# Nutrition Information in Crisis Situations

United Nations System
Standing Committee on Nutrition



March 2008 . Report Number XVI

# Highlights

**SOMALIA— SITUATION STILL PRECARIOUS IN SOMALI REGION—** Despite record 2007 *meher* harvests in many parts of the country, nearly 9 million people are still expected to require food or cash assistance in 2008. Eight million of those are being targeted by the GoE's Productive Safety Net Program, an assistance program for chronically food insecure people. The food security situation in the Somali region continues to be critical. Suffering from a series of shocks over the past few years, including poor rains and inadequate water and pasture for livestock, had led to reduced food access for many households. While formal nutrition surveys have yet to be completed, field reports point to an increase in acute malnutrition in several zones. The situation is said to be most worrisome in Afder and Liban zones, where food distributions have not taken place since October 2007.

**KENYA—DISPLACEMENT LED BY POLITICAL INSTABILITY—**Presidential elections were held in Kenya on December 27, 2007 and accusations made by the opposition party of voting irregularities plunged the country into chaos. Schools and businesses closed across the country. As of the end of March 2008, there were about 202,600 displaced persons in camps and centres, and 196,000 displaced people within host communities, the majority of those from Rift Valley province. Assessments by Kenya's Food Security Steering Group indicated that host families, most of whom are subsistence farmers, were under increasing pressure to sustain their own household food security in addition to that of displaced persons. More over, about seven districts that are affected severely by the conflict in Rift Valley province, account for close to 50 percent of all cereal produced in the country annually. As a result, current and future production has been severely disrupted by the insecurity.

**SOMALIA—CONTINUED FOOD INSECURITY IN THE SOUTH—**The humanitarian situation in Somalia has continued to deteriorate in the past months. According to the post-*Deyr* analysis by FSAU, the current crisis can be attributed to three specific components: worsening humanitarian conditions in the Shabelles, a continued increase in the number of IDPs and persistent drought in Hiran and Central regions. Overall, it is estimated that 1,830 million people, including 850,000 people in rural areas, 275,000 old IDPs and 705,000 new IDPs, will require humanitarian assistance in the coming 6 months. The number of IDPs has doubled since August 2007, bringing the grand total to more than one million. IDP communities are underserved and have settled in regions already facing severe economic hardships, making them unable to support the ongoing influx.

**CHAD — INCREASE IN POPULATION MOVEMENT—**Fighting between rebel and government forces in the capital, N'jamena, in early February 2008 led to the displacement of over 30,000 Chadians into neighboring Cameroon. The rebels withdrew from the capital after two days of street fighting and the situation, although still volatile, has stabilized. A state of emergency was declared for the whole country on February 15th. Humanitarian efforts in the east of the country have been hampered by overall insecurity and the fighting in N'djamena. At the same time, increased insecurity in Western Darfur prompted the arrival of another 15,000 refugees in Eastern Chad in February. Refugees also continued to enter Southern Chad from Central African Republic, bringing the number of new arrivals to 10,000 since the beginning of 2008 and 57,000 in total.

**PAKISTAN — IMPACT OF FLOODING—** Heavy monsoon rains, exacerbated by Cyclone Yemyin in late June, led to extensive flooding in Balochistan and Sindh provinces in July 2007. While flooding in Balochistan was mostly caused by direct rainfall, the situation in Sindh was more a result of intense pressure put on its irrigation system. The majority of farmers lost most, if not all, of their rice crop to the flooding and are anticipated to have inadequate food stores to last until next year's harvest.

**USA— REVIEW OF LITERATURE ON LEAD POISONING IN REFUGEE CHILDREN ENTERING THE COUNTRY—** As indicated by the literature, albeit limited, refugee children have much higher elevated blood lead levels compared to children in the United States. It is important that public health officials both internationally and in the United States recognize the seriousness of lead poisoning in refugee children.

# Risk Factors affecting Nutrition in Selected Situations

Situations in the table below are classed into five categories relating to prevalence and or risk of malnutrition (I—very high risk/prevalence, II—high risk/prevalence, III—moderate risk/prevalence, IV—not at elevated risk/prevalence, V-unknown risk/prevalence; for further explanation see section "Indicators and classification" at the end of the report).
The prevalence/risk is indirectly affected by both the underlying causes of malnutrition, relating to food security, public health environment and social environment, and the constraints limiting humanitarian response. These categories are summations of the causes of malnutrition and the humanitarian response, but should not be used in isolation to prescribe the necessary response.

| | **Mali** Gadougou I & II, Kayes region | **Eastern Chad** Refugee, displaced, resident populations | **Angola** Chipindo municipality, Huila province | **Myanmar** Maungdaw & Buthidaung townships, North Rakhine state | **Pakistan** Kamber-Shahdadkot and Dadu districts, Sindh province |
|---|---|---|---|---|---|
| Nutritional risk category | II/III | II | III | II | II |
| **Food Security** | | | | | |
| Households' livelihoods | 😐 | 😐 | 😐 | 😐 | ☹ |
| External assistance | 😐 | 😐 | ☹ | 😐 | 😐 |
| **Public health environment** | | | | | |
| Availability of water and access to potable drinking water | 😐 | 😐 | 😐 | ☹ | 😐 |
| Health care | 😐 | 😐 | 😐 | 😐 | 😐 |
| Sanitation | ? | 😐 | 😐 | ☹ | 😐 |
| **Social and care environment** | | | | | |
| Social environment | ? | ? | ? | ☹ | 😐 |
| Child feeding practices | ? | ? | ? | ? | 😐 |
| **Delivery of assistance** | | | | | |
| Accessibility to population | ☺ | ☹ | 😐 | 😐 | 😐 |
| Resources for humanitarian Intervention | ? | 😐 | ☹ | 😐 | 😐 |
| Availability of information | 😐 | 😐 | 😐 | 😐 | ☺ |

☺ Adequate 😐 Mixed ☹ Inadequate

# Greater Horn of Africa


## Ethiopia

Despite record 2007 *meher* harvests in many parts of the country, nearly 9 million people are still expected to require food or cash assistance in 2008 (FEWS, 02/08). Eight million of those are being targeted by the GoE's Productive Safety Net Program (PSNP), an assistance program for chronically food insecure people. However, due to limited capacity, some of the most vulnerable regions, including Somali, Benshangul and Gambella, are not currently covered under the program.

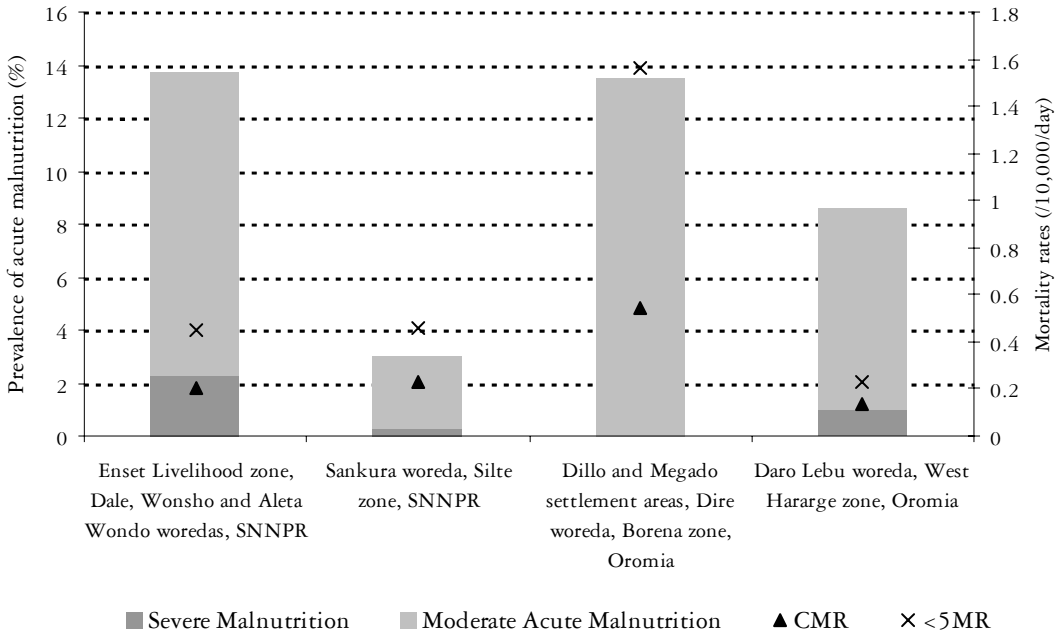
The food security situation in the Somali region continues to be critical (FEWS, 02/08). Suffering from a series of shocks over the past few years, including poor rains and inadequate water and pasture for livestock, had led to reduced food access for many households. While formal nutrition surveys have yet to be completed, field reports point to an increase in acute malnutrition in several zones. The situation is said to be most worrisome in Afder and Liban zones, where food distributions have not taken place since October 2007. In addition, the region has been affected by outbreaks of both acute watery diarrhea and measles.

Preliminary forecasts are predicting that the March to May 2008 rains will be below normal in the eastern Ethiopia (FEWS, 02/08). This could have a serious impact on upcoming harvests, especially in those regions for which this is the main rainy season.

### Nutrition situation good to serious

The Enset livelihood zone survey (SNNPR), carried out at the beginning of the hunger gap in July 2007 by ACF-F, revealed the prevalence of acute malnutrition to be 13.7% (C.I. 10.2-17.1), including 2.3% (C.I. 1.0-3.6) severe malnutrition (ENCU, 09/07) (figure 1). Mortality rates were acceptable. 67% of respondents stated they experienced food shortages in the months prior to the survey. Another 57% considered themselves as food insecure the day of the survey, despite the fact that many of them benefited from food distributions during the months of May-June.

Figure 1 Results of nutrition and mortality surveys, Ethiopia, July-August 2007 (ENCU, 09/07)



A second survey in Sankura woreda, Silte zone (SNNPR), done by SC-UK in August 2007, showed a much better situation. Acute malnutrition was only 3.0% (C.I. 1.8-4.1), and severe malnutrition a mere 0.3% (C.I. 0.1-0.8) (ENCU, 09/07). This survey took place just after the *Belg* harvest, considered to be the best in 5 years. Nearly 90% of participants relied on their own production for food. A high percentage (83%) also reported they had access to piped water and pit latrines. In addition, 14.9% said they benefited from the PSNP, which includes cash-for-work and direct cash support.

Goal conducted two surveys in the Oromia region. The first, in the Dillo and Megado settlement areas (Borena zone, July 2007), showed a serious situation. The prevalence of acute malnutrition was 13.5% (exhaustive survey), although there were no cases of severe malnutrition and mortality rates were average (ENCU, 09/07). 73.6% of families reported consuming only one meal per day, with priority given to young children, and over half said they were heavily dependent on food aid.

The second survey occurred in Daro Lebu woreda (West Hararghe zone, August 2007) and found a prevalence of acute malnutrition of 8.6% (C.I. 6.1-11.2) (ENCU, 09/07). Mortality rates were well within the acceptable range. Vaccination rates were low and water and sanitation facilities inadequate. The nutrition situation was described as normal and the food security situation typical within the Ethiopian context.

## Kenya

Presidential elections were held in Kenya on December 27, 2007 and accusations made by the opposition party of voting irregularities plunged the country into chaos. Schools and businesses closed across the country. As of the end of March 2008, there were about 202,600 displaced persons in camps and centres, and 196,000 displaced people within host communities, the majority of those from Rift Valley province (USAID, 26/03/08). Another 12,000 fled across the border to neighboring Uganda. The death toll rose to 1,020, with many more injured. Perceptions of ongoing insecurity have persisted, despite a decreased threat of violence since the signing of a power-sharing agreement on 28 February 2008.

Humanitarian actors, both national and international, were quick to jump into action, setting up shelters, providing food and medicines, as well as addressing water and sanitation needs. However, assessments by Kenya's Food Security Steering Group indicated that host families, most of whom are subsistence farmers, were under increasing pressure to sustain their own household food security in addition to that of displaced persons (FEWS, 12/02/08). More over, about seven districts that are affected severely by the conflict in Rift Valley province, account for close to 50 percent of all cereal produced in the country annually. As a result, current and future production has been severely disrupted by the insecurity (FEWS, 02/08).

## Somalia

The humanitarian situation in Somalia has continued to deteriorate in the past months. According to the post-*Deyr* analysis by FSAU, the current crisis can be attributed to three specific components: worsening humanitarian conditions in the Shabelles, a continued increase in the number of IDPs and persistent drought in Hiran and Central regions (FSAU, 08/02/08) (map). Overall, it is estimated that 1,830 million people, including 850,000 people in rural areas (table 1), 275,000 old IDPs and 705,000 new IDPs, will require humanitarian assistance in the coming 6 months. The

Table 1 Somalia food security situation analysis: Post *Deyr* 07/08 population numbers, January-June 2008 (FSAU, 08/02/08)

| Affected regions | Number of people in Humanitarian Emergency (HE) | Number of people in Acute Food and Livelihood Crisis (AFLC) | Total in AFLC or HE as % of region population |
|---|---|---|---|
| North | | | |
| | 0 | 0 | 0 |
| Central | | | |
| Galgaduud | 15,000 | 80,000 | 29 |
| Mudug | 5,000 | 35,000 | 11 |
| South | | | |
| Bakool | 5,000 | 90,000 | 31 |
| Bay | 0 | 25,000 | 4 |
| Gedo | 10,000 | 35,000 | 14 |
| Hiran | 25,000 | 65,000 | 27 |
| Middle Juba | 0 | 20,000 | 8 |
| Lower Juba | 15,000 | 60,000 | 19 |
| Middle Shabelle | 85,000 | 40,000 | 24 |
| Lower Shabelle | 155,000 | 85,000 | 28 |
| **Total** | **315,000** | **535,000** | **11** |

number of IDPs has doubled since August 2007, bringing the grand total to more than one million. IDP communities are underserved and have settled in regions already facing severe economic hardships, making them unable to support the ongoing influx.

The Shabelle regions are considered to be the hardest hit by the present crisis and represent 74% of those identified as being in a humanitarian emergency. Host to more than 367,000 IDPs and expecting below normal cereal production, the nutrition and food security situation is expected to remain critical in the coming months.

Poor rains are seriously threatening the livelihoods of many in Hiran and Central regions. The migratory routes of many pastoralists are compromised due to insecurity and they have been forced to pay for expensive trucked water to ensure adequate supply for their livestock. April to June rains, crucial to ensure an adequate *Gu* harvest and replenish water holes, are predicted to be below normal, which will surely only aggravate the already critical situation (FEWS, 12/03/08).

## Nutrition situation at emergency levels in most areas

Maps of the estimated nutrition situation in January 2007, June 2007 and January 2008 show a continued deterioration in the South and Central areas (FSAU, 01/08) (see maps).

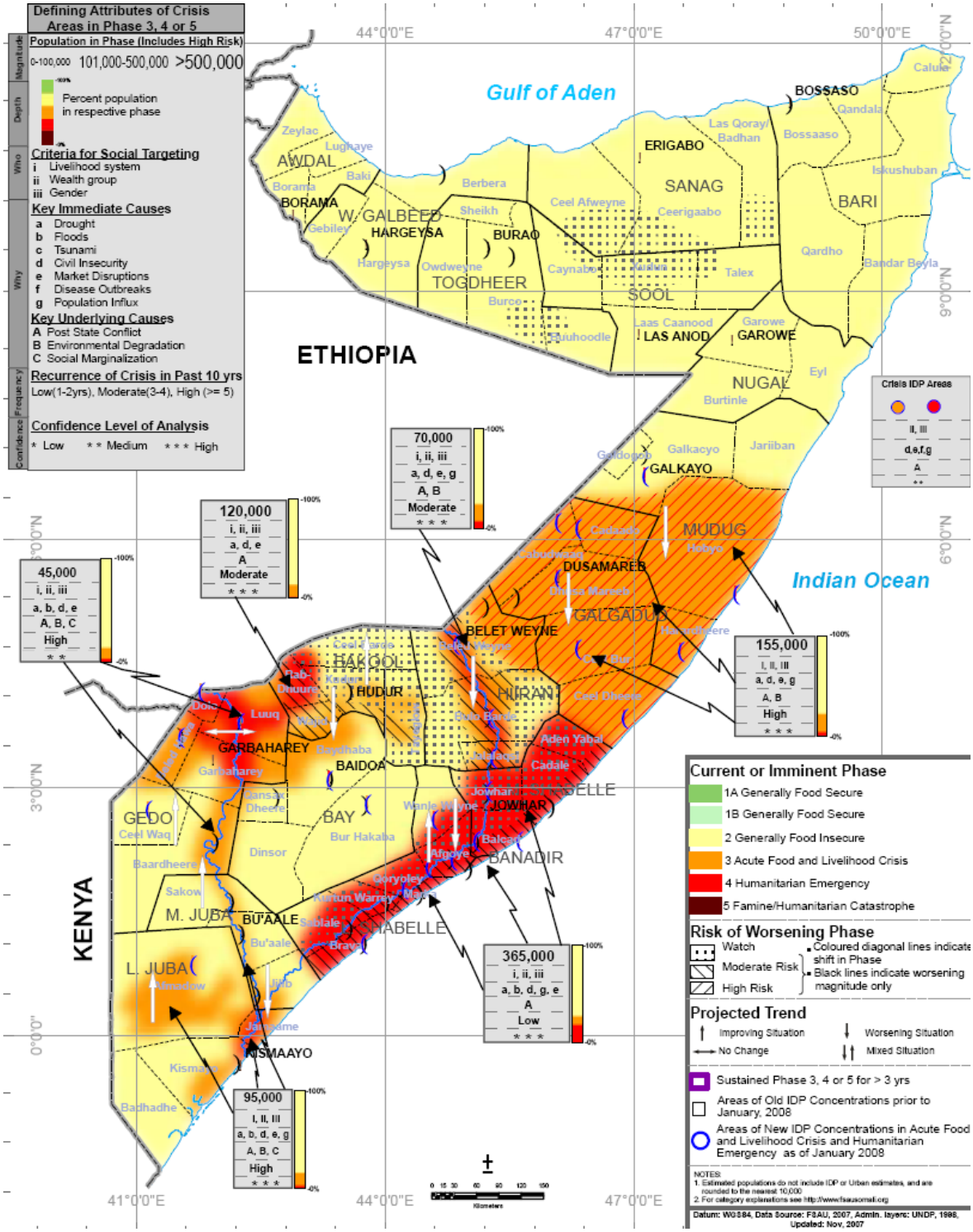
Three surveys were carried out by FSAU/ partners in the Juba/Gedo regions in December 2007 (FSAU, 01/08). These regions experienced good 2007 *Deyr* and *Gu* rains, which has contributed to improved food security for many as well as better water and pasture access for livestock. The surveys, done according to livelihood zone, found results ranging from serious to critical (figure 2), but generally, the situation had not changed significantly in the preceding 6 months (FSAU, 01/08). It should be noted, however, that the percentage of severe malnutrition was very high in the Riverine livelihood, at 4.4%, and that over half of these cases (2.6%) presented with signs of edema.

