HelpAge International
age helps

Nutrition and baseline survey of older people in three refugee camps in Dadaab, October 2011

HelpAge International helps older people claim their rights, challenge discrimination and overcome poverty, so that they can lead dignified, secure, active and healthy lives.

Acknowledgements

Many thanks to the staff of the HelpAge International Africa Regional Development Centre in Kenya for their contributions to this survey and organisation of the trip in Dadaab. We are particularly grateful to the people who helped us to implement the survey in Dadaab: UNHCR (Jamal Sisai, Dr Ann Burton, Terry Njeri Theuri, Gloria Kisia, Melody Tondeur), the Lutheran World Federation (Liban Abdiramane and the camps managers), Handicap International (Jacob Kitiyo). Special thanks to Jessica Dinstl and Hleziwe Hara, who helped to supervise the survey in Dadaab, and to Jonathan Barden who organised the logistics. Thanks to the 15 surveyors who carried out the survey in Dadaab.

Most importantly, thanks to the 629 older women and men in Ifo, Dagahaley and Hagadera, who agreed to be interviewed, measured and weighed for this survey.

The donor for this project is the Global Emergency Fund (Age UK).

Nutrition and baseline survey of older people in three refugee camps in Dadaab, October 2011
Published by HelpAge International

HelpAge International
PO Box 70156
London WC1A 9GB, UK
hai@helpage.org
www.helpage.org

Written by Dr Pascale Fritsch, Emergency Health and Nutrition Adviser, HelpAge International with Mark Myatt, Consultant Epidemiologist, Brixton Health.

Front and back cover photos: Interviewing older people in Dadaab Camps, October 2011
Photos © HelpAge International

ISBN 1 872590 61 6

Contents

List of figures and tables

Abbreviations and acronyms

ACF	Action Contre la Faim
AIDS	Acquired Immunodeficiency Syndrome
AMA	arm muscle area
BMI	body mass index
CAMA	corrected arm muscle area
CI	confidence interval
CSB	corn soya blend
DDS	dietary diversity score
EPI	Expanded Programme on Immunization
GAM	global acute malnutrition
GIZ	Gesellschaft für Internationale Zusammenarbeit
HIV	Human Immunodeficiency Virus
IRC	International Rescue Committee
LWF	Lutheran World Federation
MAM	moderate acute malnutrition
MSF	Médecins Sans Frontières
MUAC	mid-upper arm circumference
NGO	non-government organisation
RR	risk ratio
SAM	severe acute malnutrition
SSR	sitting height to standing height ratio
TB	tuberculosis
UNHCR	United Nations High Commissioner for Refugees
WFP	World Food Programme

1 Executive summary

From 3–13 October 2011, HelpAge International conducted a nutrition survey among refugees aged 60 years and above in the three main camps of Dadaab (Ifo, Dagahaley and Hagadera), north-eastern Kenya.

The aims of the survey were:

- to estimate the prevalence of acute malnutrition in people aged 60 years and above
- to investigate the health and social status of women and men aged 60 and above.

The survey used two-stage cluster sampling. A total of 629 older people were interviewed, and their measurements taken (height, half arm span, and mid-upper arm circumference (MUAC)). Body mass index (BMI) was also calculated.

The team used questionnaires to collect data on eating habits, disabilities, social and health status, and access to water and sanitation.

Key findings

The prevalence of malnutrition found, using MUAC-based case definitions, were as follows:

Class	Case definition	Prevalence
Global acute malnutrition (GAM)	MUAC <210mm or oedema	**4.63%** (95% CI=3.3% ; 6.0%)
Moderate acute malnutrition (MAM)	185mm ≤ MUAC <210mm without oedema	**2.71%** (95% CI=1.5% ; 3.9%)
Severe acute malnutrition (SAM)	MUAC <185mm or oedema	**1.91%** (95% CI=0.9% ; 3.0%)

The survey found that between about 460 and 840 older people living in the Dadaab camps were in need of some form of nutritional support (using UNHCR 21/08/11 population estimates).

Risk factors associated with malnutrition were:

- not being included in the general food distribution
- having a low diet diversity
- having a low diversity/frequency diet (ie, eating less than three different food items and less than two meals per day).

Recommendations

The prevalence of malnutrition indicates that aid agencies supporting refugees should be targeting older people as a specific vulnerable group. Based on the results of the survey, we recommend that:

- malnourished older people should be identified in order to receive the appropriate treatment
- older people need access to the general food ration distribution
- older people need a more regular and more diverse food intake
- community-based services targeting older people should be developed in the camps
- thresholds used for screening older people for malnutrition should be revised to be more sensitive to their nutrition status.

2 Context

At the time of the survey, the Horn of Africa had been facing a major drought, affecting millions of people, particularly in Somalia, Ethiopia and Kenya.

In Dadaab, in north-eastern Kenya, refugee camps were first created in 1991, when thousands of Somalis fled their country because of the civil war. Twenty years later, from July to August 2011, up to 1,800 Somali refugees arrived every day, fleeing the ongoing fighting, but mostly trying to find food. They have settled in the three "old" camps that have existed for 20 years, as well as in three new settlements that opened in September 2011 (Ifo extension: Ifo 2 East and West, and Kambioos, see Map in Annex 2). Because of the rapid influx of large numbers of refugees, aid agencies working in the camps have faced considerable challenges in providing registration and basic services for the new arrivals. By October 2011, the emergency was not so acute, as the number of new arrivals was decreasing, and agencies had scaled up their operations. But there is still much to be done.

2.1 Demographic data

Population

According to UNHCR (15/11/11 estimates), there are 15,825 registered people aged 60 years and above in the camps, of a total population of 463,438 (ie, older people represent about 3.4 per cent of the population in all camps).

Each camp is divided into 10 sections (though some have more, as new refugees have arrived), and each section is divided into 10 blocks. Each section and block is led by one man and one woman, who represent the camp population and liaise with the aid agencies.

Table 1: Population figures for Dadaab refugee camps

Camp	Total Population	Population aged 60 and above	Percentage of population aged 60 and above	Number of households	Average number of people aged 60 and above in each household
Dagahaley	124,702	4,138	3.3%	36,620	0.11
Hagadera	140,768	4,847	3.4%	44,437	0.11
Ifo	122,990	4,554	3.7%	40,757	0.11
Ifo 2 East	27,561	839	3.0%	6,629	0.13
Ifo 2 West	37,204	1,167	3.1%	9,337	0.12
Kambioos	10,213	280	2.7%	2,188	0.13
Total	**463,438**	**15,825**	**3.4%**	**139,968**	**0.11**

Source: UNHCR, Dadaab, 15 November 2011

Mortality

The Centers for Disease Control and Prevention (CDC) conducted a mortality survey for UNHCR in July and August 2011. Of 44 reported deaths (age not specified), 75 per cent (33) were reported by the head of household to have been malnourished at the time of death (Centers for Disease Control and Prevention 2011).

2.2 Existing data on nutritional status of refugees

Anthropometry

Several agencies have conducted nutrition anthropometry assessments since the beginning of the crisis. These assessments have all targeted children and/or women aged between 15 and 49 years:

- The International Rescue Committee (IRC) carried out an assessment of children aged between 6 and 59 months in Hagadera camp in July 2011, measuring the mid-upper arm circumference (MUAC). The results are shown in Table 2.
- UNHCR initiated MUAC screening for all older people who are among new arrivals at a reception centre for Ifo, Dagahaley and Hagadera camps. From the first week of August to 14 October, 1,413 people aged 60 and above were screened. The results are shown in Table 3.
- UNHCR carried out nutrition anthropometry surveys in August and September 2011 in the three main camps as well as in the outskirts of Dagahaley. The surveys targeted children aged between 6 and 59 months, children aged between 5 and 9 years, and women aged between 15 and 49 years. Preliminary results are shown in Table 4.

Table 2: Estimated prevalence of acute malnutrition in children aged between 6 months and 59 months (July 2011, Hagadera camp)

	Old arrivals	New arrivals	Overall
Global acute malnutrition (GAM)	7.8%	17.6%	9.7%
Moderate acute malnutrition (MAM)	6.6%	13.2%	7.9%
Severe acute malnutrition (SAM)	1.1%	4.4%	1.8%

Source: IRC, Dadaab, August 2011

Table 3: Result of MUAC screening of people aged 60 and above in three reception centres (cumulative results, 1 August–14 October 2011)

		Class					
		Severe		Moderate		Normal	
Camp	**Number screened**	**MUAC <160mm or oedema**		**MUAC 160 - 184mm**		**MUAC ≥185mm**	
Dagahaley	224	8	(3.6%)	25	(11.2%)	191	(85.2%)
Hagadera	1,051	0	(0.0%)	46	(4.4%)	1,005	(95.6%)
Ifo	138	4	(2.9%)	22	(15.9%)	112	(81.2%)
Overall	1,413	12	(0.8%)	93	(6.6%)	1,308	(92.6%)

Source: UNHCR, Dadaab, October 2011

Table 4: Estimated prevalence of acute malnutrition in three populations in four Dadaab settlements, August–September 2011

Population	Indicator	Class	Hagadera	Ifo	Dagahaley	Dagahaley outskirts
Children 6 – 59 months	W/H z-score (WHO 2006 standards)	GAM	17.2%	22.4%	23.2%	38.3%
		MAM	12.6%	15.5%	15.0%	19.5%
		SAM	4.6%	6.8%	8.2%	18.8%
	MUAC	At risk	14.3%	22.9%	19.1%	26.9%
		GAM	6.8%	8.8%	7.1%	24.4%
		MAM	5.0%	7.5%	5.2%	14.7%
		SAM	1.8%	1.3%	1.9%	9.7%
Pregnant / lactating women aged between 15 and 49 years	MUAC	GAM	2.5%	4.3%	0.0%	6.8%
		MAM	2.5%	4.3%	0.0%	6.8%
		SAM	0.0%	0.0%	0.0%	0.0%
Non-pregnant / lactating women aged between 15 and 49 years	MUAC	GAM	0.0%	0.0%	1.0%	1.7%
		MAM	0.5%	0.0%	0.5%	1.7%
		SAM	0.0%	0.0%	0.5%	0.0%

Source: UNHCR, Dadaab, September 2011

Food ration

The World Food Programme (WFP) is in charge of providing the general food ration in the camps. This ration, which is distributed to all registered individuals, is detailed in Table 5.

