiveness in refugee camps in the absence of adequate general rations has been questioned (19). When the family ration is insufficient to provide adequate energy to all family members, then the supplementary ration (usually 400–600 kilocalories per day) may be the only food source for young children. This is not enough to maintain nutrition. If adequate general rations are provided, children who are clinically undernourished may benefit

from daily food supplements, but only if efforts are made to identify them in the community and to ensure their attendance at feeding centers. *Therapeutic feeding programs* should be established to provide total nutritional rehabilitation of severely malnourished children (31).

PROVISION OF ADEQUATE QUANTITIES OF CLEAN WATER AND SANITATION FACILITIES UNHCR recommends that a minimum of 15 liters of clean water be provided per person per day for domestic needs–cooking, drinking, and bathing (50). In general, ensuring access to adequate quantities of relatively clean water is probably more effective in preventing diarrheal disease, especially bacterial dysentery, than providing small quantities of pure microbe-free water. When refugee camps are unavoidable, the proximity to safe water sources needs to be recognized as the most important criterion for site selection. In addition, measures to prevent post-source contamination need to be implemented, including chlorination, sufficient storage containers, and–if available–containers with narrow openings. Adequate sanitation is an essential component of diarrheal disease prevention. While the eventual goal of sanitation programs should be the construction of one latrine per family, interim measures may include the designation of separate defecation areas and the temporary provision of neighborhood latrines (one for 20 families). To achieve maximal impact, these measures should be complemented by community hygiene education and regular distribution of soap. The objective of postemergency sanitation measures should be to restore the predisaster levels of environmental services rather than attempting to improve on the original levels.

PROGRAMS FOR THE PREVENTION OF SPECIFIC COMMUNICABLE DISEASES Public pressure for action to control communicable disease following a disaster often focuses on the perceived need for mass vaccination, in particular against cholera and typhoid, diseases commonly associated in the public mind with disasters. In the case of refugees and displaced persons living in camps where water and sanitation facilities are inadequate, the elevated risk has been well documented. However, mass vaccination against cholera and typhoid fever are not usually indicated for the following reasons:

- If the organism is not present in the area and has not been introduced after the disaster, the disease poses no threat, regardless of environmental conditions. Thus, where the organism is not present, it is highly unlikely to pose a problem even if water supplies are contaminated. At present, cholera may be a threat following disasters in Africa, Asia, much of Latin America, and parts of the former Soviet Union, such as the Central Asian republics and the Caucasus.

- The most practical and effective strategy to prevent waterborne cholera and typhoid is to provide clean water in adequate quantities and adequate sanitation. Sufficient soap and hygiene education will further prevent the transmission of waterborne diseases. Receiving a dose of vaccine may give communities a false sense of security and lead them to fail to take elementary precautions such as boiling water or adequately reheating leftover food.

- A mass vaccination campaign cannot provide protection against typhoid at the time of greatest risk from contaminated water because multiple doses are required to achieve adequate immunity. Currently, the most affordable vaccine for developing countries (parenteral, heat-phenol-inactivated vaccine) has relatively low efficacy, requires two serial doses 1–4 weeks apart, and has severe side-effects. The newer oral, live-attenuated vaccine (Ty21) has higher efficacy; however, it is expensive and requires that four serial doses be administered (6).

- The traditional parenteral cholera vaccine often used in epidemic settings in the past was only 50% effective in preventing cholera and is no longer recommended by WHO (56). Of the two newer and potentially effective vaccines currently available, one requires two doses and does not induce immunity until 7–10 days after the second dose; the other, a single-dose, oral, live vaccine, has never been subjected to testing under field conditions, and its use in refugee populations would be controversial.

On the other hand, disasters that cause significant displacement of populations into crowded camps create a high risk of *measles* transmission, especially in areas where immunization coverage rates are low. Immunization of children against measles is probably the single most important (and cost-effective) preventive measure in emergency-affected populations, particularly those housed in camps. Since infants as young as 6 months of age frequently contract measles in refugee camp outbreaks and are at greater risk of dying owing to impaired nutrition, it is recommended that measles immunization programs in emergency settings target all children between the age of 6 months and 5 years (40). When undernutrition affects the entire population, and when previous exposure to measles is questionable, it may be prudent to extend the coverage to children 6–14 years of age. Immunization programs should eventually include all antigens recommended by WHO's Expanded Programme on Immunization.

Malaria control in refugee camps is more difficult. Under the transient circumstances that characterize most refugee camps, vector control techniques have generally been impractical and expensive. Prompt identification and treatment of symptomatic individuals is a more effective measure to reduce malaria mortality, although the spread of chloroquine and sulfadoxine-pyrimethamine

resistance means that effective case management will become more expensive and technically more challenging in the future.