Most areas of Bay and Bakool regions were classified as generally food insecure by latest FSAU reports (FSAU, 01/08). This was confirmed by nutrition surveys in both areas, where the prevalence of acute malnutrition ranged from 11.8% to 19.3% (figure 3) (FSAU, 12/07; MSF-CH, 11/07). Retrospective mortality rates were within acceptable limits in all four surveys.

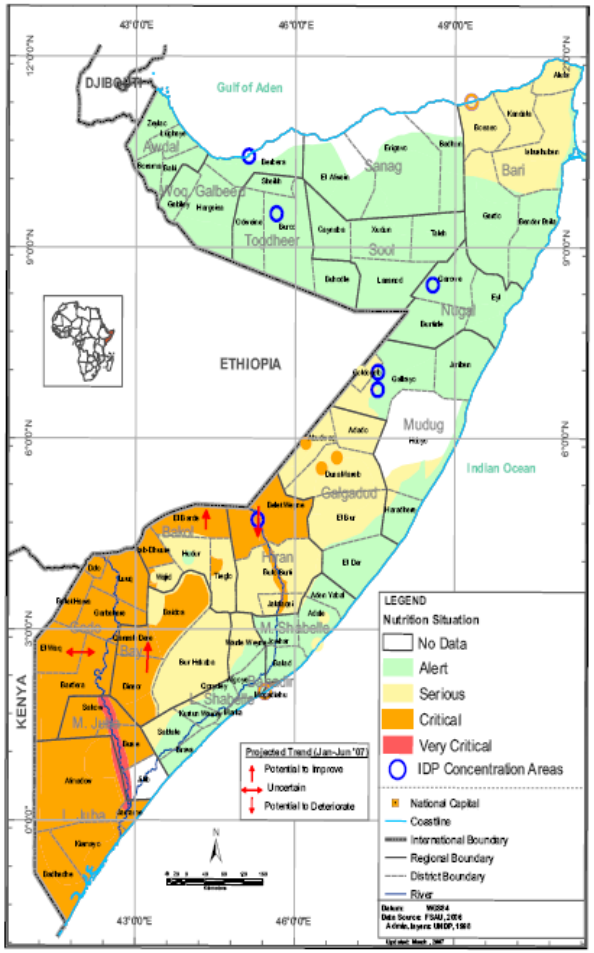
Surveys done in the Hiran region showed a similar situation (FSAU, 12/07). The prevalence of acute malnutrition was 14.2% in the agropastoral zone and 17.5% in the riverine zone (figure 4). Severe malnutrition rates were 2.9% and 2.5% respectively.

A random sampled nutrition survey among protracted IDPs living in camps around Bossasso revealed critical rates of acute malnutrition (Epi/MSF-S, 11/07). Severe malnutrition was also high, although mortality rates were under control (figure 4). Only 46.6% of respondents were vaccinated for measles.

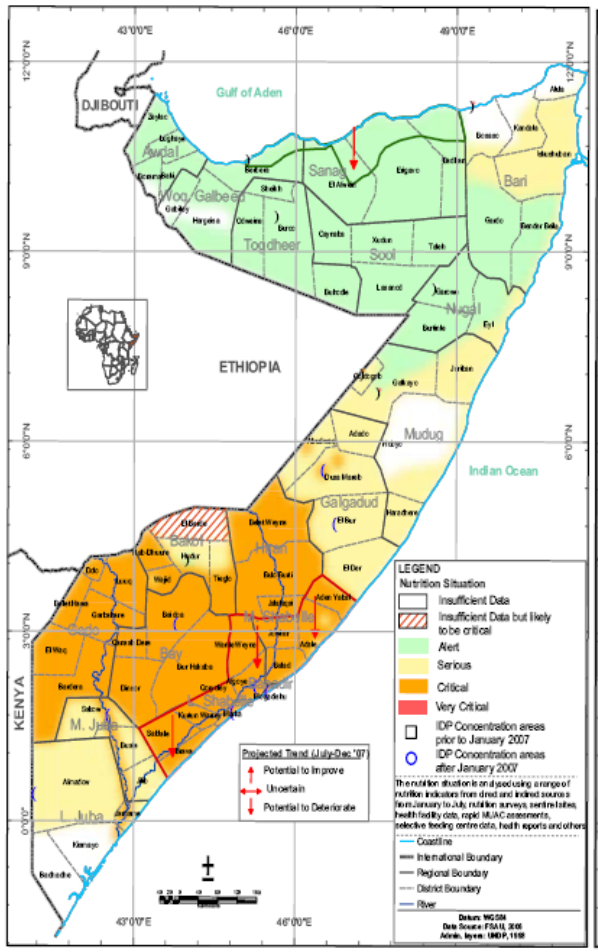
## Integrated food security phase classification, Post *Deyr*' 07/08 projections, January through June 2008 (FSAU, 08/02/08)



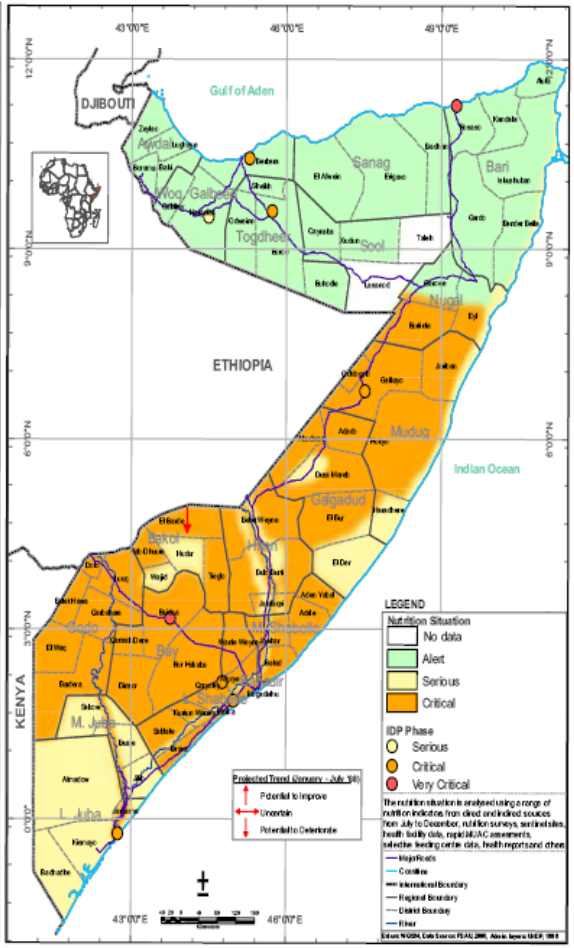
Estimated nutrition situation, January 2007 (FSAU, 01/08)




Estimated nutrition situation, July 2007 (FSAU, 01/08)




Estimated nutrition situation, January 2008 (FSAU, 01/08)



A final survey, carried out in Dusa-Mareb, Galguduud region found serious rates of malnutrition (FSAU, 01/08). Severe malnutrition and retrospective mortality were within acceptable limits (figure 4).

Figure 2 Results of nutrition and mortality surveys, Juba/Gedo regions, December 2007 (FSAU, 01/08)

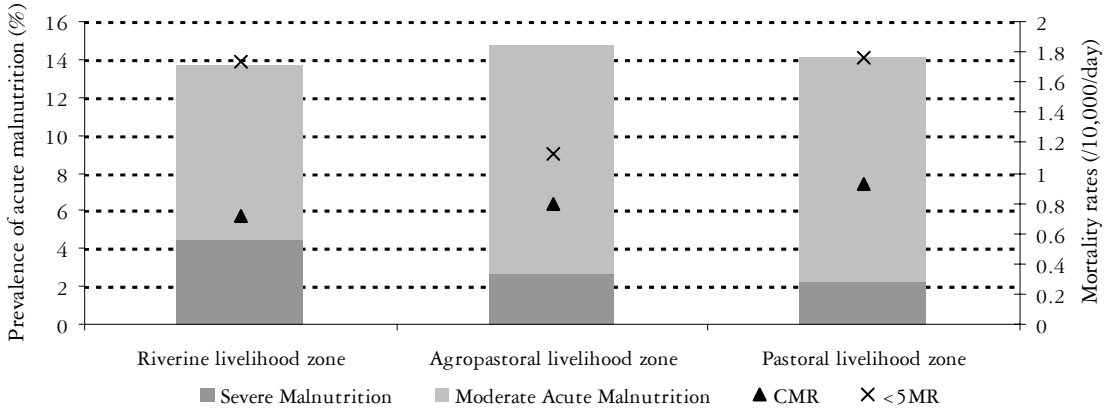



Figure 3 Results of nutrition and mortality surveys, Bay and Bakool regions, November 2007 (FSAU, 12/07, MSF-CH, 11/07)

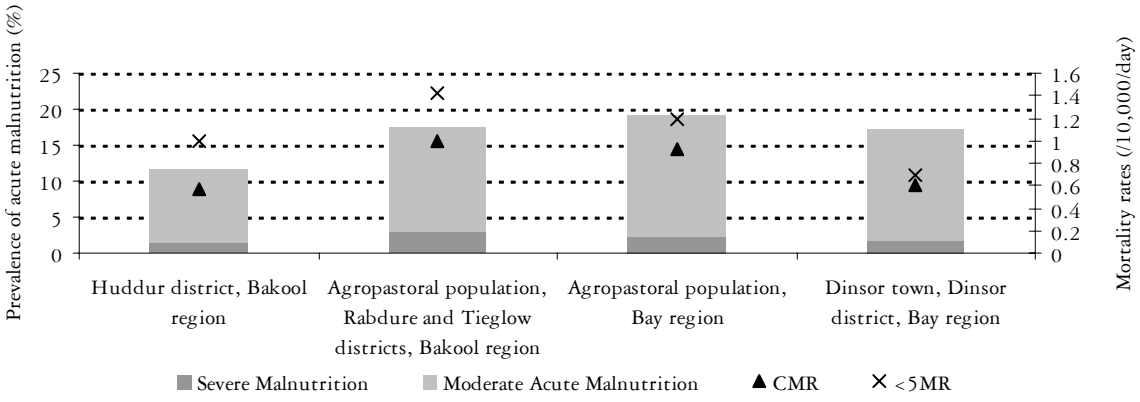
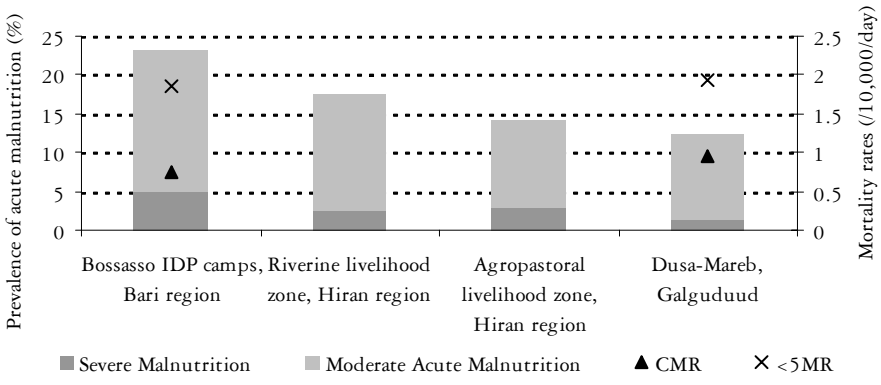



Figure 4 Results of nutrition and mortality surveys, Bari, Hiran and Gulguduud regions, November-December 2007 (FSAU, 12/07; FSAU, 01/08; MSF-S/Epicentre, 12/07)



A knowledge attitude and practices study on infant and young child feeding was conducted in North West, North East and Southern Central Zones of Somalia in September-October 2007. The results are summarized below (box 1) (FSAU/Joint, 12/07).

Box 1 Results of a knowledge, attitude and practice survey (FSAU/Joint, 12/07)

Knowledge regarding breastfeeding and infant feeding passed down from grandmothers and was generally found to be unsatisfactory
Colostrum was often viewed as unhealthy for newborns and breastfeeding not initiated in the first 3 days
EBF was generally considered as giving breast milk, water and sugar in the first months of life
Most mothers do breastfeed on demand and many breastfeed as long as 2 years or until they become pregnant again
Most infants were started on tea and semi-solid foods (porridge, biscuits, potatoes) as early as 3 months as milk alone was not considered adequate
Older children were generally fed before adults and many mothers practiced responsive feeding to encourage children to eat
Most children over the age of 2 ate from the family pot
Breastfeeding most often continued during illness as did special attempts to encourage eating until recovery

Main Recommendations
Train and support Community Nutrition Workers (CNW) and Traditional Birth Attendants (TBAs) to promote positive breastfeeding practices
Capacity building should also be extended to traditional leaders, social support networks as well as elderly women in the community

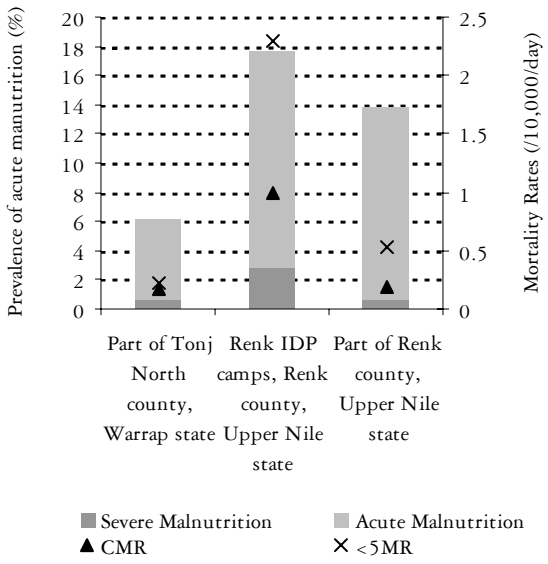
# Sudan

## South Sudan

Food security is expected to remain stable between January and April 2008 for the majority of households across all livelihood zones, with pockets of moderate to high flood-related food insecurity and pockets of moderate food insecurity due to chronic-structural food deficits (FEWS, 02/08).

Surveys were carried out among IDPs and residents in Renk County to assess the impact of July flooding on nutrition and food security (AAH-US, 10/07). The prevalence of acute malnutrition was above emergency levels in the IDP camps at 17.7% (C.I. 13.9-21.5), with a high percentage of severe malnutrition (figure 5). Rates were slightly lower among residents, but still show a serious situation. 68% of IDPs reported receiving food aid. Both groups said that they were heavily reliant

Figure 5 Results of nutrition and mortality surveys, South Sudan, October-December 2007 (AAH-US, 10/07; AAH-US, 12/07)



on purchased food and that their access to food was good.
Another survey done in Tonj North County by AAH-US in December 2007 revealed an average situation (figure 5), with a lower prevalence of acute malnutrition than in surveys carried out in previous years (AAH-US, 12/07). The survey was done just after the harvest and the food security situation was reported to be adequate.

### Darfur

Insecurity has increased in Darfur at the beginning of the year, especially in West Darfur (UN/SC, 11/03/08).

As a result of a pipeline break, CSB was in short supply and, in order to have adequate supplies for SFP programs, was removed from the general ration and replaced by pulses (UNICEF, 11/07).

Multiple surveys were conducted throughout the region, but only two were authorized for release by local authorities (UNICEF, 11/07). The surveys, both conducted in West Darfur, revealed rates of malnutrition at or above emergency levels (table 2). The prevalence of severe malnutrition was especially high in both studies although mortality rates were under control.

Table 2 Results of nutrition and mortality surveys, West Darfur (Tearfund/Joint, 06/07; World Relief, 09/07)

| Survey Area | Acute Malnutrition (%) (95% CI) | Severe Acute Malnutrition (%) (95% CI) | Crude Mortality (/10,000/day) (95% CI) | Under 5 Mortality (/10,000/day) (95% CI) |
|---|---|---|---|---|
| Beida locality | 19.5 (16.5-23.0) | 3.7 (2.4-5.6) | 0.46 | 0.76 |
| Azirni, Sanidadi and Um Tajouk | 15.7 (12.9-17.7) | 3.6 (2.4-4.8) | 0.31 | 0.51 |

# West Africa


## Mali

Food prices and availability are considered stable and the 2007 harvest regarded as average (FEWS, 11/07). Livestock are said to have good access to water holes and pastures.

At least 39 cases of cerebrospinal meningitis, including 1 death, were confirmed in the Segou region in the week 21-28 January, 2008 (WHO, 03/02/08). This brings the total number of meningitis deaths to 3 since the beginning of the year.

According to a survey conducted by ACH-S in August 2007, the nutrition situation in the Kayes region was serious, although crude and U5 mortality rates were in the acceptable range (ACH-S, 08/07) (table 3). Measles vaccination rates were very low at only 39.8%. The survey also estimated that, despite a good 2007 harvest, 50-60% of the population remains food insecure and has poor diet diversity.

Table 3 Results of a nutrition and mortality survey, Kayes region, Mali, August 2007 (ACH-S, 08/07)

| Survey Area | Acute Malnutrition (%) (95% CI) | Severe Acute Malnutrition (%) (95% CI) | Crude Mortality (/10,000/day) (95% CI) | Under 5 Mortality (/10,000/day) (95% CI) |
|---|---|---|---|---|
| Gadougou I and II communes, Kayes Region | 10.3 (7.7-13.0) | 1.4 (0.5-2.3) | 0.41 (0.19-0.63) | 1.16 (0.53-1.79) |

## Mauritania

Rising cereal prices are expected to have a negative impact on overall food security in the country, which relies heavily on international imports to fulfill domestic cereal demand (FEWS, 04/02/08). Higher prices for such commodities as rice and wheat are already pushing them out of reach for poorer families. Despite the late start and premature finish of rains in 2007, which precipitated a prolonged lean season, widespread access to government and partner programs helped alleviate a food crisis (ACH-S, 09/07).