Table 5: Composition of the food ration in Dadaab, May 2011

Item	Amount (in grams)	Frequency	Grams per month
Maize	3,150	Twice a month	6,300
Wheat flour	3,150		6,300
Pulses	900		1,800
Fortified oil	450		900
Corn soya blend (CSB)	675		1,350
Salt	75		150

Source: Care International, Dadaab, June 2011; and UNHCR, Dadaab, November 2011

This ration provides the 2,100 Kcal/day recommended by HelpAge International guidelines for older people (HelpAge International 2001). According to the same standards, the protein content of the ration is adequate (12 per cent of the ration), as well as the fat content (19 per cent of the ration – ie, at least 17 per cent of the ration)[1]. There is not enough fibre, and some micronutrients (including calcium, Vitamin C and Vitamin B12) are insufficient.

It is difficult to verify whether older people who may be isolated or frail have access to the food ration (for example, are they able to collect it, and are they receiving the full ration if somebody is collecting it for them?).

2.3 HelpAge International assessments

As there are no data on the broader wellbeing of older people in Dadaab camps, HelpAge International decided to conduct its own assessments. In June and August 2011, we organised two field visits, with staff from Nairobi and London. The assessments, which were supported by UNHCR staff and the Lutheran World Federation (LWF), were carried out through focus group discussions with older men and women and community leaders. The team also conducted interviews with aid agency staff, including refugees who are employed by UNHCR, staff from UNHCR implementing partners, major international NGOs, health workers, and officials from the Government of Kenya Department for Refugee Affairs. The team also documented case studies of a number of older people in Ifo, Hagadera and Dagahaley camps (http://www.helpage.org, keyword Dadaab).

The key findings were that older people's needs are largely invisible to the agencies working in the camps. They are not recognised as a vulnerable group, and do not receive specific attention for any of the basic services provided, whether in terms of registration, shelter, food distribution, or health and nutrition care.

Though LWF and UNHCR community services are trying to target older people as a vulnerable group, there is a lack of information about their social, health and nutrition status to guide interventions.

The focus group discussions we carried out revealed that older people have protested about the inadequacy of food, in terms of the quantity and quality of the food ration. They have complained that the food is not culturally palatable (ie, there is too much wheat flour, and no milk) and that there is no possibility of buying food on the market, because they have no source of income.

Some of the health agencies working in the camps (IRC, GIZ (the German Agency for International Cooperation, and MSF (Médecins Sans Frontières)) have included older people in their supplementary or blanket feeding programmes. However, at WFP's request, they had to reduce the number of older recipients, and admit older people on the criteria of a MUAC below 165mm, which is the threshold for severe malnutrition in a famine context. A supplementary feeding programme would usually employ a less extreme threshold.

[1] These standards differ slightly from the 2011 Sphere standards for minimum nutritional requirements. The global energy intake is similar, as well as the percentage of energy provided by fat, but older people need more protein intake. They also need more calcium, Vitamin D, B6 and B12.

3 Objectives and methodology

3.1 Objectives of the survey

The objectives of our survey were:

- to estimate the prevalence of acute malnutrition among refugee women and men aged 60 years and above in the three main camps in Dadaab
- to investigate the health and social status of these people (eg, access to basic services, size of household, mobility, general health status, living conditions, etc).

3.2 Sampling procedures

The survey employed two-stage cluster sampling.

The sample size (n) was determined using the formula:

$$n = d \cdot \frac{t^2 \cdot p(1-p)}{\gamma^2}$$

Where:

d = design effect (assumed to be 1.5)

t = confidence interval=1.96 for 95% confidence interval

p = estimated prevalence of global acute malnutrition=10%

γ = precision (ie, half-width of the 95% confidence interval) =3%

Yielding:

$$n = 1.5 \cdot \frac{1.96^2 \cdot 0.1(1-0.1)}{0.03^2} = 576$$

A minimum of n=576 people aged 60 years and above were to be surveyed.

Based on the proportion of the population aged 60 years and above in each camp (UNHCR 21/08/2011 population estimates) and the average size of the sections and blocks within the camps, we decided to collect the survey sample as 47 clusters of 13 people, since this was likely to yield a sample size (n≈611) a little larger than the calculated minimum (n=576). Primary sampling units (clusters) were sections in the three camps and were selected using the population proportional sampling (PPS) procedure using population data provided by UNHCR (for each camp, section and block). The survey sampled 17 clusters from Ifo camp and 15 clusters each from Hagadera and Dagahaley camps. Households within the clusters were selected using the modified EPI (ie, “spin the bottle”) method, as recommended by SMART (Standardised Monitoring & Assessment of Relief and Transitions). All people aged 60 years and above in selected households were sampled (the age of the respondent was self-reported). If an eligible individual was not present at the time of the visit, the household was revisited at a later time.

We collected data for 629 people aged 60 years and above. A total of 46 of the planned 47 clusters were surveyed. The "loss" of one cluster (cluster 24, in Hagadera camp) was due to a management error. The effect on overall results is likely to be negligible, however, and smaller than would be the case in a cluster-sampled survey of free-living populations where access was unproblematic and “contingency clusters” were not sampled.

3.3 Training and supervision

With the help of LWF, we recruited five teams of three surveyors, including five team leaders. The five team leaders were Somali-speaking Kenyan nationals, and the 10 enumerators were Somali or Sudanese citizens recruited in Ifo camp.

The survey questionnaire was not translated into all the languages used in the camps, but each team was able to translate the questionnaire from English to Somali. This was extensively practised during the four-day training course for team members. The teams also practised translating the questionnaire into Swahili and Dinka, which are used in some sections of the camps.

The survey teams were supervised by HelpAge International's Emergency Health and Nutrition Adviser (PF), assisted by a Programme Officer (JD) and an intern from the HelpAge International Africa Regional Development Centre (ARDC) in Nairobi (HZ).

The four-day training course took place in Dadaab from 3–6 October 2011:

- Day 1: Presentation of HelpAge International, HelpAge International code of conduct, rationale and objectives of the survey, sampling method, questionnaire.
- Day 2: Field procedures, anthropometric measurements, questionnaire.
- Day 3: Standardisation of measures exercise (10 older people volunteered to be measured and weighed), testing of questionnaire.
- Day 4: Field test in Ifo camp.

The survey was carried out from 7–13 October 2011.

4 Data analysis

4.1 Software used

The data were entered and checked using Microsoft Excel 2003™. Data were analysed using SPSS™ version 13. The SPSS Complex Samples module™ was used to calculate 95 per cent confidence intervals (CIs).

4.2 Variables examined

The team measured the weight, height, half arm span and mid-upper arm circumference (MUAC) of each older person using standard anthropometric procedures for older people (Ismail and Manandhar 1999):

- **Mid-upper arm circumference** (MUAC) was measured to the nearest 0.1cm using a non-stretch MUAC tape (designed by HelpAge International in 2000).
- **Weight** was measured to the nearest 0.1kg using digital electronic scales (four Ashton Meyers®, one Seca®).
- **Height** was measured to a precision of 0.1cm using a body meter (Seca Leicester Portable Height Measure®).
- **Half arm span** was measured to the nearest 0.1cm with a non-stretch measuring tape, on the extended arm, from the upper sternum at the base of the neck to the end of the middle finger.