In areas where epidemics of *meningococcal meningitis* are known to occur, such as in Africa's "meningitis belt," surveillance for meningitis should be established. In the event of an outbreak, vaccination should be considered if the following criteria are met: 1. the presence of meningococcal disease is laboratory confirmed; 2. serogrouping indicates the presence of group A or group C organisms. If it is logistically feasible, the household contacts of identified cases should be checked for vaccination status and then immunized if necessary. It may be simpler to organize a mass immunization program. Because cases of meningococcal meningitis are likely to cluster geographically within a refugee camp, it may be most efficient to focus the vaccination campaign on the affected area(s) first. Vaccination of children and young adults aged between 1 and 25 years will generally cover the at-risk population (29).

EPIDEMIC PREPAREDNESS Epidemic preparedness is a critical element of an emergency relief program and consists of the establishment of surveillance, including standard case definitions; development of standard case management protocols; agreement on policies for prevention (including vaccination and prophylaxis); identification of a laboratory to confirm index cases of epidemic diseases; identification of sources of relevant vaccines; establishment of reserves of essential medical supplies (ORT, intravenous solutions, and antibiotics); identification of treatment sites, triage systems, and training needs; identification of expert assistance for epidemic investigation; development of environmental management plans; and implementation of community education and prevention programs.

APPROPRIATE CURATIVE PROGRAMS STRESSING MATERNAL AND CHILD HEALTH CARE An essential drug list and standardized treatment protocols are necessary elements of a curative program. It is not necessary to develop totally new guidelines in each refugee situation: Several excellent manuals already exist, from which guidelines can be adapted to suit local conditions (16, 27). WHO has also developed guidelines for the clinical management of dehydration from diarrhea and for acute respiratory infections that can be used by trained community health workers (CHWs). Curative services should be decentralized in a camp system of CHWs, health posts, central outpatient referral clinics, and a small inpatient facility to treat severe emergency cases. Patients requiring surgery or prolonged hospitalization should be referred to a local district or provincial hospital that will require assistance with drugs and other medical supplies to cope with the extra patient load. Some relief programs, such as those in Somalia, Sudan, and Malawi, have successfully trained large numbers

of refugees as CHWs to detect cases of diarrhea, malaria, and acute respiratory infections; provide primary treatment; and refer severely ill patients to a clinic, thereby increasing coverage by health services and diminishing reliance on expatriate workers. Camp medical services need to ensure that women and children have preferential access, and specific programs need to provide an integrated package of growth monitoring, immunization, antenatal and postnatal care, the treatment of common ailments, and health promotion.

MANAGEMENT OF DIARRHEAL DISEASES The most effective management of acute watery diarrhea, including cholera, is oral rehydration therapy (ORT) supported by adequate nutrition, including continued breastfeeding. The initial high CFR among cholera patients treated in clinics in Goma, Zaire, was found to be due to a slow rate of rehydration, inadequate use of ORT, use of inappropriate intravenous fluids, and the inexperience of many relief workers in the management of severe diarrheal illness (36). Health workers need to be well trained in the clinical assessment of dehydration, the provision of ORT in supervised settings, and the treatment of severe diarrheal illness with intravenous therapy and/or appropriate antibiotics. In the event of an outbreak of *cholera*, early case finding will allow for rapid initiation of treatment. Aggressive case-finding by trained CHWs should be coupled with community education to prevent panic and to promote good domestic hygiene. Treatment centers should be easily accessible. If the attack rate for cholera is high, it may be necessary to establish temporary cholera wards to handle the patient load. Health centers should be adequately stocked with ORS, IV fluids, and appropriate antibiotics. Rehydration needs to be aggressive, but carefully supervised, especially when children are rehydrated with intravenous fluids, in order to prevent fluid overload. Antibiotics have been shown to reduce the volume and duration of diarrhea in cholera patients. Antibiotics should be administered orally; tetracycline is the antibiotic of choice if the pathogen is sensitive. Single-dose doxycycline can be used when available. In recent outbreaks in emergency settings, *Vibrio cholerae* 01 has been resistant to multiple antibiotics; in such situations, especially in developing countries, the use of more expensive antibiotics may not be indicated, and treatment efforts should focus on rehydration.

Dysentery caused by *Shigella dysenteriae* type 1 has become increasingly common in African disaster settings. Appropriate treatment with antimicrobial drugs decreases the severity and duration of dysentery caused by all species and serotypes of *Shigella*, as well as reducing the duration of pathogen excretion. The choice of a first-line drug should be based on knowledge of local susceptibility patterns. If there is no response within 2 days, the antibiotic should be changed to another recommended for shigellosis in the area. Case management of dysentery has been complicated by increasing resistance of *S. dysenteriae*

type 1 to common, affordable antibiotics. In the Zaire outbreak, the organism was resistant to all antibiotics except ciprofloxacin, which was used to treat those patients at high risk of mortality (young children, pregnant women, the elderly, and severely ill) (20). The emergence of dysentery caused by antibiotic-resistant strains of *Shigella dysenteriae* type 1 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.