ACH-S conducted a nutrition survey in the southern regions of Gorgol and Guidimakha in September 2007. Although severe malnutrition and retrospective mortality rates were within acceptable ranges, the prevalence of acute malnutrition was above emergency levels at 15.1% (ACH-S, 09/07) (table 4). Nearly half (45.1%) of all U5 deaths occurred in the days just after birth and for unknown reasons. Questions about feeding practices revealed that 46.0% of newborns receive other liquids (i.e. holy water, sugar water, other milk) before breastfeeding is initiated and that 82.5% of children in the survey consumed three or more meals per day.

Table 4 Results of a nutrition and mortality survey, Mauritania, September 2007 (ACH-S, 09/07)

| Survey Area | Acute Malnutrition (%) (95% CI) | Severe Acute Malnutrition (%) (95% CI) | Crude Mortality (/10,000/day) (95% CI) | Under 5 Mortality (/10,000/day) (95% CI) |
|---|---|---|---|---|
| Gorgol and Guidimakha regions | 15.1 (12.8-17.4) | 1.1 (0.3-2.0) | 0.72 (0.34-1.10) | 1.69 (0.47-2.91) |

## Niger

Despite good sorghum and millet harvests, maize has become both scarce and more expensive (FEWS, 11/07). However, price increases seem to be more related to trade speculation and are more or less limited to surplus areas.

Grazing conditions for livestock remained favorable, improving both their physical status and monetary value.

Niger has also been affected by the meningitis outbreak that has struck what is called the African meningitis belt. Although none of the country's departments has reached epidemic levels, a total of 217 cases and 15 deaths (Case fatality rate: 6.9%) have been reported since January 1, 2008 (WHO, 02/03/08).

The Government of Niger and partners conducted another national nutrition survey in

Figure 6 Trends in prevalence of acute malnutrition, Niger

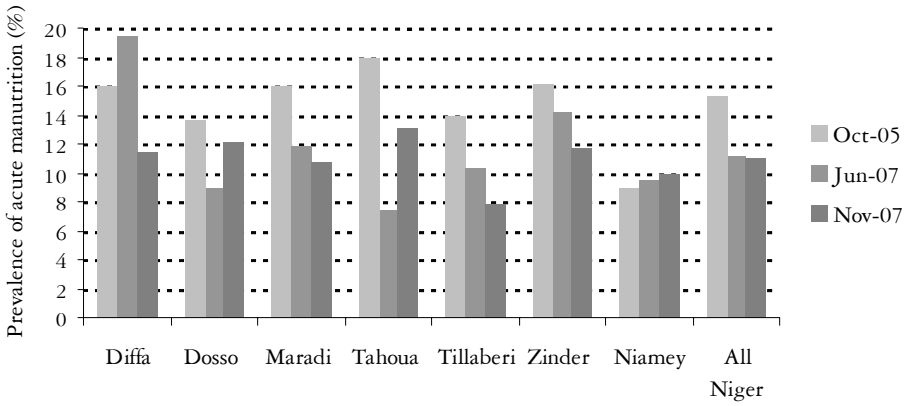
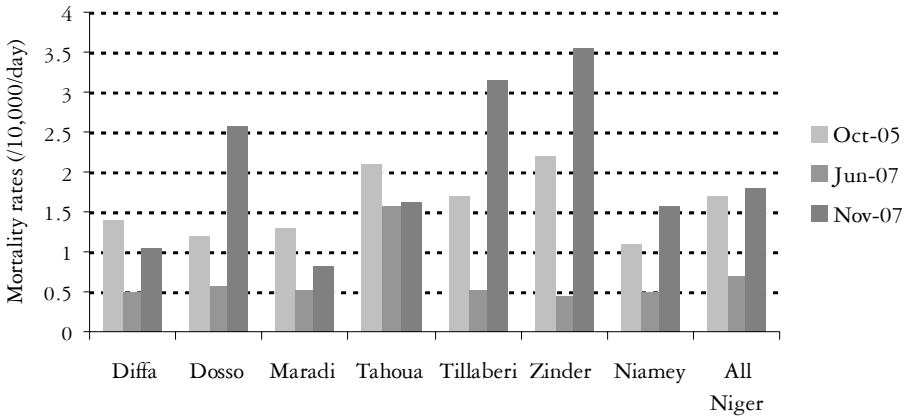



Figure 7 Trends in under-five mortality rates, Niger




November 2007, at the time of the cereal harvest (INS/Joint, 11/07). The overall prevalence of acute malnutrition remained unchanged in most of the regions, since the last survey done in June 2007 (figure 6). The two regions demonstrating a significant change were Tahoua, where acute malnutrition increased from 7.5% (5.5-10.2) in June to 14.2% (11.9-17.0) in the current survey, and Diffa where acute malnutrition decreased from 19.4% (16.0-23.4) to 11.4 (9.0-14.4).

Compared to October 2005, the prevalence of acute malnutrition seemed lower in most of the regions, although the difference seemed significant (confidence intervals did not overlap) in Tillaberi only. On the other hand, U 5 mortality rates were above alert threshold in Dosso, Tillaberi and Zinder and seemed to have significantly increased compared to June 2007 and November 2005 (figure 7).

Other surveys were conducted at department levels in Maradi and Tahoua regions (ACH-S, 09/07-01/08; MSF-B, 11/07) (table 5). They revealed precarious nutrition situations. In Dakoro, Maradi region, the prevalence of acute malnutrition had significantly decreased in November 2007, which was the harvest season, compared to April 2007, where the prevalence of acute malnutrition was 17.7% (14.5-20.9) (MSF-B, 11/07). The same pattern was observed in Mayahi department where the prevalence of acute malnutrition significantly decreased in January 2008, after the harvest, compared to September 2007 (ACH-S, 09/07; AAH-S, 01/08).

Table 5 Results of nutrition and mortality surveys, Maradi and Tahoua regions, Niger (ACH-S, 09/07-01/08; MSF-B, 11/07)

| Survey Area | Date | Acute Malnutrition (%) (95% CI) | Severe Acute Malnutrition (%) (95% CI) | Crude Mortality (/10,000/day) (95% CI) | Under 5 Mortality (/10,000/day) (95% CI) |
|---|---|---|---|---|---|
| **Maradi region** | | | | | |
| Dakoro health district | Nov-07 | 8.6 (6.4-10.8) | 0.4 (0.0-0.8) | 0.2 (0.1-0.3) | 0.6 (0.4-0.8) |
| Mayahi department | Sep-07 | 14.8 (11.7-17.8) | 1.1 (0.3-2.0) | 0.27 (0.12-0.41) | 0.96 (0.42-1.49) |
| Mayahi department | Jan-08 | 9.1 (6.9-11.2) | 0.4 (0.0-0.9) | 0.26 (0.09-0.43) | 0.63 (0.01-1.27) |
| **Tahoua region** | | | | | |
| Keita department | Nov-07 | 14.1 (10.0-18.2) | 0.7 (0.1-1.5) | 0.65 | 2.28 (1.02-3.54) |
| Abalak department | Nov-07 | 14.3 (10.4-18.3) | 1.1 (0.1-2.1) | 0.54 (0.29-0.79) | 1.58 (0.60-2.56) |

# Central Africa


## Chad

### Unrest in N'jamena leads to population movements

Fighting between rebel and government forces in the capital, N'jamena, in early February 2008 led to the displacement of over 30,000 Chadians into neighboring Cameroon (OCHA, 02/08). The rebels withdrew from the capital after two days of street fighting and the situation, although still volatile, has stabilized. A state of emergency was declared for the whole country on February 15th.

UNHCR registered approximately 20,000 refugees in the Cameroonian city of Kousseri, most of whom said they do not intend to return to Chad in the immediate future (OCHA, 02/08). A more permanent camp was established in Maltam, 32km from Kousseri, and over 5,500 refugees have already been transferred there. Food and NFI distributions, as well as a vaccination campaign, were put in place for the refugee population.

### Refugee influx from neighboring countries ongoing

Humanitarian efforts in the east of the country have been hampered by overall insecurity and the fighting in N'djamena. At the same time, increased insecurity in Western Darfur prompted the arrival of another 15,000 refugees in Eastern Chad in February (OCHA, 02/08). The UNHCR was prevented from transferring newly arrived refugees to safer locations away from the border by armed men (IRIN, 15/02/08). This took place just after the Chadian Prime Minister stated that the government would no longer allow entry to refugees from Sudan, and UNHCR was waiting government approval to move the refugees.

A food security assessment was conducted in Eastern Chad in November 2007 (WFP, 12/07). The survey covered the 12 refugee camps, five displaced camps and seven villages. The situation has remained precarious, although food consumption (according to food

frequency records over the previous week) seems to have improved compared to 2005 and 2006 (table 6). Other main results are presented in box 2.

Refugees also continued to enter Southern Chad from Central African Republic, bringing the number of new arrivals to 10,000 since the beginning of 2008 and 57,000 in total (OCHA, 06/03/08).

Table 6 Food consumption, Eastern Chad (WFP, 12/07)

| | Displaced | | | Refugees | | | Residents | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2005 | 2006 | 2007 | 2005 | 2006 | 2007 |
| Poor food consumption | - | 43.7 | 33.4 | 31.9 | 20.0 | 22.3 | - | 15.3 | 16.9 |
| Acceptable food consumption | - | 16.3 | 41.1 | 9.4 | 28.0 | 41.8 | - | 30.8 | 43.7 |

Box 2 Food security and public health; Key findings; Eastern Chad (WFP, 12/07)

### Food Security

The main source of income for refugees and IDPs is employment by humanitarian agencies (38% and 29%, respectively). More than 20% of resident population also benefit from it, although their main source of income is selling of their agricultural production

Other significant sources of income for all populations are selling of wood and petty trading

Agricultural production is limited for the host communities by the lack of means (such as seeds and tools), while the major obstacle for refugees and IDPs remains their restricted access to cultivable land

Cash savings are virtually non-existent among all communities and access to credit is limited

Food is the main expense of the families (more than 50% of total expenses for residents and IDPs and about 40% for refugees), even for refugees and IDPs, who receive food distributions

Milling costs represent 20% and 30% of total expenditures for displaced and refugees

Refugees and IDPs devote significant time to wood collection and competition for this scarce resource has become a source of tension with host communities

### Public Health

Refugee camps have a health centers that provide free care while many host villages and IDP communities have little or no access to health care

Access to safe drinking water is 81%, 89.6% and 95.6% for host, displaced and refugee populations, respectively (quantity is not mentioned)

## Contrasting nutrition situations in displaced camps

Two surveys were done by Epicentre/MSF-S in October 2007, the first in Am Dam prefecture, Ouaddai region and the second in Am Timan city, Salamat region (Epicentre/MSF-S, 10/07). Random sampled surveys were conducted among resident populations and rapid assessments using convenience sampling were conducted in nearby IDP settlements. Acute and severe malnutrition were higher in Ouaddai than in Salamat among both resident and IDP populations, and showed a serious situation (table 7). Severe acute malnutrition seemed especially high among IDPs. Vaccination rates were very low in all of the surveyed areas. ACF-F conducted another nutrition survey in the town and IDP camp of Dogdore in Ouaddai region in November 2007 (ACF-F, 11/07). The town includes approximately 2,000 residents and 27,500 IDPs. The prevalence of acute malnutrition indicated a worrisome but not alarming situation, while severe malnutrition was quite low (table 7). On the other hand, mortality rates were near or above emergency levels and may be explained in part by increased morbidity during the recent rainy period, as well as poor sanitation conditions.

Table 7 Results of nutrition and mortality surveys, Ouaddai and Salamat regions, Chad (Epicentre/MSF, 10/07; ACF-F, 11/07)

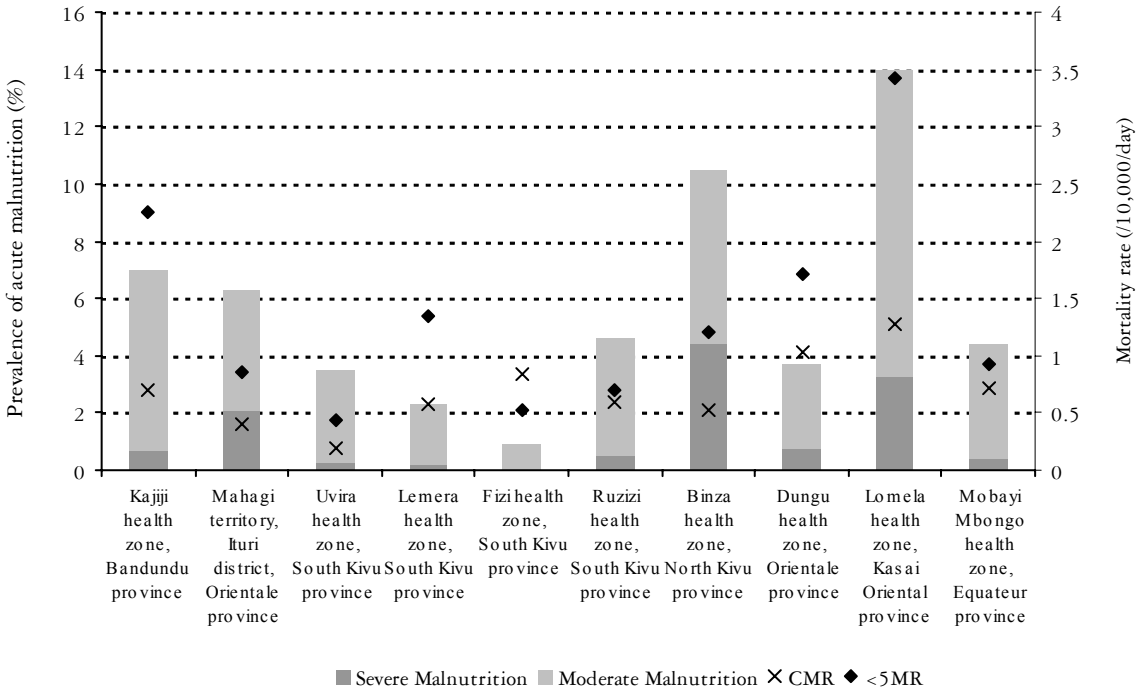
| Survey Area | Acute Malnutrition (%) (95% CI) | Severe Acute Malnutrition (%) (95% CI) | Crude Mortality (/10,000/day) (95% CI) | Under 5 Mortality (/10,000/day) (95% CI) | Measles Vaccination According to card and history (%) |
|---|---|---|---|---|---|
| Ouaddai region | | | | | |
| Residents, Am Dam prefecture | 14.4 (10.5-18.4) | 1.6 (0.4-2.7) | 0.27 (0.18-0.40) | 0.52 (0.26-0.89) | 18.1 |
| Am Sieb IDP camp, Am Dam prefecture (convenience sampling) | 17.8 | 3.7 | 0.17 | 0.52 | 34.0 |
| Dogdore village and IDP camps, Dar Slia | 8.1 (5.7-10.4) | 0.4 (0.0-0.9) | 0.89 (0.54-1.24) | 2.04 (1.24-2.83) | 90.8 |
| Salamat region | | | | | |
| Am Timan city | 8.9 (6.9-11.0) | 1.0 (0.2-1.8) | 0.34 (0.21-0.54) | 0.73 (0.36-1.42) | 40.0 |
| Ideter IDP camp, Am Timan city (convenience sampling) | 6.4 | 1.1 | 0.8 | 1.9 | 48.9 |

# Democratic Republic of Congo

Two earthquakes, measuring 6.1 and 5.0 on the Richter scale, were recorded along the DRC/Rwandan border on February 3, 2008 (OCHA, 04/02/08). Initial estimates confirmed 44 dead and over 1,000 injured. A UN assessment in the South Kivu capital of Bukavu in the weeks following the earthquake identified structural damage to homes and other buildings, including 56 medical facilities and several schools, as the major consequence of the earthquake (UNDAC, 22/02/08).

Katanga province remained in the midst of a

Figure 8 Prevalence of acute malnutrition and mortality rates, DRC, November 2007-January 2008 (AAH-US, 11/07-01/08; COOPI, 11/07)




cholera epidemic, recording 5,483 cases and 120 deaths in the first 7 weeks of the 2008 alone (OCHA, 02/08). Efforts are being made by the MoH and UN partners, as well as numerous NGOs to curb the epidemic, including provision of clean drinking water and well disinfection, improvement of sanitation facilities and community education (UNICEF, 04/03/08).

A series of random sampled surveys by AAH-US in South Kivu indicated the nutrition situation to be quite good (AAH-US, 11/07-01/08). Acute malnutrition rates ranged from 0.9-4.6%, while severe malnutrition was negligible and very few cases of edema were reported (figure 8).

Additional surveys conducted in other provinces found nutrition situations ranging from good to serious (AAH-US, 11/07-01/08; COOPI, 11/07) (figure 8). Under 5 mortality rates were above the emergency threshold in the Bandundu and Kasai Oriental province surveys.