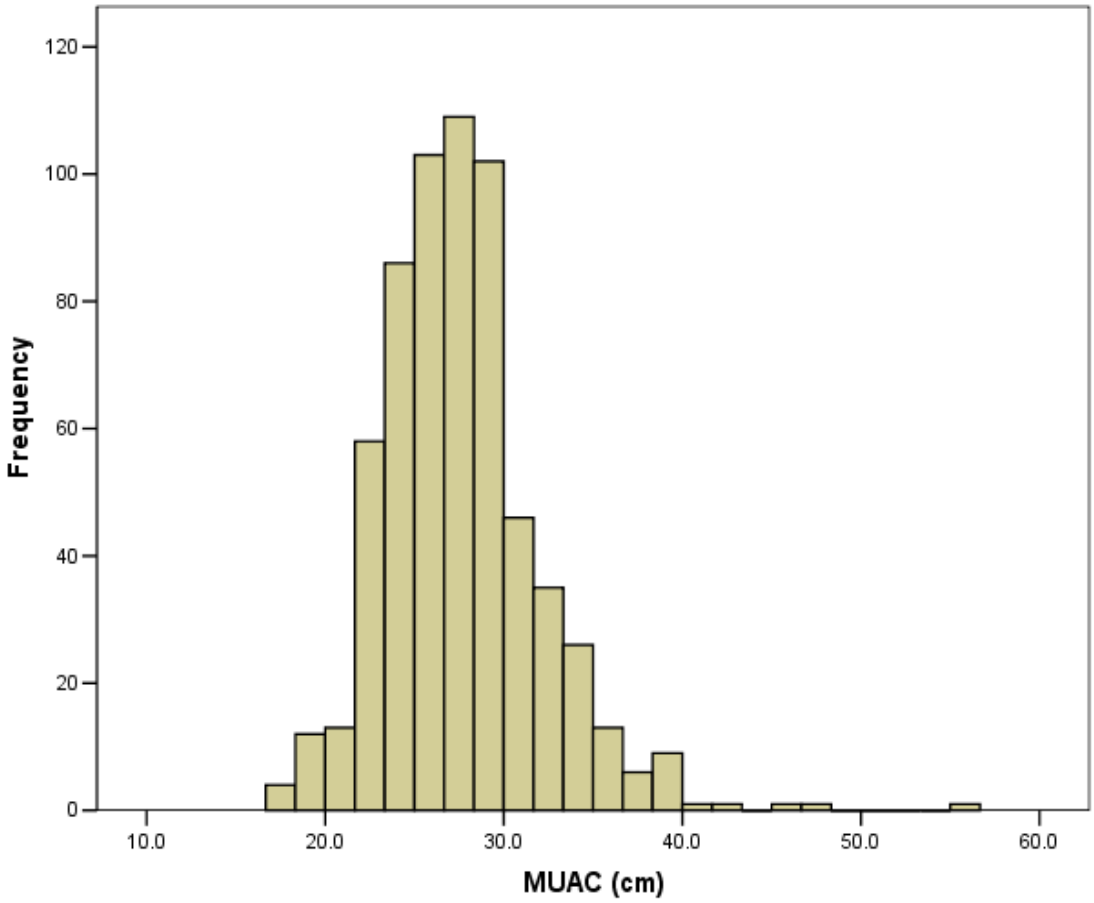
4.3 Data management: MUAC

The distribution of MUAC in the survey sample is shown in Figure 1.

MUAC data were combined with data on the presence of bilateral pitting oedema to identify cases of global acute malnutrition (GAM), moderate acute malnutrition (MAM), and severe acute malnutrition (SAM) using the following case definitions:

GAM	MUAC <210mm or oedema
MAM	185mm≤ MUAC <210mm without oedema
SAM	MUAC <185mm or oedema

Figure 1: Distribution of MUAC



4.4 Data management: body mass index

Body mass index (BMI) is calculated using the following formula:

$$BMI = \frac{Weight}{Height^2}$$

During the planning stage of the survey, it was considered likely that it would be difficult to measure the height of a considerable number of respondents – for instance, due to kyphosis, scoliosis, gross weakness, and flexor contractions (a condition associated with age and with acute malnutrition), which would prevent the respondent from standing upright. It was decided, therefore, to collect the half arm span as an alternative measure of stature that could, after manipulation, act as a proxy for height.

Height measurements were collected for 594 of the 629 respondents (94.4 per cent), half arm span measurements were taken for 617 respondents (98.1 per cent), and weight was recorded for 601 respondents (95.5 per cent). The reasons why these measurements were not collected for some respondents were because they were bedridden, too weak to stand, or were not able to balance sufficiently to stand upright.

Recorded weights were adjusted to account for the average weight of clothing worn during measurement. Weights of male subjects were reduced by 0.6kg, and females by 0.8kg. These adjustments were the average weights of clothes measured in a small subset (ie, n=10 males and n=10 females) of survey respondents.

For those respondents whose height we were not able to measure, we estimated their height by using the half arm span measurement. Examination of the relationship between height and half arm span (Figure 2) indicated that a simple linear relationship existed (similar in both males and females) between height and half arm span.

An equation for estimating height from half arm span was found using ordinary least-squares (OLS) linear regression:

$$Estimated\ height = 67.657 + 1.31 \times half\ arm\text{-}span$$

BMI was calculated using the standard formula (see above), using measured height for respondents with height and weight data, and height estimated from half arm span for respondents with half arm span and weight data but without height data. BMI was available for 600 (95.4 per cent) of 629 respondents. The distribution of BMI in the survey dataset is shown in Figure 3.

BMI data were combined with data on the presence of bilateral pitting oedema to identify cases of global acute malnutrition (GAM), moderate acute malnutrition (MAM), and severe acute malnutrition (SAM) using the following case definitions:

GAM	BMI <18.5kg/m^2 or oedema
MAM	16≤ BMI <18.5kg/m^2 without oedema
SAM	BMI <16kg/m^2 or oedema

Figure 2: Relationship between height and half arm span

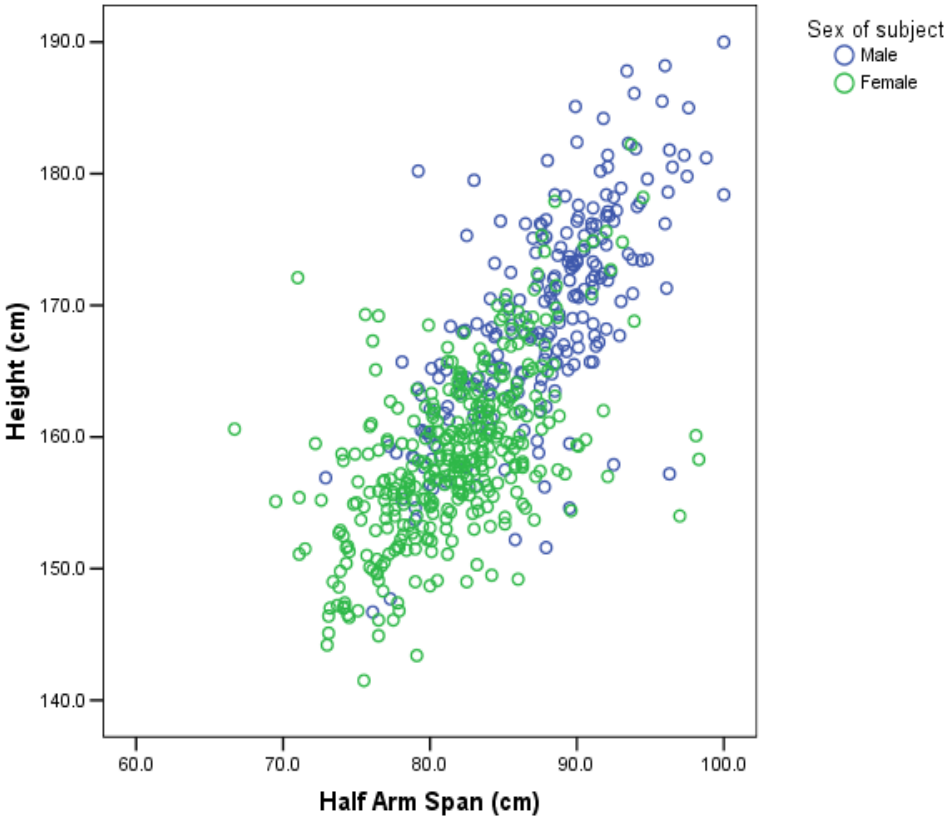
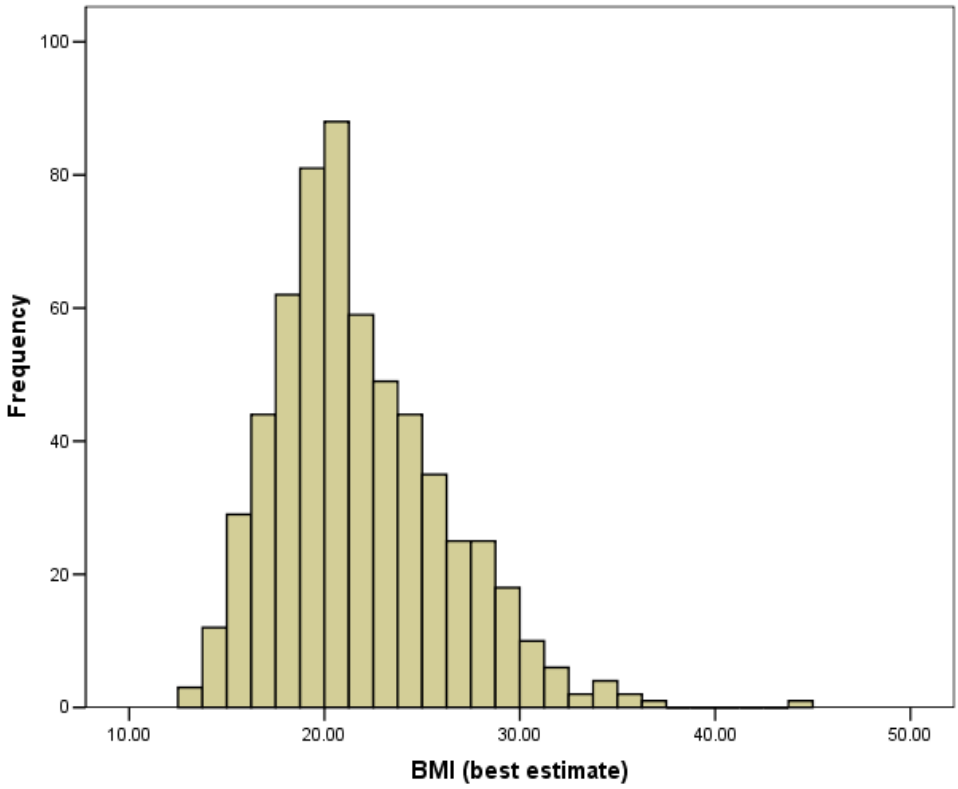


Figure 3: Distribution of BMI



4.5 Data management: dietary diversity

The following dietary data were collected:

- Number of meals eaten the previous day
- Whether or not yesterday's meals included any of the following:

  porridge (maize flour, wheat flour, CSB)

  rice

  beans

  meat, fish or eggs

  oil

  milk

  fruits or vegetables

  any other food.