During the early phase of any emergency relief operation, *tuberculosis* control activities should be limited to the treatment of patients who present themselves to the health care system and in whom tubercle bacilli have been demonstrated. Although it may be theoretically easier to ensure patient compliance with protracted chemotherapy in the confined space of a refugee camp, the personnel needed to supervise treatment may not be available. In addition, the uncertain duration of stay, frequent changes of camp locations, and poor camp organization may hinder tuberculosis treatment programs. Therefore, tuberculosis control programs should not be established until other more critical priorities have been adequately addressed (33).

HEALTH INFORMATION SYSTEM A surveillance system is an essential part of the relief program and should be established immediately (9). Only information of public health importance should be collected. Mortality surveillance is critical and may require creative data collection methods such as 24-h graveyard surveillance. In addition, surveillance of nutritional status and important epidemic diseases such as measles, cholera, and dysentery should be instituted. Information on program coverage and effectiveness should also be systematically collected; such data should include the average quantity of food rations distributed, per capita clean water available, ratio of families to latrines, immunization coverage, and supplementary feeding program attendance. Information collected by the surveillance system needs to be analyzed and widely disseminated in timely bulletins.

OTHER PROGRAMS Recent wars have consciously targeted civilian populations; refugees from Somalia, Sudan, Mozambique, Angola, and Bosnia-Herzegovina have fled intensely traumatic situations. Many have been severely injured; others have been violently and sexually abused, such as women in the former Yugoslavia, Burmese refugees in Bangladesh, and Somali refugees in Kenya. Increasing numbers of refugees have been severely disabled by landmine injuries. Innovative and culturally appropriate programs of counseling, support, and rehabilitation are urgently needed for these people. Also, there is a need to develop specialized approaches to caring for unaccompanied children,

such as those Rwandan children in the camps of eastern Zaire and Tanzania during 1994.

Once the emergency relief phase is over, new challenges arise. Many refugees, such as the Palestinians in the Middle East and the Afghans in Pakistan and Iran, remain in camps for decades. Public health programs need to be community-based and integrated with other development programs (such as education, agriculture, and income generation) that aim to minimize dependency on the outside world, restore dignity to stressed communities, and prepare for eventual repatriation to their homelands. Training of community health workers, particularly women, should be the cornerstone of these longer-term programs. New, and sometimes sensitive, issues such as family spacing and the prevention of infection with the human immunodeficiency virus (HIV) need to be addressed through community development processes (4).

Although existing technical knowledge is sufficient to prevent much of the mortality associated with mass displacement, refugees and internally displaced persons will continue to find refuge in remote regions where the provision of basic needs requires creative approaches. Therefore, there is a need for systematic operational and evaluation research in certain areas of nutrition (for example, effective methods of preventing micronutrient deficiency diseases), water supply, and disease control.

Recent and Future Trends

During the past decade, much progress has been made among the major relief agencies in standardizing approaches and procedures in public health emergencies. Training courses designed specifically for public health in emergency settings have been developed in Europe, the United States, and Australia. Standard guidelines and essential drugs lists have been developed and are routinely used in emergencies. The role of military forces in providing security and in directly providing emergency assistance has grown rapidly in recent years (34). Military forces have played a prominent role in relief operations in northern Iraq, Somalia, the former Yugoslavia, Zaire, Rwanda, and Haiti. The involvement of the military is often ambiguous, confusing the various tasks of peace-keeping, peace-enforcing, and providing relief. No one would doubt the logistical advantages of the military; however, this is not always matched with appropriate experience in the technical aspects of a relief operation. Furthermore, military assistance is expensive and because it depends on political decisions by national governments, it cannot always be integrated into disaster preparedness planning.

Relief management decisions need to be based on sound technical information, and assistance programs need to be systematically evaluated–not merely for their quantity and content, but also for their impact and effectiveness.

Responsibilities for technical coordination and implementation of relief programs should increasingly be shared with proven, competent, and experienced NGOs. Greater resources need to be allocated to personnel training, emergency preparedness planning, and the maintenance of regional reserves of essential relief supplies. These activities need to include government and nongovernment agencies in countries where emergencies are likely to occur.

Recent emergencies have followed a predictable pattern of political unrest, civil war, human rights abuses, food shortages, and, finally, mass population displacement. There has been almost no preparedness for these emergencies within the public health community. Agencies involved in health development projects need to be aware of political realities in certain regions of the world and should integrate preparedness planning into all aspects of public health programs. Health information systems should incorporate plans to simplify and focus on major health problems in the event of emergencies. Immunization, diarrheal disease control, and community health worker training programs should likewise incorporate emergency contingency plans. Finally, increased attention needs to be given to the challenges of rehabilitation of national health services following the cessation of armed conflict and the repatriation of large numbers of refugees to their country of origin (22).

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