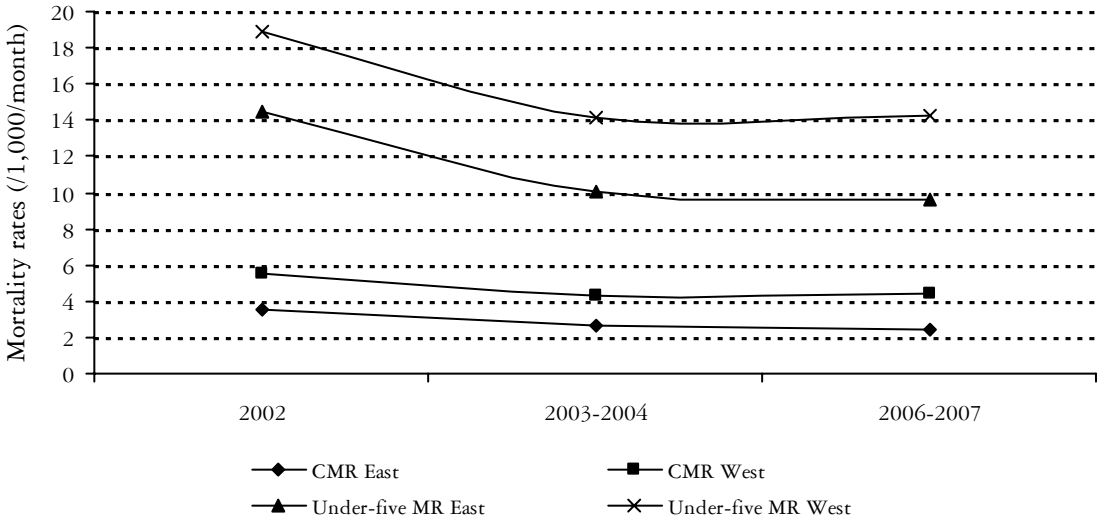
IRC conducted randomly-sampled retrospective mortality surveys in 31 health zones, covering a recall period of 16 months (January 2006 - April 2007) (IRC/Joint, 01/08). Two surveys were done; one was carried out in 15 health zones in the west of the country and the other one was undertaken in 16 health zones, in the east of the country. The results showed high mortality rates, especially in the east of the country (table 8). The difference between the crude mortality rates in the east and west was statistically significant. Mortality rates have remained stable compared to 2004 in both areas (figure 9). Fever/malaria, diarrhea, respiratory infections, tuberculosis and neonatal conditions were responsible for over 55% of deaths.

Table 8 Results of mortality surveys, DRC, 2006-2007 (IRC, 01/08)

| Crude Mortality Rate (/1,000/month) (95% CI) | Under-five Mortality Rate (/1,000/month) (95% CI) | Crude Mortality Rate (/10,000/day)* | Under-five Mortality Rate (/10,000/day)* |
|---|---|---|---|
| West | | | |
| 2.0 (1.8-2.1) | 4.7 (4.3-5.1) | 0.66 | 1.54 |
| East | | | |
| 2.4 (2.3-2.6) | 5.2 (4.8-5.7) | 0.79 | 1.70 |

* Calculated from the rate expressed as /1,000/month

Figure 9 Mortality rates, DRC




# Southern Africa


## Angola

Huila province, largely affected by the war, has experienced relative stability over the past few years and as such, most relief services have slowly been discontinued. A recent random-sampled nutrition survey conducted by ACH-S in the remote municipality of Chipindo indicated a worrisome nutrition situation (ACH-S, 09/07). The results, while not significantly different from the last survey done in 2004, are much higher than those obtained in a 2003 survey (table 9). Under 5 mortality rates have also increased in comparison to previous surveys and the study authors suggest that poor access to adequate health care, lack of dietary diversity and the cessation of food aid in December 2006 have all contributed to the rise.

Table 9 Results of a nutrition and mortality survey, Angola, September 2007 (AAH-S, 09/07)

| Survey Area | Acute Malnutrition (%) (95% CI) | Severe Acute Malnutrition (%) (95% CI) | Crude Mortality (/10,000/day) (95% CI) | Under 5 Mortality (/10,000/day) (95% CI) |
|---|---|---|---|---|
| Chipindo municipality, Huila province | 6.4 (4.6-8.3) | 0.8 (0.3-1.3) | 0.71 (0.34-1.08) | 2.04 (0.85-3.22) |

# Asia


## Myanmar

In October 2007 ACF-F conducted a random-sampled nutrition survey in Northern Rakhine State, located in the extreme west of the country along the border with Bangladesh. Approximately 90% of the population in the districts surveyed are Arakan Muslims of Indian or Persian descent and, as such, are not recognized as Burmese citizens (ACF-F, 11/07).

The survey unveils an exceptionally high prevalence of acute malnutrition, although both severe malnutrition and mortality rates are below alert levels (table 10). The results are slightly higher than those found in a January 2006 survey, but this might be explained by the fact that it was carried out towards the end of the lean season.

BMI was also calculated for 312 non-pregnant mothers, for whom 52.9% fell below 18.5 kg/m$^2$. Nearly one third of under-5 deaths were reported as having occurred in the first 8 days of life, although in most cases the specific cause of death was unknown. Over half of respondents stated using an unimproved water source, most commonly a nearby pond or river.

Table 10 Prevalence of acute malnutrition and mortality rates, Myanmar, October 2007 (ACF-F, 11/07)

| Survey Area | Acute Malnutrition (%) (95% CI) | Severe Acute Malnutrition (%) (95% CI) | Crude Mortality (/10,000/day) (95% CI) | Under 5 Mortality (/10,000/day) (95% CI) |
|---|---|---|---|---|
| Maungdaw and Buthidaung townships | 25.6 (19.7-31.5) | 1.8 (0.6-3.0) | 0.34 (0.15-0.53) | 1.36 (0.31-2.41) |

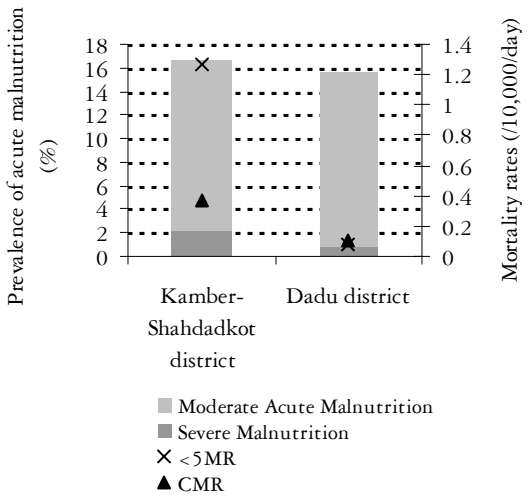
# Pakistan

Heavy monsoon rains, exacerbated by Cyclone Yemyin in late June, led to extensive flooding in Balochistan and Sindh provinces in July 2007. While flooding in Balochistan was mostly caused by direct rainfall, the situation in Sindh was more a result of intense pressure put on its irrigation system. Sindh province's already poorly maintained system of canals and drains was overwhelmed by the excess water run-off, leading to no fewer than 20 breaches. The rise of water was relatively gradual and, as such, those living in flood areas were able to evacuate to safer ground (AAH-US, 09/07).

AAH-US conducted a food security assessment in September 2007 and two nutrition surveys in November 2007 to evaluate the effect of the flooding on the populations of Kamber-Shahdadkot and Dadu districts, from where an estimated 100,000 persons (approximately 10% of the population) were forced to leave their homes.

The food security assessment found that 71% of those displaced had either already returned to their homes or anticipated returning home by the end of October 2007. 89% of respondents identified agriculture as their primary source of revenue. The majority of farmers lost most, if not all, of their rice crop to the flooding and are anticipated to have inadequate food stores to last until next year's harvest. A further 70% of people stated that they had already reduced their daily food consumption as a direct result of the floods.

FIGURE 10 PREVALENCE OF ACUTE MALNUTRITION AND MORTALITY RATES, SINDH PROVINCE, PAKISTAN, OCTOBER 2007 (AAH-US, 11/07)




Most (86%) of the displaced benefited from some sort of initial food aid. However, most common coping mechanisms identified were casual labor, the sale of livestock and borrowing money, all of which will help in the short-term, although the assessment recommends continued external support to flood victims until at least the next harvest.

In November 2007, AAH-US carried out two surveys to assess the nutritional status of children affected by the floods (AAH-US, 11/07). The prevalence of malnutrition was found to be just above the emergency threshold in both surveys (figure 10), while retrospective mortality rates were under control.

# Lead Toxicity: An Under Appreciated Harm for Refugee Children Entering the USA

*Raj Shrestha, MPH, Douglas Taren, PhD*
*Mel and Enid Zuckerman College of Public Health*
*University of Arizona*
*1295 N Martin Ave., PO Box 245163, Tucson, Arizona 85724*
*Emails: RShrestha@hsag.com and taren@email.arizona.edu*

Lead poisoning in children can be a chronic disease that can easily develop into serious conditions such as affecting the central nervous system. In adults, clinical lead poisoning usually affects the peripheral nervous system, whereas in children it most often affects the central nervous system.[1] It has been well documented that children are more sensitive to lead than adults and their symptoms are not as reversible; which ultimately lead to a paradigm shift in research by moving from focusing on lead poisoning prevention from adults in industrial settings to children with smaller exposures.[2] There has been extensive research performed on the health impacts of lead exposure in early childhood. Children who are exposed to high lead levels could have damage to the nervous, hematopoietic, endocrine, and renal systems. At lower exposures, lead has been associated with cognitive and neurobehavioral damage.[3]

One group that is often overlooked in the lead screening discussions is refugee children. In 2006, 18,711 children (0-17 years of age) were admitted to the United States as refugees. Childhood lead poisoning is a problem worldwide. In other parts of the world, the main sources of lead are different than in the United States.[4] Leaded gasoline is still widely used in many countries and contributes to elevated Blood Lead Levels (BLLs) to children overseas. Poorly glazed pottery can potentially cause high lead levels in food, which can be the most prominent source of lead in some areas. Additional sources of lead contamination include flour mills, medications and cosmetics, and consumer products.[4] Sources of lead exposure for children in Latin American and Caribbean countries can include leaded gasoline, paint, leaded-glazed ceramics, ethnic remedies, industries such as battery recycling, and cottage industries such as battery repair and the production of pottery or ceramics.[5] In Asia a lot of focus has been placed around lead poisoning in children revolves and the use of surma, a lead-based cosmetic used in India and Pakistan. Likewise, Kohl is a widely used traditional cosmetic worn around the eyes in Asia, particularly South Asia and the Middle East.[6] In Africa the literature points to lead concentrations being higher in those who used eye cosmetics, lived near a battery smelter, or lived in a certain geographical area including those with high traffic density in urban areas.[7,8]

This article will identify why lead poisoning in refugee children is a serious international health concern. The next sections will identify the effects that lead poisoning may have on the development of refugee children, screening and testing options, and risk factors associated with elevated BLLs from countries of origin.

[1] Needleman, H.L. Lead poisoning. *Annual Review of Medicine.* 2004;55:209-222
[2] Bellinger, D.C. Lead. *Pediatrics.* 2004 Apr;113(4 Suppl):1016-22
[3] Bernard, Susan M. JD, DrPH, MPH. Should the Centers for Disease Control and Prevention's Childhood Lead Poisoning Intervention Level Be Lowered? Am J Public Health. 2003 August; 93(8): 1253–1260
[4] CDC Lead Poisoning Prevention and Treatment Recommendations for Refugee Children www.cdc.gov/nceh/lead
[5] Matte TD, Figueroa JP, Ostrowski S, Burr G, Jackson-Hunt L, Keenlyside RA, Baker EL. Lead poisoning among household members exposed to lead-acid battery repair shops in Kingston, Jamaica. Int J Epidemiol. 1989 Dec;18(4):874–881
[6] Al-Ashban RM, Aslam M, Shah AH. Kohl (surma): A toxic traditional eye cosmetic study in Saudi Arabia. Public Health. 2004 Jun; 118(4):292-8
[7] Diouf, A, et al. : Environmental lead exposure and its relationship to traffic density among Senegalese children: a pilot study. Human & Experimental Toxicology, 2003 (Vol. 22) (No. 10) 559-564
[8] Pfitzner, Mark A et al. Prevalence of elevated blood lead levels in Nigerian children. Ambulatory Child Health 2000 6 (2), 115–123

## Pathophysiology of Lead Poisoning

The pathophysiology of lead poisoning in children is predicated on that fact that children are vulnerable because their developing bodies absorb more lead, and because hand-to-mouth behavior in young children puts them at risk for lead exposure. In fact, children can absorb about 50% of ingested lead.[9] Further more, poor nutrition, specifically a low intake of iron and calcium, can increase absorption of lead and exacerbate the poisoning. Lead is deposited in several tissues and into the bloodstream and can also persist in bone and teeth for up to 25 years. An important fact is that high bone lead levels can increase blood lead levels post exposure and with the elimination of the source.[10]

Toxicity from lead occurs in several ways. First, lead binds to enzymes in the heme pathway. Lead inhibits ferrochelatase, which leads to an increase in the levels of protoporphyrin. Protoporphyrin levels that reach 35µg/dL are associated with lead toxicity and iron deficiency. Additionally, lead is also a competitive inhibitor of calcium. Many sites on the cell surface are activated by calcium however they have a greater affinity for lead.[11]

Lead intoxication affects the developing brain of a child. Lead causes an inappropriate release of neurotransmitter and competes with calcium to block neurotransmitter release. The resulting affect interferes with selective pruning of synaptic connections in the brain during initial years of brain development. Lead also interferes with glutamate metabolism, which is thought to be associated with neuronal development. Another receptor that is selectively blocked by lead is *N*-methyl-D-aspartate, which is responsible for the development of brain plasticity. This effect reduces the level of retention of newly learned information. In addition, high BLLs disrupt endothelial cell function in the blood-brain barrier. This effect produces hemorrhagic encephalopathy, which results in seizures and coma.[12]

Lead encephalopathy can occur with BLLs in the range of 10-80 µg/dL which may signify the pathologic changes in the CNS of lead-exposed children. Secondary to microvascular lesions tend to be edema, vacuolation, hemorrhage and reactive glial changes.[13]

Auditory and visual functionality is also affected by increased BLLs in children. Higher doses of lead increase the threshold of the auditory nerve action potential and affects both the retina and visual cortex of the developing visual system. Low-to-moderate lead levels during development phases in children produce selective rod deficits. Researchers have stated that undetected sensory deficits could impair motor and mental development of children.[12]

Lead poisoning can also hamper with the development of tertiary brain structure that leads to permanent disabilities, most notably poor hand–eye coordination, longer reaction times, hearing or speech impairments, and decreased learning and memory.[14]
Children exposed to lead can have earlier signs of attention-deficit/hyperactivity disorder (ADHD) and lower scores on standardized tests.[15] An international pooled analysis of 1,333 children found evidence of lead hampering the intellectual ability in children with blood lead levels less than 7.5 ug/dL. In addition, it was noted that an estimated decrease of

[9] Agency for Toxic Substances and Disease Registry. *Toxicological Profile for Lead* Atlanta, Ga: ATSDR; September 2005
[10] American Academy of Pediatrics Committee on Environmental Health. Lead exposure in children: prevention, detection, and management. Pediatrics. 2005; 116:1036-1046
[11] Piomelli S. Lead poisoning. In: Behrman RE, Kliegman RM, Jenson HB, eds. *Nelson's Textbook of Pediatrics*. 16th ed. Philadelphia, Pa: WB Saunders; 2000: 2156-2159
[12] Lead poisoning: http://www.emedicine.com/radio/topic386.htm
[13] Winder C, Garten LL, Lewis PD. The morphological effects of lead on the developing central nervous system. Neuropathol Appl Neurobiol. 1983 Mar-Apr;9(2):87-108
[14] Piomelli S. Lead poisoning. In: Behrman RE, Kliegman RM, Jenson HB, eds. *Nelson's Textbook of Pediatrics*. 16th ed. Philadelphia, Pa: WB Saunders; 2000: 2156-2159
[15] American Academy of Pediatrics Committee on Environmental Health. Lead exposure in children: prevention, detection, and management. *Pediatrics*. 2005; 116:1036-1046

3.9 IQ points was associated with blood lead level increases from 2.4 to 10 ug/dL.[16]
The level of toxicity plays a role in the medical consequences of lead as described in Table 1.[17]

It is important to note that maternal blood lead levels of 10 to 15 µg/dL may increase risk for premature birth and low birth weight. Lead also readily crosses the placenta, thus endangering fetal viability.[18] In addition, it has been documented that effects of lead may actually continue into adolescence regardless of whether BLLs decrease.[19] Finally, exposure to lead could potentially lead to delayed puberty in females.[20]

## Screening and Diagnostic Testing

The two most common methods of screening children for lead poisoning are venous blood sampling and capillary blood sampling. The venous method is the most accurate way to measure lead in blood, while the capillary screening method is an easier way to screen young children. However, capillary samples appear to be less accurate and more prone to contamination. Capillary testing has a false-positive rate of three to nine percent and false-negative rate of one to eight percent.[21]

In children with BLLs of 45 µg/dL or more, it can be helpful to determine the erythrocyte protoporphyrin level, which increases when blood lead levels exceed 30 µg/dL. This indicates impairment of the heme biosynthetic pathway. Due to this impairment in the system, children with elevated levels should be tested for iron deficiency (usually via the zinc protoporphyrin test).[22] Erythrocyte protoporphyrin levels lag behind blood lead levels by several weeks, therefore periodically monitoring the erythrocyte protoporphyrin level to gauge the effectiveness of medical interventions is recommended.
Table 2 identifies recommendations for follow-up testing with venous samples according various cut points for blood lead levels.[23]

Capillary filter paper was used to obtain capillary samples. The filter paper method for lead determinations has a sufficiently high sensitivity and specificity and correlates well with venous sampling. There has been an emphasis placed on this type of screening due to the ease with which this technique can be performed. Samples can be easily sent to a laboratory by regular mail. These characteristics of the screening approach indicate that it is a promising and attractive reference method, particularly in large populations of widely dispersed young children in China and other countries.[24]

Table 1 Blood Lead Levels and Effect on Children*

| Blood Lead Level (ug/dl) | Effect on Children |
|---|---|
| >380 | convulsions, coma, and death |
| 100-150 | encephalopathy |
| >70 | anemia with acute poisoning |
| >40 | decrease hemoglobin synthesis |
| >20 | delayed nerve conduction |
| >10 | slow cognitive and behavioral development |
| <10 | stunt bone growth as a consequence of decreased vitamin D metabolism |

* Table adapted from Centers for Disease Control and Prevention[17]