These data were combined into a dietary diversity score (DDS) as a simple count of the number of foods consumed in the previous 24 hours. The distribution of the DDS is shown in Figure 4. The DDS was grouped as follows:

Below average	DDS <3
Average or better	DDS ≥3

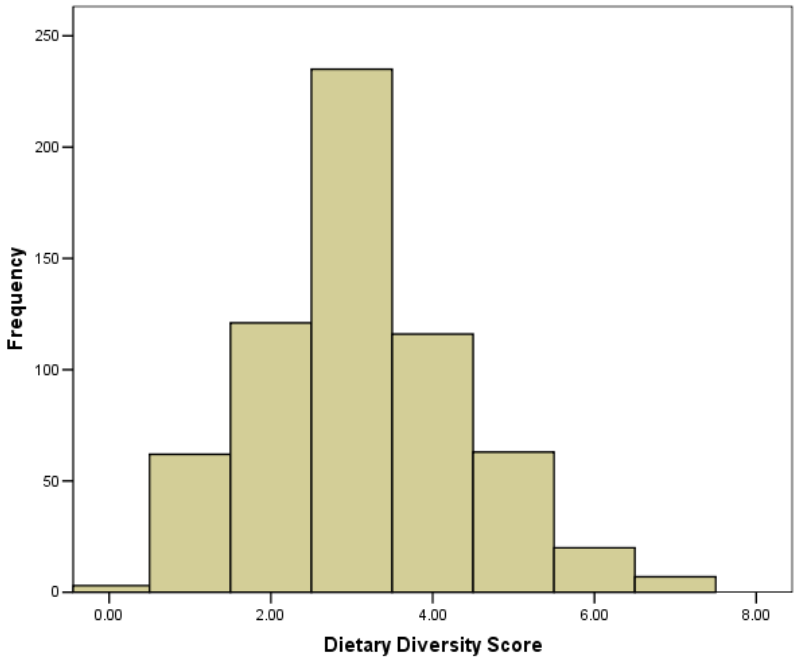
The cut-point used (ie, DDS=3) corresponds to the mean (3.12), median (3), and modal (3) values of the distribution of DDS in the survey sample.

This new variable was combined with the number of meals per day in order to create a variable indicating both low dietary diversity and low meal frequency:

Low diversity / frequency	DDS <3 and meals per day <2
Average or better dietary diversity	DDS >3 and meals per day ≥2

The cut-point (ie, number of meals=2) corresponds to the mean (2.14), median (2), and modal (2) values of the distribution of the number of meals in the survey sample.

Figure 4: Distribution of dietary diversity scores



4.6 Case definitions

The nutritional status of the population was defined using the criteria set out in Table 6 below:

Table 6: Indicators for nutritional status

	Indicator	
Class	**BMI (kg/m^2)**	**MUAC (mm)**
Severe malnutrition	BMI <16 or oedema	MUAC <185 or oedema
Moderate malnutrition	18.5> BMI ≥16	210> MUAC ≥185
No malnutrition	BMI ≥18.5	MUAC ≥210

See Annex 1 for a discussion on the use of MUAC and BMI.

5 Results of the survey

5.1 Demographic information

A total of 629 people aged 60 and above were interviewed, and their weight and measurements taken, in 46 clusters: 17 in Ifo, 14 in Hagadera, and 15 in Dagahaley. In some cases (where the person being interviewed was very old and frail, or confused, or sick), a family member or neighbour answered the questions on their behalf.

Table 7: Person answering the questionnaire

Person answering	Number of respondents	Percentage of respondents
Self	581	92.4%
Family	37	5.9%
Other	11	1.7%
Total	**629**	**100.0%**

Women represented 61.7 per cent of respondents. This is a higher percentage than the proportion of women aged 60 years and above (50.2 per cent) expected from UNHCR camp population statistics. This might be due to the fact that some men were away from home at the time of the survey, taking care of cattle or business. If this were the case, then the results presented here may slightly overestimate the prevalence of malnutrition and poor health (as people with businesses or cattle are less likely to be malnourished).

Respondents' ages (self-reported) ranged from 60 to 110 years old, with a mean age of 69 years and a median age of 66 years. Figure 5 shows a population pyramid (ie, the distribution of age by sex) in the survey sample.

Almost all respondents (98.3 per cent) were Somali. The remaining 1.7 per cent were Ethiopian asylum seekers.

Most of the people we interviewed had arrived in the camp before January 2011 (83.2 per cent); only 6.2 per cent had arrived since June 2011 (see Figure 6).

Figure 5: Distribution of respondents' age by sex

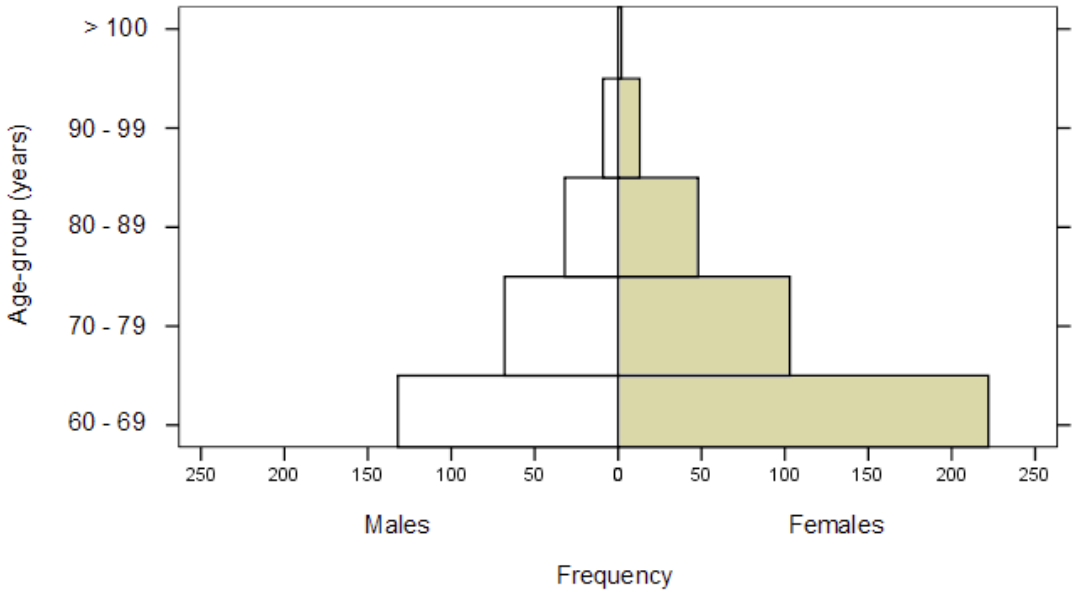
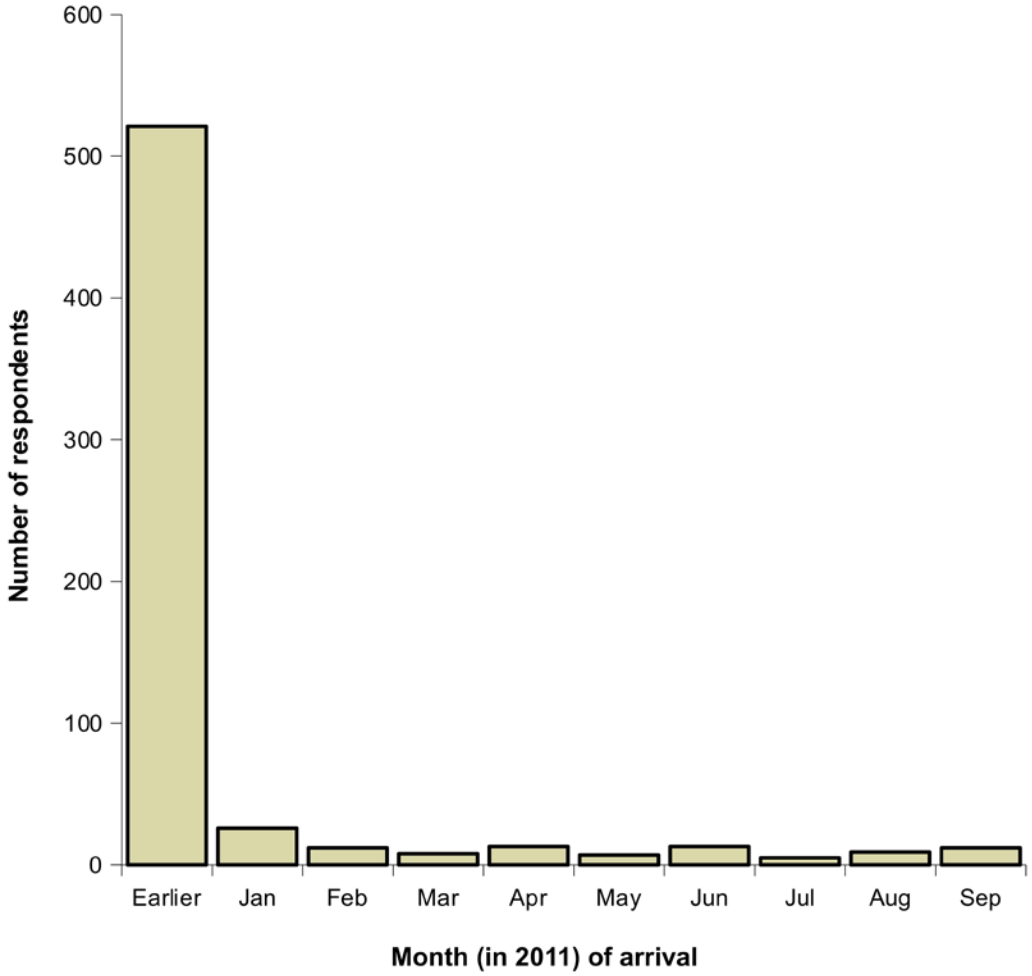


Figure 6: Month of arrival



5.2 Nutritional status

Table 8 shows the nutritional status of respondents using BMI-based case definitions.

Table 8: Nutritional status of older people (BMI-based case definitions)

Class	Case definition	Prevalence
GAM	**BMI <18.5kg/m^2 or oedema**	23.8% (95% CI=20.3% ; 27.6%)
MAM	**16kg/m^2≤ BMI <18.5kg/m^2 without oedema**	16.8% (95% CI=13.6% ; 20.0%)
SAM	**BMI <16kg/m^2 or oedema**	7.0% (95% CI=4.8% ; 9.2%)

Table 9 shows the nutritional status of respondents using MUAC-based case definitions.

Table 9: Nutritional status of older people (MUAC-based case definitions)

Class	Case definition	Prevalence
GAM	**MUAC <210mm or oedema**	4.63% (95% CI=3.3% ; 6.0%)
MAM	**185mm≤ MUAC <210mm without oedema**	2.71% (95% CI=1.5% ; 3.9%)
SAM	**BMI <185mm or oedema**	1.91% (95% CI=0.9% ; 3.0%)

We did not distinguish primary malnutrition from secondary malnutrition due to infection.

(See Annex 1, Use of MUAC and BMI, for details on primary and secondary malnutrition.)

5.3 Health status

Just over one-third of those we interviewed (36.0 per cent) were taking regular medicines prescribed by medical staff. The main diseases treated were “pains” (68.1 per cent), high blood pressure (14.2 per cent) and diabetes (4.9 per cent).

Four people reported having tuberculosis (TB). However, this is a self-declared number and is unlikely to reflect the true prevalence of TB among older people in the camps.

More than three-quarters of respondents (76.6 per cent) had been sick during the two weeks before the survey, and 68.7 per cent of these went to a health facility for treatment. The main “sickness” was pain (72.3 per cent). This includes muscular/joint pains, gastric pains, and headaches.

2.6 per cent of respondents were bedridden or housebound.

Half of all respondents (50.5 per cent) did not need any help walking or standing.

Table 10 summarises the data we collected on disability.

Table 10: Frequency of disabilities

Disability	Prevalence	
Physical disability	8.4%	(95% CI=6.3% ; 11.2%)
Hearing impairment	22.6%	(95% CI=18.0% ; 27.9%)
Visual impairment	54.7%	(95% CI=49.8% ; 59.5%)

One in 10 respondents (10.2 per cent) were unable to wash or dress, and 15.8 per cent were unable to carry out usual activities like housework, cooking or eating; 40.8 per cent needed help with these activities.

More than two-thirds (71.5 per cent) of those interviewed said they felt weak. In most cases, this was a long-standing weakness (on average, for around three years). Only 7.1 per cent reported feeling weak for the past two months.

With regard to mental health, 8.9 per cent of those we interviewed were confused or had difficulty understanding or answering the questions. Just over 3 per cent (3.2 per cent) admitted that they were feeling depressed. Almost one in 10 (9.6 per cent) had lost a family member in the three months before the survey.

5.4 Social status

Eight older people reported that they were living alone (1.3 per cent), six men and two women. All other respondents were living in households with between 1 and 48 others (mean=7.5). The average size of households in the sample is 8.5 people. This is considerably larger than the 3.3 people per household in UNHCR registration data. The difference is probably due to the definition of household: in our survey, the definition was left to the respondent.

The vast majority (88.5 per cent) of the older people we interviewed reported that they were the head of the household. Among them, 59.2 per cent were women.

12.1 per cent were involved in community activities (going to community meetings, being a community representative, etc), and 63.2 per cent of those involved were men.

Again, the vast majority (85.0 per cent) of those we interviewed had responsibility for taking care of children. Given this high percentage, they are likely to be occasional carers rather than have full responsibility for children in the household.

5.5 Access to basic services

Food

Almost all respondents (98.1 per cent) were receiving their general ration every cycle (i.e., every two weeks). Only 12 did not.

More than half (63.2 per cent) reported giving food to other members of their family or neighbours.

On average, the older people we interviewed had two meals (or snacks) per day, with around 30.5 per cent of them having three or more meals (or snacks) per day. Figure 7 shows the distribution of the number of meals per day (24-hour recall) in the survey sample.

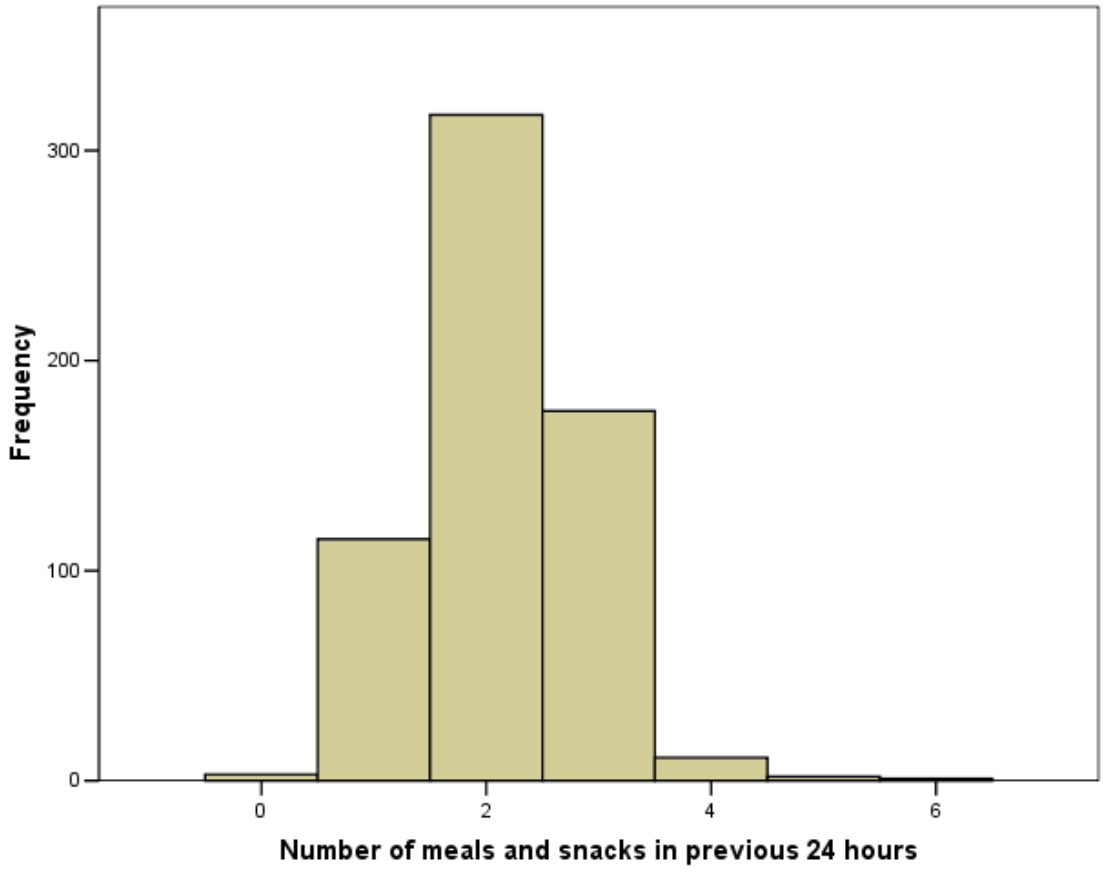
The main foods consumed by the older people we interviewed reflect the contents of the general ration (ie, porridge, oil, beans). Many older people did manage to eat some foods that were not part of the general ration (eg, rice, milk, fruits and vegetables). The data are summarised in Table 11.

Table 11: Foods consumed

Food	Proportion of older people eating this food	Notes
Porridge (maize / wheat flour or CSB)	74.8%	These foods are part of the general ration
Oil	57.8%	
Beans	53.9%	
Rice	44.9%	These foods are **not** part of the general ration
Milk	26.6%	
Meat or fish or eggs	21.8%	
Other foods (tea, pancakes, pasta, njeera)	16.2%	
Fruits and vegetables	15.8%	

Two-thirds of respondents (66.0 per cent) reported having a poor appetite, and 57.1 per cent had problems chewing food. Almost half of them eat alone (47.1 per cent).

Figure 7: Distribution of number of meals per day



Water and sanitation

Of the 629 respondents, 95.5 per cent were satisfied with the drinking water supply, with a minority complaining of shortages.

Just over 94.6 per cent of older people were living in a household with a simple pit latrine with a slab, and 98.2 per cent were using it either directly or to dispose of faeces.

A small number of those interviewed (1.8 per cent) were living in a house with no latrine, and generally used their neighbours' latrine (most of these were in Hagadera camp).

Faeces disposal by older people is thus generally safe (see Table 12).