[16] Lanphear BP, Hornung R, Khoury J, et al. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. *Environ Health Perspect.* 2005; 113:894-899
[17] Centers for Disease Control and Prevention. Managing Elevated Blood Lead Levels Among Young Children: Recommendations From the Advisory Committee on Childhood Lead Poisoning Prevention. 2002
[18] Mendelsohn AL, Dreyer BP, Fierman AH, et al. Low-level lead exposure and behavior in early childhood. *Pediatrics.* 1998; 101:E10
[19] Bellinger D, Sloman J, Leviton A, et al. Low-level lead exposure and children's cognitive function in the preschool years [published correction appears in *Pediatrics.* 1994;93:A28]. *Pediatrics.* 1991; 87:219-227
[20] Selevan SG, Rice DC, Hogan KA, et al. Blood lead concentration and delayed puberty in girls. *N Engl J Med.* 2003;348: 1527-1536
[21] United States Preventive Services Task Force. 1996. Chapter 23, Screening for Elevated Lead Levels in Childhood and Pregnancy. *Guide to Clinical Preventive Services: Second Edition.* 1996
[22] CDC. *Preventing lead poisoning in young children.* Atlanta (GA): CDC; 2005 Aug. p.101
[23] www.keepingkidshealthy.com
[24] Shen, Xiao-Ming et al. Applicability of a filter paper method to measure blood lead levels in large populations of Chinese children. Clinica Chimica Acta Volume 328, Issues 1-2, February 2003, Pages 99-104

TABLE 2 CLASSIFICATION OF BLOOD LEAD LEVELS CUT-OFF POINTS IN CHILDREN[23]

| Classification of blood lead levels cut-off points in children | | |
|---|---|---|
| Blood Lead Level (mcg/dl) | Exposure Level | Time when venous blood level should be obtained for confirmation and/or follow-up |
| < 9 | I | not necessary |
| 10-14 | IIA | 3-4 months |
| 15-19 | IIB | within 1 month |
| 20-44 | III | within 1 week |
| 44-69 | IV | within 48 hours |
| >69 | V | immediately |

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## Blood Lead Levels in Refugees Within the United States

In 2006, 41,150 persons were admitted to the United States as refugees. Of these refugees, 18,711 or 45% were children (0-17 years of age). The leading countries of origin for refugees were Somalia, Russia, and Cuba which accounted for 47% of all refugees admitted. Within the United States in 2006, refugees mainly settled in California, Minnesota, Texas, Florida, Washington and New York. It is estimated that nearly one-half of all refugees settled in one of these six states. Most refugee resettlement agencies try to place refugees in areas in which the refugees may already have family members or in similar ethnic communities. [25]

Over the past decade, approximately 70,000 refugees have resettled in the United States each year. US federal regulations stipulate a process for the health screening of refugees shortly after they arrive in the country. Refugees must undergo an overseas health screening and US regulations permit and fund an initial domestic screening to eliminate health-related barriers to successful resettlement while protecting the health of the public. Departments of health or public health agencies usually run these screenings; however, the breadth of clinical services and laboratory testing that are provided varies considerably among states.[26]

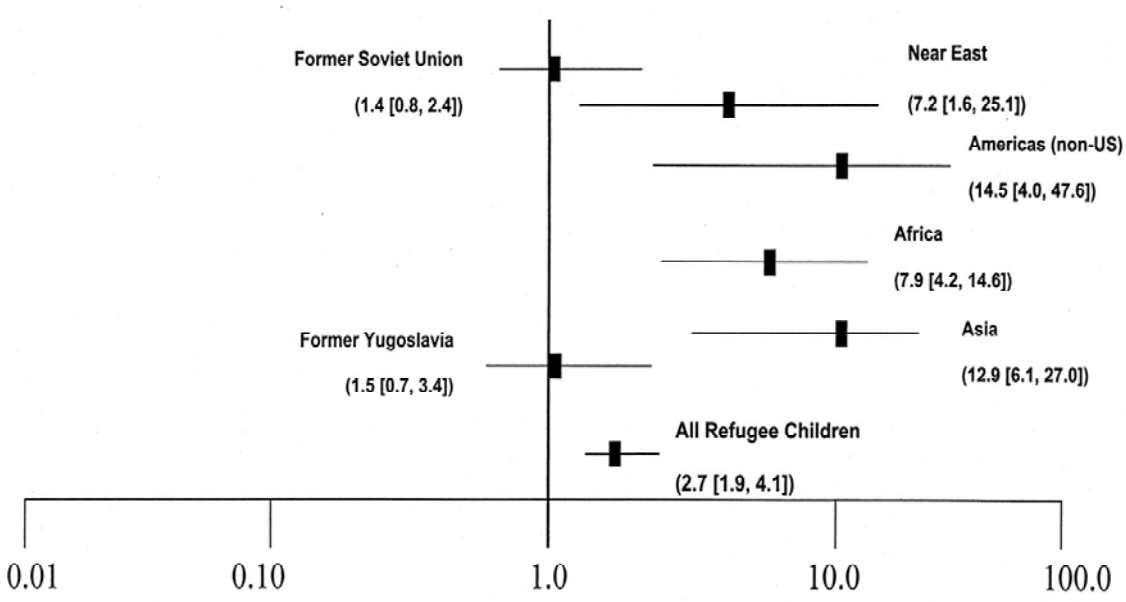
Federal standards stipulate that a refugee medical screening take place within 90 days after a refugee's arrival in the United States. However, the screening is not uniform across all states and most do not have a BLL screening protocol for refugee children. The Centers for Disease Control and Prevention (CDC) recommends blood lead testing of children within 90 days of arriving into the United States so treatment can be provided if necessary. According to the CDC, until federal standards for blood lead testing and lead risk assessment in refugee children are imple-

[24] Shen, Xiao-Ming et al. Applicability of a filter paper method to measure blood lead levels in large populations of Chinese children. Clinica Chimica Acta Volume 328, Issues 1-2, February 2003, Pages 99-104

[25] http://www.migrationinformation.org/USfocus/display.cfm?ID=229

[26] Geltman, Paul L., Cochran, Jennifer. A Private-Sector Preferred Provider Network Model for Public Health Screening of Newly Resettled Refugees. Am J Public Health, Feb 2005; 95: 196 - 199

Table 3 Odds of BLL elevation by birth place for 660 refugee children who resettled in Massachusetts between 1995 and 1999, compared with similarly-aged US children*




* Table adapted from Getlman et al 2001[28]

mented, BLL testing of all refugee children 6 months to 16 years old on arrival in the United States is recommended. In addition, the CDC recommends blood lead testing, for children younger than 6 years within 90 days after arrival in the United States, and a follow-up blood lead test 3-6 months after placement in a permanent residence. Also, blood lead screening for refugee children aged 6 years and older should be performed if lead hazards are evident.[27]

## Blood Lead Levels by Country of Origin

It has been documented that newly arrived refugee children are twice as likely as U.S. children to have elevated BLLs as indicated. Some sub-populations of refugee children are 12-14.5 times more likely to have elevated BLLs[28] as indicated in Table 3.

In Asia, increased focus has been placed around lead poisoning in children and the use of surma and kohl. Surma is a lead-based cosmetic and can be a source of lead. Likewise, Kohl is a widely used traditional cosmetic. Individuals living in the Middle East and South Asia wear this around the eyes.[6] Another concern in Asia pertaining to lead exposure in children is ayurveda, which is a traditional form of medicine practiced in India and other countries in the Indian sub-continent. Ayurvedic medications often included products such as herbs, minerals, and metals.[29]

In Africa, there have been many studies that have looked at the risk of lead exposure in children. In many countries in Africa, traffic density is increasing in urban areas which is considered a risk factor for children in terms of lead exposure.[7] Some studies have shown that the strongest associations were found between elevated BLLs and whether the family lived in a house on a tarred road.[30] In addition, in Africa peeling paint in older homes was identi-

[27] CDC Lead Poisoning Prevention and Treatment Recommendations for Refugee Children www.cdc.gov/nceh/lead
[28] Geltman PL, Brown MJ, Cochran J. Lead poisoning among refugee children resettled in Massachusetts, 1995 to 1999. Pediatrics. 2001;50:457-59
[29] MMWR weekly, Lead Poisoning Associated with Ayurvedic Medications --- Five States, 2000—2003
[30] Nriagu, Jerome et al. Lead poisoning of children in Africa, III. Kaduna, Nigeria Science of The Total Environment Volume 197, Issues 1-3, 30 April 1997

fied as a risk factor for elevated blood lead levels in children. [31] Some studies have shown that elevated BLLs were found in those children who used eye cosmetics, lived near a battery smelter, or lived in a certain geographical area. The causes of lead intoxication in children in Africa are considered to be multi-factoral.[8]

In Latin American and the Caribbean countries, children are most likely exposed to lead by leaded gasoline, paint, leaded-glazed ceramics and living near battery repair.[5] Some studies have indicated that risk factors also include, being of race/ethnicity other than white, living in a home built after 1979, car repair in the home or yard, and eating paint chips.[32] In addition, Latin American folk terra cotta pottery is a risk fact to children due to high lead content and everyday uses such as cooking and storage of food/drink. This type of pottery can leach significant amounts of lead and is a source of lead poisoning in children.[33]

Of the refugees resettling in the US, research has indicated that 73 % of the children had a decline in BLLs, however 27 % of those children were still being exposed in the United States. Countries from Asia and Africa, particularly with the largest numbers of refugees entering the US (Somalia and Vietnam) yielded the greatest percentage of cases. In addition, children from the Caribbean islands and Latin America also seemed to be at higher risk.[34] The strongest factor setting a pattern among those with high BLLs was a child's country of origin. On the other hand, European refugees from the former Soviet Union and Yugoslavia faired better with lower BLLs. Table 4 characterizes lead exposure in refugee children from Asia, Africa and Latin America/Caribbean and depicts associated studies performed that address specific concerns by region.

## Conclusion

It is important that public health officials both internationally and in the United States recognize the seriousness of lead poisoning in refugee children. As indicated by the literature, albeit limited, refugee children have much higher elevated BLLs compared to children in the United States. It is important for international public health workers who work with relocation refugees be familiar with the risk factors associated with this *pre-entry lead exposure*. Subsequently public health workers in the United States should also be familiar with refugee children and *pre-entry exposure* risk factors which will assist them in also evaluating the related topic of *post-entry exposure* in the United States.

Risk factors for lead poisoning among refugee children may differ from those among U.S.-born children. Screening for BLLs should be done for all refugee children who may have been exposed in their country of origin or even in refugee camps. Education of refugee parents about lead exposure hazards associated with activities should be considered in the design of lead poisoning prevention and control programs.

[31] Mathee, Angela et al. Lead in Paint: Three Decades Later and Still a Hazard for African Children? Environ Health Perspect. 2007 March; 115(3): 321–322
[32] Trepka, Mary Jo,et al. Risk factors for lead poisoning among Cuban refugee children. Public Health Rep. 2005 Mar–Apr; 120(2): 179–185
[33] ww.dhs.ca.gov/child**lead**/tableware/twtalk.html. California Department of Public Health
[34] http://immigration.about.com/library/weekly/aa063001a.htm

Table 4 Literature Evaluation for Lead Screening in Refugee Children Relevant to Region of Origin

| References (Pub. Date) | Region | Study Purpose Population/Exposure | Methods Keep consistent with reporting sample size, age and type of study | Results |
|---|---|---|---|---|
| Entzel, et al (2003)[35] | Latin America/Caribbean | Cuban refugee children | A retrospective cross-sectional study of medical records for 256 children | 22.9% of refugee children screened had elevated BLLs (>10 ug/dl), which is roughly three times higher than the US average of 7.6%. Researchers concluded that lead poisoning should be considered an important health problem among refugee children recently arrived from Cuba. |
| Matte, et al (2006)[5] | Latin America/Caribbean | Jamaica children who lived near lead smelters. | 107 children, 2-12 years old Mona Commons, were examined in a door-to-door survey. BLLS greater than 70 mg/dL were confirmed using venous samples | BLLs were in the range 2.2-202 µg/dL. 59% of these had BLL levels above 10 µg/dL and the population mean was an unacceptably high 25.1 µg/dL This severe chronic exposure to lead was exacerbated by a significant history of pica, and chronic nutritional anemia. |
| Nrigru, et al (1998)[30] | Africa | Children from Kaduna in Northern Nigeria. | Prevalence of elevated BLLs was determined in 154 children, 1-6 years of age | Mean BLLs was found to be 10.6 µg/dl, and 2% of the children had BLL levels greater than 30 µg/dl. Greatest BLL levels were in children 5 years old and was attributed to the tendency for this age group to play longer in contaminated outdoor environments. The strongest associations were found between BLL and whether the family owned a car or lived in a house on a tarred road. Potential sources of lead in the city as well as household and behavior risk factors likely resulted in exposure of children to lead. |
| Phitzner, et al (2000)[8] | Africa | Young, urban Nigerian children. (Jos, Nigeria) | A randomized cluster sample of 218 children aged 6–35 months to evaluate elevated BLLs. | 70% of the children had BLLs in excess of 10 µg/dL. Mean BLLs were 15.2 µg/dl. Multiple factors associated with increased BLLs included being Muslim, using eye cosmetics, living near a battery smelter, and specific geographic areas. |
| Mathee, et al. (2007)[31] | Africa | Johannesburg South African school children. | 383 Johannesburg school children were screened for eleveated BLLs. Home assessments and interviews with parents of children were conducted. | BLLs ranged from 1.0 to 18.1 µg/dL. Mean BLLs was 9.1 µg/dL. Peeling paint in homes was identified as a risk factor for elevated blood lead levels in children. |

[35] Entzel ,Pamela P., Fleming, Lora E., Trepka ,Mary Jo, Squicciarini, Dominick, The Health Status of Newly Arrived Refugee Children in Miami–Dade County, Florida. Am J Public Health. 2003 February; 93(2): 286–288

Table 4 Literature Evaluation for Lead Screening in Refugee Children Relevant to Region of Origin

| References (Pub. Date) | Region | Study Purpose Population/Exposure | Methods Keep consistent with reporting sample size, age and type of study | Results |
|---|---|---|---|---|
| Diouf, et al. (2003)[7] | Africa | Young children in Dakar and Khombole, Senegal | 330 children, age were screened as part of a cross-sectional study in 2 different areas in Senegal to determine the impregnation levels of the lead released by the exhaust of cars. | 16.7% of rural children had BLL>10 µg/dL, while 58.9% of urban children had BLLs >10 µg/dL. The mean BLL was 7.32 for all children. Lead exposure was lower for children living in rural areas compared with urban areas. Difference associated with automobile traffic. |
| Nuwayhid, et al. (2003)[36] | Middle East | Cross-sectional study of children in Beirut, Lebanon | 281 children, 1 -3 years old screened as part of routine check-up at the private, and outpatient pediatric ambulatory services to determine prevalence of BLLs > 10µg/dL | 39 (14%) children had BLLs ≥ 10 µg/dL The mean BLL was 6.60 µg/dL. Elevated BLLs were associated with paternal manual jobs, residence being located in high traffic areas, summer season, using hot tap water, exposure to kohl, and living in older buildings. |
| Al-Ashban RM (2004)[6] | Middle East | The study purpose was to find evidence of lead levels in different samples of kohl in Saudi Arabia. | A total of 107 kohl samples were collected from different regions of Saudi Arabia, and analyzed for the presence of lead. In addition, aluminum and antimony levels were also determined. | Lead levels up to 53% were detected in some kohl preparations, and some samples were found to contain camphor and menthol. The blood analyses of regular kohl users revealed a high lead concentration. Due to the health risk, an official public awareness campaign is suggested to encourage the use of lead-free kohl. |
| Boseila, et al. (2004)[37] | Middle East | Young children in Giza, Egypt from rural and urban locations | 164 children from rural and urban areas of Giza, Egypt to evaluate risk factors for elevated BLLs. | 46% of rural children had BLLs > 15 µg/dL , while 20% of urban children had BLLs>15 µg/dL. The mean for the 164 children was 12.96 µg/dL. Lead levels differed considerably in children classified by housing quality. |
| Albalak, et al. (2002)[38] | South East Asia | School children in Jakarta, Indonesia | 397 children in a population-based, cross-sectional blood lead survey that included capillary blood lead sampling and a brief questionnaire on risk factors for lead poisoning. before the beginning of the phase-out of leaded gas. | Thirty-five percent of children had BLLs ≥10 µg/dl and 2.4% had BLLs ≥20 µg/dl. Approximately one-fourth of children had BLLs 10–14.9 µg/dl. The mean BLL of the children was 8.6 µg/dl. |

[36] Nuwayhid, Iman et al. Blood Lead Concentrations in 1–3 Year Old Lebanese Children: A Cross-sectional study. Environ Health. 2003; 2: 5
[37] Boseila, et al. Blood Lead Levels in Egyptian Children: Influence of Social and Environmental Factors. American Journal of Public Health 47-49 January 2004, Vol 94, No. 1
[38] Albalak, et al. Blood lead levels and risk factors for lead poisoning among children in Jakarta, Indonesia. The Science of the Total Environment, Volume 301, Number 1, 1 January 2003 , pp. 75-85(11)

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## Greater Horn of Africa

### Ethiopia


| | | |
|---|---|---|
| ENCU | 09/07 | Emergency Nutrition Quarterly Bulletin (Third quarter 2007) |
| FEWS | 02/08 | Ethiopia Food Security Update |


### Kenya


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|---|---|---|
| FEWS | 02/08 | Kenya Food Security Update |
| FEWS | 12/02/08 | Kenya political crisis: location and impact |
| USAID | 26/03/08 | Kenya-Complex Emergency |


### Somalia


| | | |
|---|---|---|
| Epi/ MSF-S | 12/07 | Retrospective mortality, nutrition and measles vaccination coverage survey, Bossaso |
| FEWS | 12/03/08 | Somalia Food Security alert |
| FSAU | 12/07 | Nutrition Update, December 2007 |
| FSAU/Joint | 12/07 | Somali knowledge, attitude and practices study (KAPS), infant and young child feeding and health seeking practices |
| FSAU | 01/08 | Nutrition Update, January 2008 |
| FSAU | 08/02/08 | Food Security and Nutrition, Special brief, Post-*Deyr* '07/08 analysis |
| MSF-CH | 11/07 | Nutrition and retrospective mortality survey in Dinsor town |


### Sudan


| | | |
|---|---|---|
| AAH-US | 10/07 | Nutritional anthropometric survey, IDP camps and Renk, Jelhak, Shomedi and Geiger payams, Renk county, Upper Nile State |
| AAH-US/ | 12/07 | Nutritional anthropometric survey, Children under 5 years old, Awul, Warrap, Manalor, Pagol, and Kiirik payams of Tonj North County, Warrap state |
| FEWS | 02/08 | Food Security Update |
| UNICEF | 11/07 | Darfur Nutrition Update, September-November 2007 |
| UN/SC | 11/03/08 | Sudan: Continued fighting in Darfur makes clear preparing for negociations not priority for Governement, rebels, with dire implications, Security Council told |
| WV | | Warrap, Man Alor, Pagol and Kiirik payams, Tonj North County, Warrap State, Executive summary |