Table 12: Disposal of stools

Method for disposing of faeces	Proportion	Note
Used latrine directly	80.8%	98.4% safe disposal
Put or rinsed into latrine	17.4%	
Buried	0.2%	
Left in the open / thrown in the bush	1.3%	1.6 % unsafe disposal
Other	0.3%	

Healthcare

Most of the older people we interviewed reported attending a health facility when they were ill (68.9 per cent of older people with a sickness). The main reason for not going to the health facility was that it was too far away (see Table 13). Availability of drugs was also an issue.

Table 13: Reasons for not attending a health facility when sick

Reason	Number of respondents	Percentage
Too far	76	48.4%
No drugs available	33	21.0%
Other	25	15.9%
Could not go alone	17	10.8%
Does not know where it is	6	3.8%
Total	**157**	**100.0**

5.6 Assessing nutritional vulnerability (risk factors)

A number of risk factors and risk markers for vulnerability were collected in this survey (see Table 14).

Table 14: Risk factors and markers collected in the survey

Group	Risk factor / marker	Associated with malnutrition?	Notes
Family life	Newly arrived in the camp	No	Self-report Arrived in 2011
	Living alone	No	Self-report
	No regular carer	No	Self-report
	Looking after children	No	Self-report
Functional ability	Needs help for usual activities	No	Self-report
	Weakness	No	Self-report
Disability	Housebound	No	Self-report
	Poor eyesight	No	Self-report
	Poor hearing	No	Self-report
	Poor mobility	No	Self-report
Health	Lack of healthcare	No	Self-report Did not attend health facility when last sick
	Chronic disease	No	Self-report Regularly takes prescribed drugs
Mental state	Recent death in family	No	Self-report
	Depression	No	Self-report
	Confusion	No	Self-report or interviewer's determination
Food intake	Not included in general ration	**Yes**	Self-report
	Poor diet diversity	**Yes**	Self-report Number of types of foods (from a list of porridge, rice, beans, meat / fish / eggs, oils / fats, milk, fruit / vegetables, and other) eaten the previous day
	Low meal frequency	**Yes**	Combined with dietary diversity
	Poor appetite	No	Self-report
	Gives food to others	No	Self-report
	Chewing problems	No	Self-report

All these risk factors were tested for their association with malnutrition, using BMI and MUAC-based case definitions.

The following variables were associated with malnutrition using either MUAC or BMI-based case definitions:

- **Respondents reporting that they receive a food ration every cycle** are less likely to be malnourished by MUAC (ie, less likely to have a MUAC of <210mm or oedema) than those who report not receiving a ration every cycle (risk ratio (RR)=0.25, 95 per cent CI=0.09–0.73).

  Respondents reporting that they receive a ration every cycle are less likely to be malnourished by BMI (ie, less likely to have BMI <16kg/m^2 or oedema) than those who report not receiving a ration every cycle (RR=0.24, 95 per cent CI=0.10–0.58).

- **Respondents reporting low dietary diversity** (ie, eating less than three different food items per day) are more likely to be malnourished by MUAC (ie, more likely to have a MUAC of <210mm or oedema) than those who report eating three or more different food items per day (RR=2.74, 95 per cent CI=1.47–5.11).

  Respondents reporting low dietary diversity (ie, eating less than three different food items per day) are more likely to be malnourished by BMI (ie, less likely to have BMI <16kg/m^2 or oedema) than those who report eating three or more different food items per day (RR=2.91, 95 per cent CI=1.55–5.44).

- **Respondents reporting low dietary diversity and frequency** (ie, eating less than three different food items per day and less than two meals per day) are more likely to be malnourished by MUAC (ie, more likely to have a MUAC <210mm or oedema) than those who reported eating three or more food items and two or more meals per day (RR=2.49, 95 per cent CI=1.27–4.86).

  Respondents reporting low dietary diversity and frequency (ie, eating less than three different food items per day and less than two meals per day) are more likely to be malnourished by BMI (ie, less likely to have BMI <16kg/m^2 or oedema) than those who reported eating three or more food items and two or more meals per day (RR=2.92, 95 per cent CI=1.61–5.39).

- **Sex** (ie, being male) was also associated with malnutrition by BMI (RR=2.33, 95 per cent CI=1.21–4.48) but not with malnutrition by MUAC (RR=1.30, 95 per cent CI=0.55–3.06). This discordance suggests that this may be due to men having a more extreme body shape (ie, longer limbs and shorter trunks) than women.

6 Discussion

6.1 Using BMI and MUAC to determine risk of malnutrition

The prevalence of acute malnutrition found in this survey differs considerably depending on whether we use body mass index (BMI) or mid-upper arm circumference (MUAC). BMI is very dependent on the person's body shape and is sensitive to localised accumulation of fluid (ie, oedema or ascites), which is common in acute malnutrition in adults. BMI can be used as a tool to follow up individual adults in therapeutic or supplementary feeding programmes, but it is not well suited for use as a screening tool or in anthropometric surveys. MUAC is much less affected by body shape and localised accumulation of fluid, and is therefore better suited than BMI for use as a screening tool and in anthropometric surveys.

There are also recognised problems with the use of BMI in older populations in general, and in Somali populations in particular. This means that the prevalence estimates using MUAC-based case definitions are likely to be better indicators of nutrition-related morbidity and mortality risk in the survey population (see Annex 1).

6.2 Case definitions / admission criteria

MUAC has been used to assess the nutritional status of adults during periods of famine, and its use for this purpose was recommended by the United Nations Forum for Nutrition in July 2000 (Olukoya 1990; Rodrigues et al. 1994; Collins 1996; Collins et al. 2000). The strong associations between MUAC and body weight, and MUAC and nutrient reserves in muscle and fat in adults, are well established (Winick 1979; Ohlson et al. 1956; Leiter and Marliss 1982; Leiter and Marliss 1983). Also, MUAC is not affected by oedema or pregnancy, and is independent of height (Olukoya 1990).

The use of MUAC has not, however, been fully evaluated as a prognostic indicator in adults, but estimates of arm muscle area (AMA) and corrected (ie, for humerus cross-section) arm muscle area (CAMA) form parts of well-validated diagnostic procedures for adult under-nutrition in hospital settings, and are used as prognostic indicators in older people and cancer patients (Gassull 1984; Friedman et al. 1991; Heymsfield et al. 1984). The use of AMA and CAMA requires accurate measurement of skin-fold thickness and is therefore impractical for community-based case-finding and in most healthcare settings in developing countries. MUAC is a more practicable measure and is strongly correlated with both AMA and CAMA (Winick 1979; Ohlson et al. 1956, Leiter and Marliss 1982).

MUAC thresholds for diagnosing acute under-nutrition in adults, derived by extrapolation from well-nourished populations in developing countries without reference to data collected during famines, have been proposed (Ferro-Luzzi and James, 1996). These thresholds have been shown to be associated with increased mortality and morbidity in chronically undernourished populations (Duffield 1998; Strickland and Ulijaszek 1992). Data from famines suggest that thresholds extrapolated from well-nourished populations may not be useful for assessing acute under-nutrition in adults, and alternative thresholds have been proposed (see Table 15) (Collins 1996).

Table 15: MUAC thresholds for assessing adult malnutrition during famine

Class	MUAC (mm)
Normal	≥185mm
Moderate acute under-nutrition	<185mm
Severe acute under-nutrition	<160mm

These thresholds were developed for use in situations of famine, where resources are likely to be scarce, and before the development of community-based models of delivering therapeutic feeding. Different MUAC thresholds are commonly used in programmes providing nutritional support to pregnant and lactating women, people living with AIDS, and the chronically sick.

Table 16: MUAC thresholds for assessing adult malnutrition

Class	MUAC (mm)
Normal	≥210mm
Moderate acute under-nutrition	<210mm
Severe acute under-nutrition	<185mm

These thresholds have been shown to be associated with increased mortality and morbidity in chronically undernourished and older populations (Ferro-Luzzi and James 1996; Duffield 1998; Strickland and Ulijaszek 1992).

Current UNHCR guidelines use the "famine thresholds" given above and propose admission into supplementary feeding programmes (SFP) for adults with a MUAC between 160mm and 185mm (UNHCR, 2011), and admission into therapeutic feeding programmes (TFP) for adults with a MUAC below 160mm (Collins et al. 2000; Borrel 2001). In the Dadaab refugee camps, however, the World Food Programme (WFP) is currently requesting health agencies to only include adults with a MUAC ≤165mm in SFPs (as explained to HelpAge International by the nutrition officers from three health agencies in Dadaab, in August 2011). This is a much lower threshold than is supported by currently available evidence. It should be noted that there is no specific therapeutic feeding programme for adults or older people in the Dadaab camps.

Given the available evidence regarding the relationship between MUAC and increased mortality and morbidity, the threshold for inclusion in SFPs should be increased to at least MUAC <185mm, with adults with MUAC <160mm being referred to TFP. The use of these thresholds assumes considerable resource scarcity and inpatient TFP. If resources allow, then the more sensitive thresholds (ie, 210mm/185mm) could be used.

Assuming programme coverage of 70 per cent (the Sphere Project's minimum standard for SFP and TFP, The Sphere Project 2011), the use of the more sensitive thresholds, including oedema, for persons aged 60 years and above would, given the prevalence found by the survey presented here, result in an estimated caseload of 266 (95 per cent CI=158 ; 384) SFP admissions and 187 (95 per cent CI=88 ; 295) TFP admissions – many of which could, after appropriate clinical assessment, be treated as outpatients. These are not large numbers compared with the caseloads calculated using the prevalence estimates for children aged between 6 months and 59 months shown in Tables 2 and 3, and are likely to result in only modest increases in SFP and TFP caseloads (see Table 17) – of around 5 per cent and 13 per cent respectively.

Table 17: Resource implications of including older people in SFP

Camp population	Proportion 6-59 months	Prevalence MAM	Source	Estimated caseload	Programme
414,577	18%	7.9%	IRC	5,895	SFP
		5.2%	UNHCR	3,880	
				Mean = 4,887	

Source: IRC, UNHCR, Dadaab, 2011. Population: 21/08/2011 UNHCR estimates

Estimated increase in SFP caseload=266/4,887=5.4%

Table 18: Resource implications of including older people in TFP

Camp population	Proportion 6-59 months	SAM Prevalence	Source	Estimated caseload	Programme
414,577 (21/08/2011 estimates)	18%	1.8%	IRC	1,343	TFP
		1.9%	UNHCR	1,418	
				Mean = 1,381	

Source: IRC, UNHCR, Dadaab, 2011. Population: 21/08/2011 UNHCR estimates

Estimated increase in TFP caseload = 187/1,381=13.5%

Switching to the less sensitive "famine thresholds", including oedema, for people aged 60 years and above would result in an estimated caseload of 225 (95 per cent CI=80 ; 366) SFP admissions, and 84 (95 per cent CI=5 ; 172) TFP admissions (all with oedema). These correspond to an estimated increase in the SFP caseload of about 4.6 per cent, and about 6.1 per cent in the TFP caseload.

The next section sets out our recommendations for addressing malnutrition among older people in the refugee camps of Dadaab, based on the findings of our survey.

7 Recommendations

The results of our survey demonstrate the need for intervention to address the needs of older people in refugee camps who are malnourished or at risk of malnutrition. Humanitarian principles affirm that everyone has the right to humanitarian assistance, following the principles of impartiality and non-discrimination: "…no one should be discriminated against on any grounds of status, including age, gender…" (The Sphere Project 2011, p22).

The prevalence of malnutrition among older people in the three main camps at Dadaab, using MUAC case definitions, reveal that older people's food needs are currently not being sufficiently addressed by aid agencies. HelpAge International calls on them to address this important gap in the humanitarian response.

Malnourished older people must first be identified in order to be referred for the appropriate treatment.

1. The Sphere Project's core standard 4 (design and response)[2] suggests using disaggregated data in order to analyse how different groups of people are affected by a disaster, and to design programmes to meet the needs of all affected populations (including older people).

   We recommend that:

   - Sex and age disaggregated data should be systematically collected and used in the Dadaab camps, for assessments and reporting.
   - Systematic screening of older people at reception centres should be continuous, using more sensitive case definitions/admission criteria (see below). Community-based health workers should be trained to detect malnutrition in older people through a process of ongoing screening. Taking the MUAC measurement is simple enough for this work to be done by community-based volunteers.
   - The thresholds for screening older people for malnutrition should be revised in order to be more sensitive.
   - The following case definitions/admission criteria should be used for all adults in the Dadaab refugee camps:

Indicator	Course of action
MUAC ≥210mm	Screen again within 30 days
MUAC <210mm	Refer to supplementary feeding programme (SFP) and follow up
MUAC <185mm	Refer to therapeutic feeding programme (TFP) and follow up
Oedema	Refer to TFP and follow up

   These thresholds can be used for screening older people in all situations where they are at risk of malnutrition.

[2] The Sphere Project's Handbook, *Humanitarian charter and minimum standards in humanitarian response*, sets out six core standards that agencies should adhere to. They cover: (1) people-centred humanitarian response; (2) coordination and collaboration; (3) assessment; (4) analysis and design; (5) performance, transparency and learning; and (6) aid worker performance.

2. The Sphere Project's core standard 4 also recommends designing the response so that vulnerable groups have full access to assistance and protection services.

We recommend that:

- Older people with a MUAC between 185mm and 210mm should be included in existing supplementary feeding programmes.
- Older people with a MUAC of less than 185mm or oedema should be referred to the camp's hospital, assessed for causes of secondary malnutrition (eg, TB or other chronic diseases), treated accordingly, and enrolled into a therapeutic feeding programme. Though health agencies theoretically treat malnourished adults in their therapeutic feeding programmes, very few are in fact admitted, and there is currently no outpatient therapeutic feeding for older people in the camps.

Older people need access to the general ration distribution

The measures to facilitate and ensure the registration of older people for the general food ration have to be reinforced. The Sphere Project's core standard 3 (assessment) emphasises the importance of assessing vulnerability. However, older people's needs are not currently assessed in the Dadaab camps.

We recommend that:

- Vulnerable older people should be identified at the reception centres (the vulnerability form should include these categories: "isolated older people", "older people above 80 years of age", "older people with a MUAC below 210mm").
- Community services should follow up these vulnerable older people, and facilitate their rapid registration. They should also be referred to appropriate support programmes (eg, Handicap International currently has an emergency programme for vulnerable people, where they are able to organise transport and help for registration).
- Community-based measures are put in place to facilitate pick-up (or delivery) of the general food ration to older people who may have difficulty attending distributions.

Older people need a more regular and more diverse food intake

The Sphere minimum standards in food security and nutrition state that "understanding the unique nutritional needs of... older people and persons with disabilities is also important in developing adequate food responses" (The Sphere Project 2011, p.147).

We recommend that:

- The dietary diversity within the general food ration should be improved.
- The micronutrient content of the food ration should be improved, either by adding micronutrient supplements or by diversifying the general food ration. In order to meet the nutritional needs of older people, the ration should include fruit and vegetables to increase the quantity of fibre and Vitamin C. A source of Vitamin B12 is needed, for example from fortified food (ready-to-use foods, high-energy biscuits or compressed food bars) or micronutrients powder ("sprinkles"). These needs could be met through a blanket supplementary feeding programme for older people.
- A daytime meal delivery to the most vulnerable older people should be organised: those who are housebound, older people with chronic diseases or disability, and those who are otherwise isolated.

Community-based services targeting older people should be developed in the camps. Community health workers are currently taking care of women and children. Only Handicap International has trained community-based health workers who are carrying out home visits to disabled people of all ages.

Through a partnership with Handicap International, it should be possible to train a pool of community health workers/home-based carers to support the most vulnerable groups in the camps: notably people with disabilities, and older people. These carers would be trained in health and nutrition education, as well as being able to identify basic health and nutrition problems, in order to make a referral to the relevant structure (health post, hospital) or notify the appropriate agency (in case of a social problem).

Our survey showed that 48.4 per cent of the older people we interviewed did not attend a health facility when they were sick because it was too far away, and 10.8 per cent did not attend because they needed an escort. That makes nearly 60 per cent who needed some kind of help with transport. There should be a service (such as an escort, an ambulance or donkey carts) to transport older people to a health post or hospital when they receive a referral for treatment.

We hope that UNHCR and the other aid agencies will consider these recommendations carefully, so that older people are truly acknowledged as a vulnerable group and appropriate protection and assistance is provided to them.

Annex 1: Use of MUAC and BMI

Here, we review the evidence for using body mass index (BMI) and mid-upper arm circumference (MUAC) to assess the nutritional status of adults.

Body mass index (BMI)

Most research has concentrated on the use of BMI for estimating the prevalence of chronic under-nutrition in stable populations. This is a very different role than screening for acute under-nutrition (Collins et al. 2000). The assumption in NGO manuals and academic articles that BMI is an appropriate indicator for screening for acute under-nutrition has not been tested (Ferro-Luzzi and James 1996; Boelaert et al. 1995; Collins 1995). The commonly used BMI threshold for severe chronic under-nutrition (ie, ≤15.9kg/m^2) is unlikely to reflect the severity of acute under-nutrition requiring specialised treatment (Collins 1993; Collins 1995; Collins et al. 1998). Extremely low BMI values were observed in Somalia during the 1992 emergency (Collins 1995). This prompted a downward revision of the BMI threshold to ≤12.9kg/m^2 to denote severe wasting (Ferro-Luzzi and James 1996). This revision did not account for the Somali long-legged phenotype, which is an important explanatory factor behind the very low BMI values observed (Collins 1995; Hiernaux 2000). The revised threshold is, therefore, probably inappropriately low, and lacking in case-finding sensitivity in populations with different body shapes (ie, from the Somali long-legged phenotype).

A major problem with the use of BMI is that both acute and chronic under-nutrition present as low BMI, but the process leading to a low BMI may be acute or chronic, and the examination of a single BMI value does not allow these two very different conditions to be differentiated from each other. Apart from this major problem, there are several other problems associated with the use of BMI as an anthropometric index. These problems are discussed below.

Factors other than nutritional status determine the functional significance of BMI values. The most important of these is body shape. Body shape is frequently determined by the sitting height to standing height ratio (SSR). This index varies considerably both between and within populations. International comparisons have found average SSR to vary between 0.48 (in Australian aborigines) and 0.55 (in Japan) (Norgan 1994a; Norgan 1995). This range translates into differences in BMI due to body shape alone of over 6kg/m^2. In one Australian aborigine population, for example, the SSR was found to vary between 0.41 and 0.53 (Norgan 1995). This is larger than the worldwide variation in average SSR and translates into differences in BMI in excess of 10kg/m^2 due to body shape alone (Norgan 1994a). When BMI is used to assess an individual (as is done in screening), the calculated BMI should be adjusted using a correction factor based on their SSR. This requires an additional measurement (ie, of sitting height) and several additional calculations (ie, to calculate SSR and to apply a correction to the calculated BMI). Without this adjustment, sensitivity and specificity of diagnoses based on BMI thresholds may be low (Norgan1994a; Norgan 1994b; Norgan 1995).