## West Africa

### Mali


| | | |
|---|---|---|
| ACH-S | 08/07 | Enquête nutritionnelle et de mortalité, Communes Gadougou I et Gadou gou II, Région de Kayes, Cercle Kita |
| FEWS | 11/07 | Mali: Mise à jour de la Sécurité Alimentaire |
| WHO | 03/02/08 | Health Action in Crises, Highlights 193, 28 January-3 February, 2008 |


### Mauritania


| | | |
|---|---|---|
| ACH-S/Joint | 09/07 | Enquête nutritionnelle et de mortalité en Mauritanie dans les régions du Gorgol et du Guidimakha |
| FEWS | 04/02/07 | West Africa Food Security Update |


### Niger


| | | |
|---|---|---|
| ACH-S | 09/07 | Enquête nutritionnelle et de mortalité rétrospective-département de Mayahi, Niger |
| ACH-S | 11/07 | Enquête nutritionnelle et de mortalité rétrospective-département de Abalak, Niger |
| ACH-S | 11/07 | Enquête nutritionnelle et de mortalité rétrospective-département de Keita, Niger |
| ACH-S | 01/08 | Enquête nutritionnelle et de mortalité rétrospective-département de Mayahi, Niger |
| INS-N/Joint | 11/07 | Enquête nutrition et survie des enfants de 6 à 59 mois, données récapitulatives préliminaires |
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| MSF-B | 11/07 | Enquête nutritionnelle et de mortalité retrospective, District sanitaire de Dakoro, Région de Maradi |
| WHO | 02/03/08 | Health Action in Crises, Highlights No 197, 25 February to 2 March 2008 |

# Central Africa

## Chad

| | | |
|---|---|---|
| ACF-F | 11/07 | Enquêtes nutritionnelle anthropométrique et mortalité rétrospective, Village et camp de déplacés de Dogdoré, Enfants âgés 6 à 59 mois, Dogdoré, Dar Sila, Tchad Est, Résultats préliminaires |
| Epi/MSF-S | 10/07 | Enquête anthropométrique nutritionnelle , de couverture vaccinale contre la rougeole, de mortalité rétrospective, et d'accès aux soins, Am Timan, résidents et déplacés, région du Salamat |
| Epi/ MSF-OCBA | 10/07 | Enquêtes nutritionnelles, de mortalité, d'accès aux soins et de couverture vaccinale parmi la population de résidents et de déplacés dans la sous-préfecture d'Am Dam, Ouaddaï |
| IRIN | 15/02/08 | Chad: Armed group blocks UNHCR from moving new Sudanese refugees |
| OCHA | 02/08 | Regional Humanitarian Update, Volume 2, Issue 2 |
| OCHA | 05/03/08 | Humanitarian needs and responses in Chad: Information bulletin |
| WFP | 12/07 | Enquêtes sur les capacités d'autosuffisance alimentaire des réfugiés Soudanais, les personnes déplacées et les populations hôtes à l'Est du Tchad |

## DRC

| | | |
|---|---|---|
| AAH-US | 12/07 | Rapport d'enqûete nutritionnelle anthropométrique, Zone de santé de Dungu, Province Orientale |
| AAH-US | 11/07 | Enquête nutritionnelle anthropométrique, Zone de santé de Kajiji, Province de Bandundu, Résumé exécutif |
| AAH-US | 11/07 | Enquête nutritionnelle anthropométrique, Zone de santé d'Uvira, Province du Sud Kivu |
| AAH-US | 11/07 | Enquête nutritionnelle anthropométrique, Zone de santé de Lemera, Province du Sud Kivu, Résumé exécutif. |
| AAH-US | 11/07 | Enquête nutritionnelle anthropométrique, Zone de santé de Ruzizi, Province du Sud Kivu |
| AAH-US | 12/07 | Enquête nutritionnelle anthropométrique, Zone de santé de Mobayi Mbongo, Province de l'Equateur, Résumé exécutif |
| AAH-US | 01/08 | Enquête nutritionnelle anthropométrique, Zone de santé de Fizi, Province du Sud Kivu |
| AAH-US | 01/08 | Enquête nutritionnelle anthropométrique, Zone de santé de Lomela, Province du Kasai Oriental, Résumé exécutif |
| COOPI | 11/07 | Rapport d'enquête nutritionnelle territoriale, Territoire de Mahagi, Zones de santé de Mahagi, Nyarambe, Angumu, Logo, Rimba, Kambala, Aungba, District d'Ituri, Province Orientale |
| COOPI | 11/07 | Rapport enquête nutritionnelle: Anthropométrie et mortalité, La zone de santé de Binza, Territoire de Rutshuru, Province du Nord Kivu |
| IRC/Joint | 01/07 | Mortality in the Democratic Republic of Congo: An ongoing crisis |
| OCHA | 04/02/08 | Situation Report: Earthquake in Great Lakes Region |
| OCHA | 02/08 | Regional Humanitarian Update, Volume 2, Issue 2 |
| UNDAC | 22/02/08 | Democratic Republic of Congo Earthquake in the Great Lakes Region mission report |
| UNICEF | 04/03/08 | Information note: UNICEF mobilizes to tackle cholera epidemic in Katanga |

# Southern Africa

## Angola

| | | |
|---|---|---|
| ACH-S | 09/07 | Report of nutrition and mortality in Chipindo municipality, Huila Province |

# Asia

## Myanmar

| | | |
|---|---|---|
| ACF-F | 11/07 | Anthropometric nutrition and retrospective mortality survey, North Rakhine State, Maungdaw and Buthidaung Townships, Union of Myanmar |

## Pakistan

| | | |
|---|---|---|
| AAH-US | 09/07 | Washed away: A food security assessment of flood-affected populations in Kamber-Shahdadkot and Dadu districts, Sindh province |
| AAH-US | 11/07 | Nutritional assessment on flood-affected populations, Kamber-Shahdadkot and Dadu districts, Sindh province |

# Survey methodology

## The Greater Horn region

### Somalia

**Bossaso IDP camps, Bossaso district, Bari region, Puntland**

Epicentre/MSF-E carried out a standard two-stage 30-by-30 cluster sampled nutrition survey in the 19 IDP camps surrounding Bossaso in November 2007. A total of 924 children 6-59 months were included in the study. In addition to information collected on vaccination and mortality rates, several food security and demographic indicators were also included.

**Dinsor town, Dinsor district, Bay region**

MSF-CH carried out a standard two-stage 30-by-30 cluster sampled nutrition survey in November 2007. A total of 927 children 65-109.9cm were included in the study. Vaccination, mortality rates and food security and indicators were also surveyed.

### Sudan

**Renk county, Upper Nile State, South Sudan**

Two nutrition surveys were conducted by AAH-US in October 2007. The first, a two-stage 34-by-15 cluster survey, was conducted in the Renk county IDP camps and included a total of 622 children 6-59 months. The second, carried out among residents in the county, consisted of 33 clusters of 18 children each, for a total of 611 in the final analysis. The surveys also estimated measles vaccination and vitamin A distribution coverage, crude and under-five mortality rates and various food security and public health indicators.

**Tonj North county, Warrap State, South Sudan**

AAH-US performed a two-stage 37-by-20 cluster sampling methodology nutrition survey in 5 of the 10 payams of Tonj North county. In all, 745 children between the ages of 6-59 months were included in the study. Other data collected for the survey included estimates of measles vaccination and vitamin A distribution coverage, crude and under-five mortality rates and various food security and public health indicators.

## West Africa

### Mali

**Gadougou communes, I and II, Kayes region, Cercle Kita**

A two-stage 37-by-20 cluster sampling methodology nutrition survey was completed by ACH-S in August 2007. 783 children 6-59 months were included in the sample. The survey also estimated measles vaccination, vitamin A distribution coverage, and various public health and food security indicators. Retrospective mortality rates were calculated for the 105 days prior to the survey.

### Mauritania

**Gorgol and Guidimakha regions**

ACH-S/Joint carried out a two-stage 36-by24 cluster sampled nutrition survey in September 2007, measuring a total of 880 children between the ages of 6-59 months. The survey also estimated measles vaccination, vitamin A distribution coverage, retrospective mortality rates and various public health and food security indicators.

### Niger

**Whole country and regions**

A country wide nutrition survey was conducted by UNICEF, GoN and partners, using cluster sampling methodology, stratified by region and by milieu (rural vs. urban). The anthropometric survey was carried out in Oct/Nov 2007 and included a total of 6,932 children between the ages of 6-59 months. The survey further estimated crude and under-five mortality rates and 8055 children 6-59 months were included in the sample. Measles vaccination and Vitamin A distribution coverage, as well as infant and child feeding practices, were also measured.

**Dakoro department, Maradi region**

The survey was conducted by MSF-B in November 2007. A two-stage cluster sampling methodology was used to measure 920 children between 65-110 cm. The survey also estimated measles vaccination and crude and under-five mortality rates.

**Mayahi department, Maradi region**

The surveys were conducted by ACH-S in September 2007 and January 2008. A two-stage cluster sampling methodology was used to measure 987 children between 65-110 cm in September 2007 and 733 children in January 2008. The surveys also estimated measles vaccination and crude and under-five mortality rates.

**Abalak department, Tahoua region**

The survey was conducted by ACH-S in November 2007. A two-stage cluster sampling methodology was used to measure 558 children between 65-110. The survey also estimated measles vaccination and crude and under-five mortality rates.

#### Keita department, Tahoua region
The survey was conducted by ACH-S in November 2007. A two-stage cluster sampling methodology was used to measure 574 children between 65-110. The survey also estimated measles vaccination and crude and under-five mortality rates.

## Central Africa
### Chad
#### Am Timan city, Salamat region
A two-stage 30-by-30 cluster-sampled nutrition survey was conducted by Epicentre/MSFE in October 2007. The inclusion criteria of this survey was based on height rather than age, and as such, children measuring 65cm-109.9 cm were selected. In total, 985 children were included in the analysis. The survey also estimated measles vaccination coverage and crude and under-five mortality rates. In addition, a rapid assessment (mortality, morbidity and basic food security) was done among 182 families residing in the Ideter IDP camp. Anthropometric measurements were collected for the 188 children in the sample.

#### Am Dam prefecture, Ouaddai region
A two-stage cluster-sampled nutrition survey was conducted by Epicentre/MSF-OCBA in October 2007. A total of 956 children measuring 65cm and 109.9 cm were included in the sample. The survey also estimated measles vaccination and retrospective mortality rates over 6 months prior to the survey. A rapid assessment (mortality, morbidity and measles vaccination) was also done among 180 families residing in the Am Sieb IDP camp. Anthropometric measurements were collected for the 191 children in the sample.

#### Dogdoré village and IDP camps, Dar Sila, East Chad
ACF-F carried out a two-stage 30-by-17 cluster sampling methodology nutrition survey in November 2007. In total, 509 children 6-59 months were included in the anthropometric survey. Measles vaccination coverage, crude and under-five mortality rates, as well as various public health and food security indicators were also estimated.

### Democratic Republic of Congo
#### Mahagi territory, Ituri district, Orientale province
The survey was conducted by COOPI in November 2007. A three-stage 45-by-26 cluster sampling methodology was used to measure 1170 children between 6-59 months. The survey also estimated measles vaccination and vitamin A distribution coverage, retrospective mortality rates over 6 months
prior to the survey and health structure utilization.

#### Binza health zone, Rutshuru territory, North Kivu province
COOPI conducted a second nutrition survey, this time using a standard 30-by-30 cluster methodology. A total of 934 children 6-59 months were included in the final analysis. Information was also collected on measles vaccination and vitamin A distribution coverage, crude and under-five mortality rates, and various public health and infant and child feeding practice indicators.

#### Kajiji health zone, Bandundu province
The survey was conducted by AAH-US in November 2007. A two-stage 30-by-32 cluster sampling methodology was used to measure 951 children between 6-59 months. The survey also estimated measles vaccination, vitamin A distribution coverage and retrospective mortality rates.

#### Dungu health zone, Orientale province
A random sampled 30-by-30 cluster survey was performed by AAH-US in December 2007. Data collected included anthropometry on 951 children 6-59 months, as well as measles vaccination and Vitamin A supplementation coverage, and crude and under-five mortality rates.

#### Mobayi Mbongo health zone, Equateur province
A standard 30-by-30 cluster sampled nutrition survey was carried out by AAH-US in December 2007. A total of 946 children 6-59 months were included in the survey, which included measles vaccination, Vitamin A distribution coverage and retrospective mortality rates in the 3 months prior to each survey.

#### South Kivu province
AAH-US completed four standard 30-by-30 cluster sampled nutrition surveys in the health zones of Uvira, Lemera, Ruzizi and Fizi between November 2007 and January 2008. Children ages 6-59 months were selected for inclusion and final samples sizes were 953, 957, 958 and 975. Information was also collected on measles vaccination and Vitamin A distribution coverage and well as retrospective mortality rates in the 3 months prior to each survey.

#### Lomela health zone, Kasai Oriental province

AAH-US carried out a two-stage 30-by-30 cluster sampling methodology nutrition survey in January 2008. In total, 939 children 6-59 months were included. The survey also measured measles vaccination coverage, Vitamin A distribution coverage and crude and under-five mortality rates.

#### Whole country

IRC conducted a nationwide mortality survey, its fifth since 2000, covering the period from January 2006 to April 2007. The study employed a three-stage cluster sampling methodology, surveying 14,000 households in 35 health zones (20 clusters of 20 households per health zone). All 11 provinces were represented in the survey. Results were stratified along the 2001 military frontline: West (government side) and East (rebel side).

## Southern Africa

### Angola

#### Chipindo municipality, Huila province

ACH-S conducted a 3-stage cluster sampled nutrition survey of 870 children 6-59 months in September 2007. The survey also estimated vitamin A distribution coverage and retrospective mortality rates.

## Asia

### Myanmar

#### Maungdaw and Buthidaung townships, Northern Rahkine State

This nutrition survey, a two-stage 30-by25 random cluster sampled survey, was carried out by ACF-F in October 2007. A total of 761 children aged 6-59 months were included in the sample. The survey also estimated measles vaccination and vitamin A distribution coverage, crude and under-five mortality rates, and various public health and infant and child feeding practice indicators.

### Pakistan

#### Kamber-Shahdadkot and Dadu districts, Sindh province

AAH-US carried out two cluster sampled nutrition surveys in November 2007. The survey samples consisted of 778 and 790 children 6-59 months respectively. In addition to anthropometric measures, the surveys also estimated measles vaccination as well as retrospective mortality rates.

# Abbreviations and acronyms

| | |
|---|---|
| AAH-US | Action Against Hunger USA |
| ACF-F | Action Contre la Faim France |
| ACH-S | Action Contra El Hambre Spain |
| CMR | Crude Mortality Rate |
| < 5 MR | Under-five Mortality Rate |
| ENCU | Emergency Nutrition Coordination Unit |
| Epi | Epicentre |
| FEWS | Famine Early Warning System |
| FSAU | Food Security Analysis Unit for Somalia |
| INS | Institut National de Statistique |
| IRC | International Rescue Committee |
| IRIN | International Regional Information Network |
| MSF-B | Médecins sans frontières - Belgique |
| MSF-CH | Médecins sans Frontières - Switzerland |
| MSF-S | Médecins sans frontières - Spain |
| MUAC | Mid-upper arm circumference |
| OCHA | Office for the Co-ordination of Humanitarian Assistance |
| UNDAC | United Nations Disaster Assessment and Coordination |
| UNICEF | United Nations International Children's Emergency Fund |
| UNSC | United Nations Security Council |
| USAID | US Agency for International Development |
| WFP | World Food Programme |
| WHO | World Health Organization |
| WV | World Vision |

# Results of surveys

| Survey Area | Date | Population | Estimated Population Number | Survey Conducted by | Acute Malnutrition* (%) (95% CI)[§] | | Severe Acute Malnutrition** (%) (95% CI)[§] | | Oedema (%) | MUAC[#] (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| **GREATER HORN OF AFRICA** | | | | | | | | | | |
| **ETHIOPIA** | | | | | | | | | | |
| Enset Livelihood zone, Dale, Wonsho and Aleta Wondo woredas, SNNPR | Jul-07 | Resident | 133,156 | ACF-F[1] | 13.7 | 10.2-17.1 | 2.3 | 1.0-3.6 | 1.0 | - |
| Sankura woreda, Silte zone, SNNPR | Aug-07 | Resident | 94,907 | SC-UK/ Joint[1] | 3.0 | 1.8-4.1 | 0.3 | 0.1-0.8 | 0.2 | - |
| Dillo and Megado settlements, Dire woreda, Borena zone, Oromia region | July-07 | Resident | 1,239 | GOAL[1] | 13.5 | Exhaustive | 0.0 | - | 0.0 | MUAC < 12.5 cm : 3.2 |
| Daru Lebu woreda, West Hararge zone, Oromia region | Aug-07 | Resident | 106,610 | GOAL[1] | 8.6 | 6.1-11.2 | 1.0 | 0.3-1.6 | 0.3 | - |
| **SOMALIA** | | | | | | | | | | |
| **Bakool region** | | | | | | | | | | |
| Huddur district | Nov-07 | Resident | - | FSAU/ Joint[2] | 11.8 | 9.0-14.7 | 1.3 | 0.4-2.2 | - | - |
| Agropastoral population, Rabdure and Tieglow districts | Nov-07 | Resident | - | FSAU/ Joint[2] | 17.4 | 11.3-23.5 | 3.0 | 0.5-5.9 | - | - |
| **Juba/Gedo regions** | | | | | | | | | | |
| Riverine livelihood zone | Dec-07 | Resident | - | FSAU/ Joint[2] | 13.7 | 10.0-17.3 | 4.4 | 2.5-6.4 | 2.6 | - |
| Agropastoral livelihood zone | Dec-07 | Resident | - | FSAU/ Joint[2] | 14.7 | 10.9-18.5 | 2.6 | 1.4-3.9 | 1.3 | - |
| Pastoral livelihood zone | Dec-07 | Resident | - | FSAU/ Joint[2] | 14.1 | 11.3-16.9 | 2.2 | 1.3-3.2 | 1.2 | - |
| **Hiran region** | | | | | | | | | | |
| Riverine livelihood zone | Nov-07 | Resident | - | FSAU/ Joint[2] | 17.5 | 14.5-20.4 | 2.5 | 1.5-3.6 | - | - |
| Agropastoral livelihood zone | Nov-07 | Resident | - | FSAU/ Joint[2] | 14.2 | 11.4-17.0 | 2.9 | 1.7-4.2 | - | - |
| **Bay Region** | | | | | | | | | | |
| Agropastoral population | Nov-07 | Resident/ Displaced | - | FSAU/ Joint[2] | 19.3 | 15.9-22.8 | 2.1 | 0.8-3.6 | - | - |
| Dinsor town, Dinsor district | Nov-07 | Resident | 15,000 | MSF-CH | 17.2[2] | 13.9-21.0 | 1.8[2] | 0.8-3.8 | - | MUAC < 11cm: 0.6 MUAC <12.5cm: 4.8 |
| **Bari region** | | | | | | | | | | |
| Bossasso IDP camps | Dec-07 | Displaced | 21,486 | Epi/MSF-S | 23.3 *27.2[3]* | 18.9-27.6 *24.3-30.2* | 4.9 *9.4[3]* | 3.5-6.2 *7.4-11.3* | 1.2 | MUAC < 11cm: 2.7 MUAC <12.5cm: 13.5 |
| **Galguduud region** | | | | | | | | | | |
| Dusa-Mareb | Nov-07 | Resident/ Displaced | - | ACF-F[2] | 12.4 | 10.1-14.6 | 1.3 | 0.4-2.1 | - | - |

*Acute malnutrition (children aged 6-59 months): weight-height < - 2 Z-scores and/or oedema
** Severe acute malnutrition (children aged 6-59 months): weight-height < - 3 Z-scores and/or oedema
[§]95% Confidence Interval; not mentioned if not available from the survey report
[#] Mid Upper Arm Circumference
[1]From ENCU quarterly bulletin (ENCU, 30/09/07). The methodology is in accordance with the ENCU specifications for nutritional surveys, which are in line with international standards.[1]From FSAU Nutrition Update
[2]From FSAU Nutrition Update
[3]According to WHO 2006 Child Growth Standards (http://www.who.int/childgrowth/en/)

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| Measles immunisation coverage (%)[#] | | Assessment of micronutrient deficiencies | Vitamin A distribution coverage, within the past 6 months | Women's anthropometric status (%) | Crude Mortality (/10,000/day) (95% CI)[§] | | Under 5 Mortality (/10,000/day) (95% CI)[§] | |
|---|---|---|---|---|---|---|---|---|
| Proved by card | Card + history | | | | | | | |
| 13.5 | 79.3 | - | 73.2 | - | 0.2 | 0.04-0.36 | 0.45 | 0.0-0.93 |
| 1.4 | 66.6 | - | 82.7 | - | 0.23 | 0.09-0.37 | 0.46 | 0.0-0.97 |
| 10.4 | 65.9 | - | 90.3 | - | 0.54 | - | 1.56 | - |
| 7.4 | 45.5 | - | 66.9 | - | 0.14 | - | 0.23 | - |
| | | | | | | | | |
| - | 45.2 | - | 44.0 | - | 0.57 | 0.19-0.94 | 1.0 | 0.15-1.86 |
| - | 31.3 | - | 41.1 | - | 1.0 | 0.03-1.71 | 1.43 | 0.41-2.46 |
| | | | | | | | | |
| - | - | - | - | - | 0.72 | - | 1.74 | - |
| - | - | - | - | - | 0.8 | 0.45-1.16 | 1.13 | 0.49-1.78 |
| - | - | - | - | - | 0.93 | 0.54-1.31 | 1.76 | 0.62-2.90 |
| | | | | | | | | |
| - | 53.0 | - | 69.2 | - | - | - | - | - |
| - | 39.9 | - | 54.1 | - | - | - | - | - |
| | | | | | | | | |
| - | 51.0 | - | 55.0 | - | 0.93 | 0.62-1.24 | 1.2 | 0.63-1.76 |
| 35.5 | 83.7 | - | - | - | 0.6 | 0.5-1.0 | 0.7 | 0.4-1.6 |
| | | | | | | | | |
| 16.8 | 46.6 | - | - | - | 0.76 | 0.60-1.0 | 1.82 | 1.12-2.70 |
| | | | | | | | | |
| - | - | - | - | - | 0.95 | - | 1.93 | - |

[#] Measles vaccination coverage for children aged 9-59 months

| Survey Area | Date | Population | Estimated Population Number | Survey Conducted by | Acute Malnutrition* (%) (95% CI)[§] | Severe Acute Malnutrition** (%) (95% CI)[§] | Oedema (%) | MUAC[#] (%) |
|---|---|---|---|---|---|---|---|---|
| **SUDAN** | | | | | | | | |
| **West Darfur** | | | | | | | | |
| Beida locality | Jun-07 | Resident/ Displaced | - | Tearfund/ Joint[1] | 19.5 16.5-23.0 | 3.7 2.4-5.6 | - | - |
| Azirni, Sanidadi and Um Tajouk localities | Sept-07 | Resident/ Displaced | - | World Relief/ Joint[1] | 15.7 12.9-17.7 | 3.6 2.4-4.8 | - | - |
| **Warrap State** | | | | | | | | |
| Awul, Warrap, Man Alor, Pagol and Kiirik payams, Tonj North County | Dec-07 | Resident | 77,690 | AAH-US/ WV | 6.2 4.3-8.1<br>*6.2[2] 4.4-7.9* | 0.7 0.0-1.3<br>*0.8[2] 0.0-1.6* | - | MUAC < 11.0 cm: 0.1<br>MUAC <12.0 cm: 1.6 |
| **Upper Nile State** | | | | | | | | |
| Renk county IDP population | Oct-07 | Displaced | 7,414 | AAH-US | 17.7 13.9-21.5<br>*18.2[2] 14.5-21.9* | 2.9 1.6-4.2<br>*4.2[2] 2.5-5.9* | 0.8 | MUAC < 11.0 cm: 1.4<br>MUAC <12.5 cm: 12.0 |
| Renk county resident population | Oct-07 | Resident | 67,182 | AAH-US | 13.9 10.9-17.0<br>*15.2[2] 12.5-18.0* | 0.7 0.1-1.2<br>*1.8[2] 0.8-2.8* | 0.0 | MUAC < 11.0 cm: 0.5<br>MUAC <12.0 cm: 8.0 |
| **WEST AFRICA** | | | | | | | | |
| **Mali** | | | | | | | | |
| Gadougou I and II communes (Cercle Kita), Kayes Region | Aug-07 | Resident | 25,835 | ACH-S | 10.3 7.7-13.0 | 1.4 0.5-2.3 | 0.1 | MUAC < 11.0 cm: 0.6<br>MUAC <12.0 cm: 3.3 |
| **Mauritania** | | | | | | | | |
| Gorgol and Guidimakha regions | Sept-07 | Resident | 96,357 | ACH-S/ Joint | 15.1 12.8-17.4 | 1.1 0.3-2.0 | 0.0 | MUAC < 11.0 cm: 0.2<br>MUAC <12.5 cm: 5.4 |
| **Niger** | | | | | | | | |
| Whole country | Nov-07 | Resident | - | INS-N/ Joint | 11.0 10.0-12.1<br>*12.3[2] 11.3-13.3* | 0.8 0.5-1.2<br>*2.2[2] 1.8-2.8* | - | - |
| Diffa Region | Nov-07 | Resident | - | INS-N/ Joint | 11.4 9.0-14.4<br>*12.9[2] 9.8-16.8* | 0.6 0.2-1.7<br>*2.5[2] 1.6-4.1* | - | - |
| Dosso Region | Nov-07 | Resident | - | INS-N/ Joint | 12.1 9.1-15.9<br>*10.6[2] 8.4-13.4* | 0.9 0.3-2.3<br>*3.1[2] 1.7-5.4* | - | - |
| Maradi Region | Nov-07 | Resident | - | INS-N/ Joint | 10.7 8.5-13.4<br>*12.2[2] 10.3-14.5* | 0.8 0.4-1.5<br>*1.4[2] 0.7-2.6* | - | - |
| Tahoua Region | Nov-07 | Resident | - | INS-N/ Joint | 13.1 11.4-15.0<br>*14.2[2] 11.9-17.0* | 0.4 0.2-1.1<br>*1.7[2] 0.8-3.2* | - | - |
| Tillaberi Region | Nov-07 | Resident | - | INS-N/ Joint | 7.9 6.5-9.6<br>*8.9[2] 7.0-11.3* | 1.0 0.4-2.4<br>*1.1[2] 0.5-2.3* | - | - |
| Zinder Region | Nov-07 | Resident | - | INS-N/ Joint | 11.7 9.6-14.2<br>*13.9[2] 11.5-16.6* | 1.0 0.3-3.0<br>*3.6[2] 2.5-5.0* | - | - |
| Niamey Region | Nov-07 | Resident | - | INS-N/ Joint | 9.9 6.9-14.0<br>*12.2[2] 9.3-15.4* | 0.9 0.2-3.1<br>*2.5[2] 1.3-4.5* | - | - |

*Acute malnutrition (children aged 6-59 months): weight-height < - 2 Z-scores and/or oedema (NCHS/WHO references)
** Severe acute malnutrition (children aged 6-59 months): weight-height < - 3 Z-scores and/or oedema (NCHS/WHO references)
[§]95% Confidence Interval; not mentioned if not available from the survey report
[#] Mid Upper Arm Circumference
[1] From UNICEF Darfur Nutrition Update
[2]According to WHO 2006 Child Growth Standards (http://www.who.int/childgrowth/en/)

Continued...

| Measles immunisation coverage (%)[#] | | Assessment of micronutrient deficiencies | Vitamin A distribution coverage, within the past 6 months | Women's anthropometric status (%) | Crude Mortality (/10,000/day) (95% CI)[§] | | Under 5 Mortality (/10,000/day) (95% CI)[§] | |
|---|---|---|---|---|---|---|---|---|
| Proved by card | Card + history | | | | | | | |
| | | | | | | | | |
| - | - | - | - | - | 0.46 | - | 0.76 | - |
| - | 87.0 | - | 81.0 | - | 0.31 | - | 0.51 | - |
| | | | | | | | | |
| 10.0 | 62.5 | - | - | - | 0.17 | 0.06-0.28 | 0.23 | 0.0-0.53 |
| | | | | | | | | |
| 32.9 | 84.6 | - | - | - | 1.0 | 0.56-1.43 | 2.29 | 1.14-3.44 |
| 55.7 | 91.9 | - | - | - | 0.19 | 0.02-0.36 | 0.53 | 0.0-1.23 |
| | | | | | | | | |
| 12.6 | 39.8 | - | - | - | 0.41 | 0.19-0.63 | 1.16 | 0.53-1.79 |
| | | | | | | | | |
| 23.9 | 76.1 | - | 64.2 | - | 0.72 | 0.34-1.10 | 1.69 | 0.47-2.91 |
| | | | | | | | | |
| 19.8 | 53.3 | - | 55.0 | - | 0.62 | - | 1.81 | - |
| 31.8 | 50.5 | - | 39.6 | - | 0.43 | - | 1.06 | - |
| 20.2 | 52.4 | - | 66.4 | - | 0.87 | - | 2.57 | - |
| 11.7 | 64.7 | - | 60.3 | - | 0.33 | - | 0.83 | - |
| 22.9 | 50.7 | - | 58.0 | - | 0.63 | - | 1.62 | - |
| 20.2 | 44.9 | - | 32.5 | - | 0.86 | - | 3.14 | - |
| 11.5 | 45.2 | - | 55.4 | - | 1.04 | - | 3.55 | - |
| 54.7 | 70.2 | - | 60.9 | - | 0.49 | - | 1.57 | - |

[#] Measles vaccination coverage for children aged 9-59 months

| Survey Area | Date | Population | Estimated Population Number | Survey Conducted by | Acute Malnutrition* (%) (95% CI)[§] | | Severe Acute Malnutrition** (%) (95% CI)[§] | | Oedema (%) | MUAC[#] (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| Dakoro health district, Maradi region | Nov-07 | Resident | 159,274 | MSF-B | 8.6[1]<br>*9.2*[2] | 6.4-10.8<br>*7.3-11.2* | 0.4[1]<br>*1.1*[2] | 0.0-0.8<br>*0.4-1.8* | 0.0 | MUAC < 11.0 cm: 0.2<br>MUAC <12.5 cm: 2.8 |
| Mayahi department, Maradi region | Sep-07 | Resident | 500,000 | ACH-S | 14.8 | 11.7-17.8 | 1.1 | 0.3-2.0 | 0.1 | MUAC < 11.0 cm: 0.9<br>MUAC <12.5 cm: 13.5 |
| Mayahi department, Maradi region | Jan-08 | Resident | 500,000 | ACH-S | 9.1 | 6.9-11.2 | 0.4 | 0.0-0.9 | 0.1 | MUAC < 11.0 cm: 0.6<br>MUAC <12.5 cm: 15.9 |
| Keita department, Tahoua region | Nov-07 | Resident | 261,565 | ACH-S | 14.1 | 10.0-18.2 | 0.7 | 0.1-1.5 | 0 | MUAC < 11.0 cm: 0.9<br>MUAC <12.5 cm: 8.4 |
| Abalak department, Tahoua region | Nov-07 | Resident | 101,715 | ACH-S | 14.3 | 10.4-18.3 | 1.1 | 0.1-2.1 | 0 | MUAC < 11.0 cm: 0.6<br>MUAC <12.5 cm: 8.6 |
| **CENTRAL AFRICA** | | | | | | | | | | |
| **CHAD** | | | | | | | | | | |
| Am Dam prefecture, Djourf Al Ahmar Department, Ouaddai Region | Oct-07 | Resident/ Displaced | 16,700 | Epi/MSF-S | 14.4[1]<br>*16.4*[2] | 10.5-18.4<br>*14.0-18.8* | 1.6[1]<br>*3.2*[2] | 0.4-2.7<br>*2.1-4.4* | 0.1 | MUAC < 11.0 cm: 0.2<br>MUAC <12.5 cm: 2.8 |
| Am Timam city, Am Timan department , Salamat region | Oct-07 | Resident | 17,000 | Epi/MSF-S | 8.9[1]<br>*10.1*[2] | 6.9-11.0<br>*8.1-12.2* | 1.0[1]<br>*2.6*[2] | 0.2-1.8<br>*1.5-3.7* | 0.4 | MUAC < 11.1 cm: 0.6<br>MUAC <12.5 cm: 4.7 |
| Dogdore village and IDP camps, Dar Sila, Ouaddai region | Nov-07 | Resident/ Displaced | 29,500 | ACF-F | 8.1 | 5.7-10.4 | 0.4 | 0.0-0.9 | 0.2 | - |
| **DRC** | | | | | | | | | | |
| **SOUTH KIVU** | | | | | | | | | | |
| Uvira health zone, Uvira territory | Nov-07 | Resident | 217,653 | AAH-US | 3.5<br>*4.1*[2] | 2.2-4.8<br>*2.7-5.5* | 0.3<br>*1.2*[2] | 0.0-0.7<br>*0.5-1.8* | 0.0 | MUAC < 11.0 cm: 0.0<br>MUAC <12.0 cm: 0.6 |
| Lemera health zone, Uvira territory | Nov-07 | Resident | 127,318 | AAH-US | 2.3<br>*3.3*[2] | 1.3-3.3<br>*1.9-4.8* | 0.2<br>*0.4*[2] | 0.0-0.5<br>*0.0-0.8* | - | MUAC < 11.0 cm: 0.0<br>MUAC <12.0 cm: 0.0 |
| Ruzizi health zone, Uvira territory | Nov-07 | Resident | 129,696 | AAH-US | 4.6<br>*5.7*[2] | 2.3-6.9<br>*3.6-7.9* | 0.5<br>*1.3*[2] | 0.0-1.0<br>*0.5-2.0* | 0.1 | MUAC < 11.0 cm: 0.0<br>MUAC <12.0 cm: 0.3 |
| Fizi health zone, Fizi territory | Jan-08 | Resident | 211,214 | AAH-US | 0.9<br>*1.9*[2] | 0.5-1.5<br>*1.2-2.7* | 0.0<br>*0.0*[2] | 0.0-0.2<br>*0.0-0.2* | 0.0 | MUAC < 11.0 cm: 0.0<br>MUAC <12.0 cm: 0.0 |
| **NORTH KIVU** | | | | | | | | | | |
| Binza health zone, Rutshuru territory | Nov-07 | Resident | 126,871 | COOPI | 10.5 | 7.9-13.0 | 4.4 | 2.3-5.5 | 3.4 | MUAC < 11.0 cm: 0.6<br>MUAC <12.5 cm: 7.4 |

*Acute malnutrition (children aged 6-59 months): weight-height < - 2 Z-scores and/or oedema (NCHS/WHO references)
** Severe acute malnutrition (children aged 6-59 months): weight-height < - 3 Z-scores and/or oedema (NCHS/WHO references)
[§]95% Confidence Interval; not mentioned if not available from the survey report
[#] Mid Upper Arm Circumference
[1] Survey results based on children 65cm-110cm and may include some children >5 years
[2] According to WHO 2006 Child Growth Standards (http://www.who.int/childgrowth/en/)

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| Measles immunisation coverage (%)[#] | | Assessment of micronutrient deficiencies | Vitamin A distribution coverage, within the past 6 months | Women's anthropometric status (%) | Crude Mortality (/10,000/day) (95% CI)[§] | | Under 5 Mortality (/10,000/day) (95% CI)[§] | |
|---|---|---|---|---|---|---|---|---|
| Proved by card | Card + history | | | | | | | |
| 22.2 | 45.9 | - | - | - | 0.2 | 0.1-0.3 | 0.6 | 0.4-0.8 |
| 11.9 | 48.9 | - | - | - | 0.27 | 0.12-0.41 | 0.96 | 0.42-1.49 |
| 74.8 | 82.6 | - | - | - | 0.26 | 0.09-0.43 | 0.63 | 0.01-1.27 |
| 18.9 | 59.3 | - | - | - | 0.65 | - | 2.28 | 1.02-3.54 |
| 14.9 | 41.1 | - | - | - | 0.54 | 0.29-0.79 | 1.58 | 0.60-2.56 |
| | | | | | | | | |
| 3.4[3] | 18.1[3] | - | - | - | 0.27 | 0.18-0.40 | 0.52 | 0.26-0.89 |
| 8.0[3] | 40.0[3] | - | - | - | 0.34 | 0.21-0.54 | 0.73 | 0.36-1.42 |
| 77.1 | 90.8 | - | - | - | 0.89 | 0.54-1.24 | 2.04 | 1.24-2.83 |
| | | | | | | | | |
| 16.6 | 85.6 | - | 85.2 | - | 0.2 | 0.03-0.38 | 0.43 | 0.0-0.91 |
| 40.2 | 92.1 | - | 90.6 | - | 0.58 | 0.27-0.89 | 1.34 | 0.25-2.43 |
| 40.8 | 87.8 | - | 86.6 | - | 0.59 | 0.35-0.84 | 0.69 | 0.93-2.44 |
| 63.4 | 92.1 | - | 93.0 | - | 0.83 | 0.55-1.11 | 0.52 | 0.11-0.92 |
| | | | | | | | | |
| 0.6 | 81.1 | - | 90.8 | - | 0.53 | 0.21-0.84 | 1.21 | 0.36-2.06 |

[#] Measles vaccination coverage for children aged 9-59 months
[3] Measles vaccination coverage for children 65 cm-110cm

| Survey Area | Date | Population | Estimated Population Number | Survey Conducted by | Acute Malnutrition* (%) (95% CI)§ | | Severe Acute Malnutrition** (%) (95% CI)§ | | Oedema (%) | MUAC# (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bandundu** | | | | | | | | | | |
| Kajiji health zone | Nov-07 | Resident | 117,828 | AAH-US | 7.0<br>*7.4¹* | 5.6-8.5<br>*5.7-9.0* | 0.7<br>*1.5¹* | 0.2-1.2<br>*0.8-2.2* | - | - |
| **Orientale** | | | | | | | | | | |
| Mahagi, Nyarambe, Angumu, Logo, Rimba, Kambala and Aungba health zones, Ituri district | Nov-07 | Resident | 1,008,826 | COOPI | 6.3 | 4.2-8.3 | 2.1 | 0.7-3.5 | 1.7 | MUAC < 11.0 cm: 0.6<br>MUAC <12.5 cm: 6.2 |
| Dungu health zone, Haut-Uele district | Dec-07 | Resident | 95,973 | AAH-US | 3.7<br>*3.6¹* | 2.6-4.7<br>*2.5-4.6* | 0.8<br>*1.3¹* | 0.3-1.4<br>*0.5-2.0* | 0.7 | MUAC < 11.0 cm: 0.7<br>MUAC <12.0 cm: 3.4 |
| **Kasai Oriental** | | | | | | | | | | |
| Lomela health zone | Jan-08 | Resident | 90,257 | AAH-US | 14.0<br>*13.8¹* | 10.7-17.2<br>*10.9-16.8* | 3.3<br>*4.9¹* | 1.6-5.0<br>*3.2-6.6* | - | MUAC < 11.0 cm: 7.4<br>MUAC <12.0 cm: 12.3 |
| **Equateur** | | | | | | | | | | |
| Mobayi Mbongo health zone | Dec-07 | Resident | 84,825 | AAH-US | 4.4<br>*3.9¹* | 3.0-5.9<br>2.6-5.2 | 0.4<br>*0.5¹* | 0.0-0.8<br>*0.1-1.0* | - | MUAC < 11.0 cm: 0.3<br>MUAC <12.0 cm: 1.2 |
| **Southern Africa**<br>**Angola** | | | | | | | | | | |
| Chipindo municipality, Huila province | Sept-07 | Resident/ Returnee | 70,100 | ACH-S | 6.4 | 4.6-8.3 | 0.8 | 0.3-1.3 | 0.2 | - |
| **Asia**<br>**Myanmar** | | | | | | | | | | |
| Maungdaw and Buthidaung townships, North Rakhine State | Oct-07 | Resident | 756,827 | ACF-F | 25.6<br>*24.8¹* | 19.7-31.5<br>*19.2-30.5* | 1.8<br>*4.6¹* | 0.6-3.0<br>2.5-6.7 | 0.0 | MUAC < 11.0 cm: 0.3<br>MUAC <12.0 cm: 5.7 |
| **Pakistan** | | | | | | | | | | |
| Kamber-Shahdadkot district, Sindh province | Nov-07 | Resident | 99,563 | AAH-US | 16.7<br>*18.7¹* | 12.9-20.5<br>*15.0-22.3* | 2.2<br>*4.1¹* | 1.2-3.2<br>*2.6-5.6* | 0.3 | MUAC < 11.0 cm: 0.4<br>MUAC <12.0 cm: 4.4 |
| Dadu district, Sindh province | Nov-07 | Resident | 90,725 | AAH-US | 15.6<br>*17.8¹* | 12.8-18.3<br>*14.8-20.9* | 0.9<br>*3.2¹* | 0.1-1.7<br>*1.9-4.5* | 0.3 | MUAC < 11.0 cm: 0.5<br>MUAC <12.0 cm: 5.5 |

*Acute malnutrition (children aged 6-59 months): weight-height < - 2 Z-scores and/or oedema (NCHS/WHO references)
** Severe acute malnutrition (children aged 6-59 months): weight-height < - 3 Z-scores and/or oedema (NCHS/WHO references)
§95% Confidence Interval; not mentioned if not available from the survey report
# Mid Upper Arm Circumference
¹According to WHO 2006 Child Growth Standards (http://www.who.int/childgrowth/en/)

Continued...

| Measles immunisation coverage (%)[#] | | Assessment of micronutrient deficiencies | Vitamin A distribution coverage, within the past 6 months | Women's anthropometric status (%) | Crude Mortality (/10,000/day) (95% CI)[§] | | Under 5 Mortality (/10,000/day) (95% CI)[§] | |
|---|---|---|---|---|---|---|---|---|
| Proved by card | Card + history | | | | | | | |
| 35.3 | 97.7 | - | 98.5 | - | 0.69 | 0.08-1.30 | 2.26 | 0.0-4.42 |
| 14.5 | 67.7 | - | 91.1 | - | 0.4 | 0.28-0.51 | 0.85 | 0.52-1.17 |
| 14.7 | 76.8 | - | 73.9 | - | 1.03 | 0.51-1.56 | 1.71 | 0.73-2.68 |
| 5.2 | 92.8 | - | 89.4 | - | 1.27 | 0.83-1.71 | 3.43 | 2.13-4.74 |
| 14.9 | 74.8 | - | 93.7 | - | 0.72 | 0.38-1.07 | 0.93 | 0.30-1.56 |
| | | | | | | | | |
| - | - | - | 73.0 | - | 0.71 | 0.34-1.08 | 2.04 | 0.85-3.22 |
| | | | | | | | | |
| 12.6 | 51.9 | - | 53.2 | BMI < 16.0: 12.5; BMI < 18.5: 52.9 | 0.34 | 0.15-0.53 | 1.36 | 0.31-2.41 |
| | | | | | | | | |
| 2.0 | 73.5 | - | - | - | 0.37 | 0.11-0.63 | 1.27 | 0.35-2.19 |
| 6.5 | 82.6 | - | - | - | 0.11 | 0.0-0.22 | 0.08 | 0.0-0.23 |

[#] Measles vaccination coverage for children aged 9-59 months

# Indicators and risk categories

The methodology and analysis of nutrition and mortality surveys are checked for compliance with internationally agreed standards (SMART, 2002; MSF, 2002; ACF, 2002).
Most of the surveys included in the Reports on Nutrition Information in Crisis Situations are random sampled surveys, which are representative of the population of the targeted area. The Reports may also include results of rapid nutrition assessments, which are not representative of the target population but rather give a rough idea of the nutrition situation. In that case, the limitations of this type of assessments are mentioned.
Most of the nutrition survey results included in the Reports target children between 6-59 months but may also include information on other age groups, if available.
Detailed information on the methodology of the surveys which have been reported on in each issue, is to be found at the end of the publication.

## Nutrition indicators in 6-59 month olds

Unless specified, the Reports on Nutrition Information in Crisis Situations use the following internationally agreed criteria:

. **Wasting**, defined as weigh-for-height index (w-h) < -2 Z-scores of the NCHS reference.
. **Severe wasting**, defined as weigh-for-height index < -3 Z-scores of the NCHS reference.
. **Oedematous malnutrition or kwashiorkor**, diagnosed as bilateral pitting oedema, usually on the upper surface of the feet. Oedematous malnutrition is always considered as severe malnutrition.
. **Acute malnutrition**, defined as the prevalence of wasting (w-h < -2 Z-scores) and/or oedema
. **Severe acute malnutrition**, defined as the prevalence of severe wasting (w-h < -3 Z-scores) and/or oedema.
. **Stunting** is usually not reported, but when it is, these definitions are used: stunting is defined as < - 2 Zscores height-for-age, severe stunting is defined < - 3 Zscores height-for-age.
. **Mid-Upper-Arm Circumference (MUAC)** As there is no international agreement on MUAC cut-offs, the results are reported according to the cut-offs used in the survey.
. **Micro-nutrient deficiencies**
Micro-nutrient deficiencies are reported when data are available.

## Nutrition indicators in adults

No international consensus on a definitive method or cut-off to assess adult under-nutrition has been reached (SCN, 2000). Different indicators, such as Body Mass Index (BMI, weight/height2), MUAC and oedema, as well as different cut-offs are used. When reporting on adult malnutrition, the Reports always mention indicators and cut-offs used by the agency providing the survey.

## Mortality rates

In emergency situations, crude mortality rates and under-five mortality rates are usually expressed as number of deaths/10,000 people/day.

## Interpretation of indicators

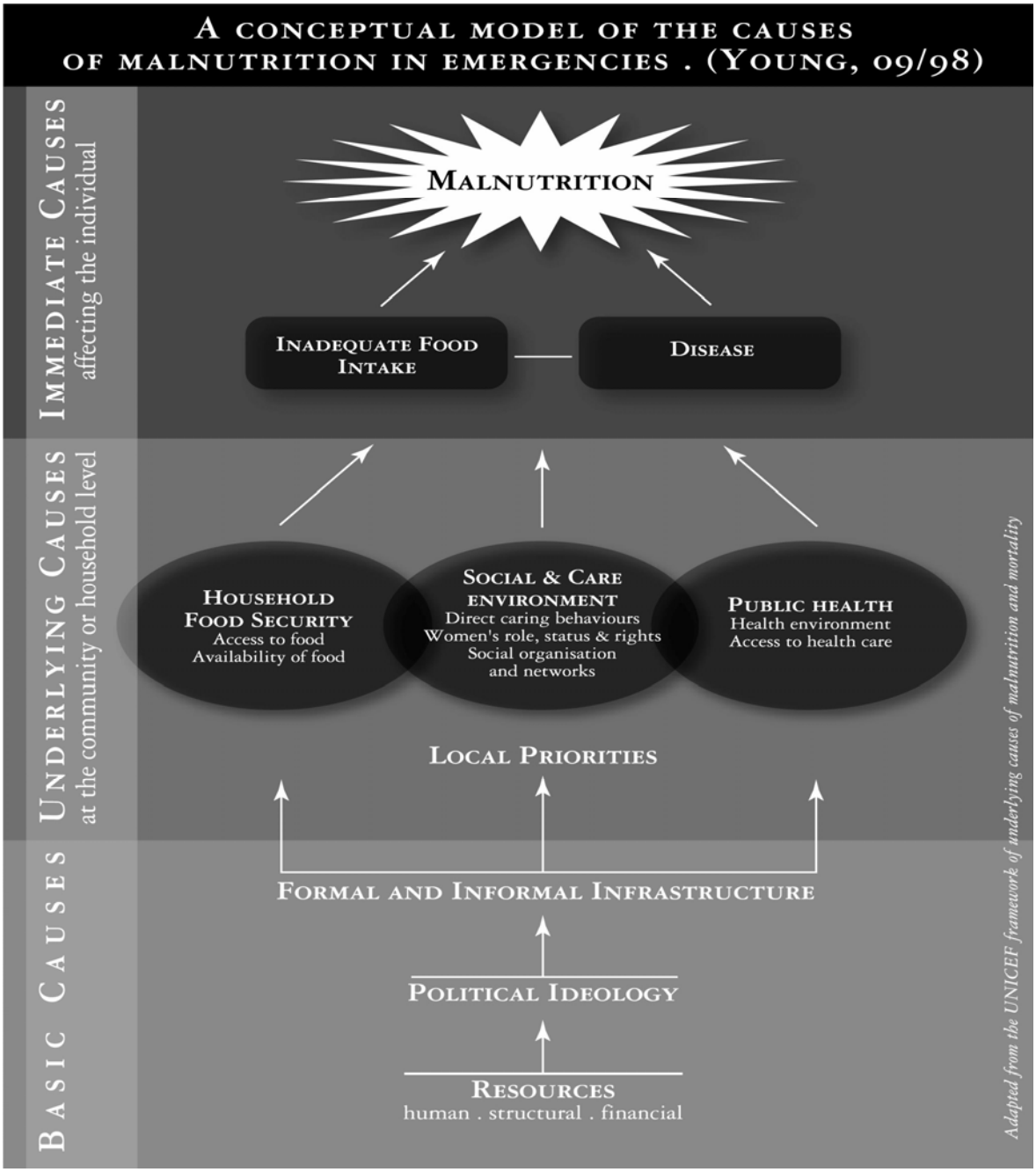
Prevalence of malnutrition and mortality rates are late indicators of a crisis. Low levels of malnutrition or mortality will not indicate if there is an impending crisis. Contextual analysis of health, hygiene, water availability, food security, and access to the populations, is key to interpret prevalence of malnutrition and mortality rates.
Thresholds have been proposed to guide interpretation of anthropometric and mortality results.
A prevalence of acute malnutrition between 5-8% indicates a worrying nutritional situation, and a prevalence greater than 10% corresponds to a serious nutrition situation (SCN, 1995). The Crude Mortality Rate and under-five mortality rate trigger levels for alert are set at 1/10,000/day and 2/10,000/day respectively. CMR and under-five mortality levels of 2/10,000/day and 4/10,000/day respectively indicate a severe situation (SCN, 1995).
Those thresholds have to be used with caution and in relation to contextual analysis. Trend analysis is also recommended to follow a situation: if nutrition and/or mortality indicators are deteriorating over time, even if not above threshold, this indicates a worsening situation.

## Classification of situations

In the Reports, situations are classed into five categories relating to risk and/or prevalence of malnutrition. The prevalence/risk is indirectly affected by both the underlying causes of malnutrition, relating to food, health and care, and the constraints limiting humanitarian response. These categories are summations of the causes of malnutrition and the humanitarian response:
• Populations in *category I* – the population is currently in a critical situation; they either have a *very high risk* of malnutrition or surveys have reported a very high prevalence of malnutrition and/or elevated mortality rates.
• Populations in *category II* are currently at *high risk* of becoming malnourished or have a high prevalence of malnutrition.
• Populations in *category III* are at *moderate risk* of malnutrition or have a moderately high prevalence of malnutrition; there maybe pockets of high malnutrition in a given area.
• Populations in *category IV* are *not* at an elevated nutritional risk.
• The risk of malnutrition among populations in *category V* is *not known*.

## Nutrition causal analysis

The Reports on Nutrition Information in Crisis Situations have a strong public nutrition focus, which assumes that nutritional status is a result of a variety of inter-related physiological, socio-economic and public health factors (see figure). As far as possible, nutrition situations are interpreted in line with potential underlying determinants of malnutrition.

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# NICS quarterly reports

The UN Standing Committee on Nutrition, which is the focal point for harmonizing nutrition policies in the UN system, issues these Reports on Nutrition Information in Crisis Situations with the intention of raising awareness and facilitating action. The Reports are designed to provide information over time on key outcome indicators from emergency- affected populations, play an advocacy role in bringing the plight of emergency affected populations to the attention of donors and humanitarian agencies, and to identify recurrent problems in international response capacity. The Reports on Nutrition Information in Crisis Situations are aimed to cover populations affected by a crisis, such as refugees, internally displaced populations and resident populations.

This system was started on the recommendation of the SCN's working group on Nutrition of Refugees and Displaced People, by the SCN in February 1993. Based on suggestions made by the working group and the results of a survey of the readers, the Reports on Nutrition Information in Crisis Situations are published every three months.

Information is obtained from a wide range of collaborating agencies, both UN and NGOs. The Reports on Nutrition Information in Crisis Situations are put together primarily from agency technical reports on nutrition, mortality rates, health and food security.

The Reports provide a brief summary on the background of a given situation, including who is involved, and what the general situation is. This is followed by details of the humanitarian situation, with a focus on public nutrition and mortality rates. The key point of the Reports is to interpret anthropometric data and to judge the various risks and threats to nutrition in both the long and short term.

This report is issued on the general responsibility of the Secretariat of the UN System/Standing Committee on Nutrition; the material it contains should not be regarded as necessarily endorsed by, or reflecting the official positions of the UNS/SCN and its UN member agencies. The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the UNS/SCN or its UN member agencies, concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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This report was compiled by Julie Debons of the UNS/SCN Secretariat
Design concept: Marie Arnaud Snakkers

The chairman of the UNS/SCN is Ann Veneman

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The SCN Secretariat and the NICS Coordinator extend most sincere thanks to all those individuals and agencies who have provided information and time for this issue, and hope to continue to develop the excellent collaboration which has been forged over the years.

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If you have information to contribute to forthcoming reports, or would like to request back issues of the report, please contact:

Claudine Prudhon, NICS Coordinator,
UNS/Standing Committee on Nutrition
20, avenue Appia, 1211 Geneva 27, SWITZERLAND
Tel: +(41-22) 791.04.56, Fax: +(41-22) 798.88.91,
Email: scn@who.int
Web: http://www.unsystem.org/scn

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Funding support is gratefully acknowledged from US Agency of International Development and UNHCR.

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ISSN 1564-376X