Height is known to change significantly during the day due to the compression effect of gravity, with height being greatest in the morning (Thompson 1942). This means that BMI values are dependent on the time of day at which height is measured, with BMI being lowest in the morning. The effect is likely to be small.

Weight is also known to vary throughout the day depending on factors such as hydration and the contents of the intestinal tract (Myatt et al. 2006). Such variability is likely to be a larger problem when using weight-for-height in children than when using BMI in adults.

Acute under-nutrition is associated with gross weakness, flexor contractions, and scoliosis (all conditions associated with increasing age), which prevent the patient from standing straight (Winick 1979; Keys 1950; Mollinson 1946; Zimmer et al. 1944). These present difficulties in measuring height, which will tend towards underestimation of standing height, which leads to overestimation of BMI.

The increasing prevalence of kyphosis, scoliosis, and conditions that affect the ability to stand straight with age (eg, osteoarthritis and osteoporosis), as well as the presence of osteomalacia, require the identification of these conditions and the use of proxies for height such as arm span, half arm span, or knee height (Steele and Mattox 1987; Steele and Chenier 1990; Reeves et al. 1996; Feldesman 1992). The use of proxies requires additional calculations and may introduce errors in excess of 1.5kg/m^2. The use of proxies is further complicated by the need to use different corrections in different age groups and different ethnic groups (Reeves et al. 1996; Feldesman 1992; Feldesman et al. 1990).

Data on the prevalence of nutrition-associated oedema from emergency, concentration camp, and experimental settings (Table A), indicate that oedema is a common complication of acute under-nutrition in adults.

Table A: Prevalence of nutrition-associated oedema in several settings

Study	Year	Location	Prevalence
Collins	1993	Angola	90%
Collins	1992	Somalia	24%
McCance et al.	1946	Germany	“common”
Mollinson	1945	Germany	“typical finding”
Debray	1945	France	100%
Keys et al.*	1945	USA	87%
Zimmer et al.	1942	France	50%

* Previously well-nourished volunteers starved under experimental conditions

In adults, nutritional-associated oedema frequently presents as bilateral pitting oedema, facial oedema, and ascites. Ascites is not included in standard case-definitions of oedematous under-nutrition in children, and is uncommon in children. Ascites is, however, a common complication of acute under-nutrition in adults and results in far greater spurious weight increases than pitting oedema (Collins 1995; Collins 1996; Collins et al 1998; Collins et al 2000; Keys 1950; Zimmer et al 1944). Retained fluid can frequently account for over 10 per cent of body weight (Collins et al 2000). Nutrition-associated oedema is associated with poor prognosis in children and adults. This means that patients with oedema often have a poorer prognosis with higher values of BMI (Collins et al 2000). BMI is not, therefore, an appropriate indicator for people suffering from nutrition-associated oedema. The problem is further complicated by the fact that the presence of facial oedema (sometimes called “moon-face”) can give the impression that a patient is well nourished.

Adult body size, shape, and composition change with age, with a tendency to lose fat-free mass and gain fat mass (Forbes and Halloran 1976; Stoudt et al. 1965; Borkan and Norris 1977,; Noppa et al. 1980; Wang et al.1994; Strickland and Ulijaszek, 1992; Rolland-Cachera et al. 1991; Norgan NG 1994c,; Mazariegos et al.1994; Gallagher et al. 1996; Forbes and Reina 1970). These changes may alter the functional significance of BMI thresholds at different ages. In emergency settings, some NGOs have used different thresholds for adults aged above and below 50. For example, Table B shows the thresholds used by Action Contre la Faim (ACF).

Table B: Age-adjusted BMI thresholds used by ACF in emergency setting

		BMI (kg/m^2)	
Classification	**Intervention**	**Adults ≤50 years**	**Adults >50 years**
Moderate	Supplementary feeding	≤16.0	≤17.0
Severe	Therapeutic feeding	≤15.0	≤16.0

There are, however, no published data supporting the use of different thresholds for different age groups, and the thresholds shown in Table B are ad-hoc modifications of standard BMI thresholds. The use of different thresholds for different age groups is also complicated by the fact that many adults in developing countries do not know their exact age.

Mid-upper arm circumference (MUAC)

Until recently, the use of MUAC as a diagnostic tool was restricted to children aged between 12 months and 59 months. The lower age limit has recently been reduced to 6 months and work is ongoing to evaluate the use of MUAC in both younger and older children. MUAC has been used to assess the nutritional status of adults during famine, and its use for this purpose was recommended by the United Nations Forum for Nutrition in July 2000 (Olukoya 1990; Rodrigues et al 1994; Collins 1996; Collins et al 2000).

The strong associations between MUAC and body weight and MUAC and nutrient reserves in muscle and fat in adults are well established (Winick 1979; Ohlson et al. 1956; Leiter and Marliss 1982; Leiter and Marliss 1983). MUAC is not affected by oedema or pregnancy and is independent of height (Olukoya, 1990).

The use of MUAC has not been fully evaluated as a prognostic indicator in adults. But estimates of arm muscle area (AMA) and corrected (ie, for humerus cross section) arm muscle area (CAMA) form parts of well-validated diagnostic procedures for adult under-nutrition in hospital settings, and are used as prognostic indicators in older people and cancer patients (Gassull et al 1984; Friedman 1991; Heymsfield et al 1984). The use of AMA and CAMA require accurate measurements of skin-fold thickness, and are impractical for use in primary healthcare settings in developing countries. MUAC is a more practicable measure and is strongly correlated with both AMA and CAMA (Winick 1979; Ohlson et al. 1956; Leiter and Marliss 1982; Leiter and Marliss 1983).

MUAC thresholds for diagnosing acute under-nutrition in adults, derived by extrapolation from well-nourished populations in developing countries without reference to data collected during famines, have been proposed (Ferro-Luzzi and James 1996). These thresholds have been shown to be associated with increased mortality and morbidity in chronically undernourished populations (Duffield 1998; Strickland and Ulijaszek 1992). Data from famines suggest that thresholds extrapolated from well-nourished populations may not be useful for assessing acute under-nutrition in adults, and alternative thresholds have been proposed (see Table C) (Collins 1996).

Table C: MUAC thresholds for diagnosing acute under-nutrition in famines

Classification	MUAC
Normal	≥185mm
Moderate acute under-nutrition	<185mm
Severe acute under-nutrition	<160mm

These thresholds were developed for use in situations of famine, where resources are likely to be scarce and primary under-nutrition is common. Primary under-nutrition develops when nutrient intake is insufficient to provide for normal physiological needs and, in adults, this is invariably due to lack of food. Secondary under-nutrition develops when an underlying disease process (eg, such as an HIV-related disease, TB, or cancer) increases metabolic demand and/or decreases food intake or utilisation. Neither BMI nor MUAC can differentiate between primary and secondary under-nutrition. It is important to note that primary and secondary under-nutrition are the result of different underlying pathophysiological processes and the functional significance of anthropometric indicators is also likely to differ (Collins et al 2000). Different thresholds (ie, different from those presented in Table C) have been used in programmes providing nutritional support to pregnant and lactating women, people living with AIDS, and the chronically sick. In these programmes, a threshold of 210mm is common. Table D presents revised thresholds suitable for diagnosing acute under-nutrition in non-emergency or chronic care situations.

Table D: Revised MUAC thresholds for diagnosing acute under-nutrition

Classification	MUAC
Normal	≥210mm
Moderate acute under-nutrition	<210mm
Severe acute under-nutrition	<185mm

There are problems associated with the use of MUAC as an anthropometric index in adults. These problems are discussed below.

There is, at present, little data on the relationship between MUAC and mortality and other functional measures in adults. Thresholds based on mortality risk cannot be presented with the same degree of certainty as is possible with children. The thresholds presented in Table C have, however, been used in several settings and, when combined with clinical signs, have been found to be more strongly predictive of mortality than BMI (Collins 1996; Collins and Myatt 2000). The thresholds presented in Table D are similar to those presented by other authors and have been shown to be associated with increased mortality and morbidity in chronically undernourished populations (Ferro-Luzzi and James 1996; Strickland and Ulijaszek 1992; Duffield 1998).

Using MUAC to assess adults may be affected by the redistribution of subcutaneous fat from peripheral to central areas of the body during ageing (Forbes and Halloran 1976; Stoudt et al. 1965; Borkan and Norris 1977; Noppa et al. 1980; Wang et al 1994; Strickland and Ulijaszek 1992; Rolland-Cachera et al 1991; Leiter and Marliss 1983; Norgan 1994; Mazariegos et al. 1994; Gallagher et al 1996; Forbes and Reina 1970). Age-specific MUAC thresholds may, therefore, be required when assessing older people.

Ethnic differences in MUAC have not been sufficiently studied to determine whether a single set of MUAC thresholds is appropriate for all ethnic groups. The evidence from children suggests that a single set of thresholds could be used for all ethnic groups (Myatt et al, 2006).

It is often asserted that, in terms of precision and accuracy of measurement, MUAC compares unfavourably with weight-for-height based indices such as BMI. Evidence supporting such assertions is, however, elusive. Research with children demonstrates consistently better intra-observer and inter-observer reliability for MUAC compared with weight-for-height based indices (Myatt et al 2006; Velzeboer et al.1983).

Summary

Currently available evidence indicates the following:

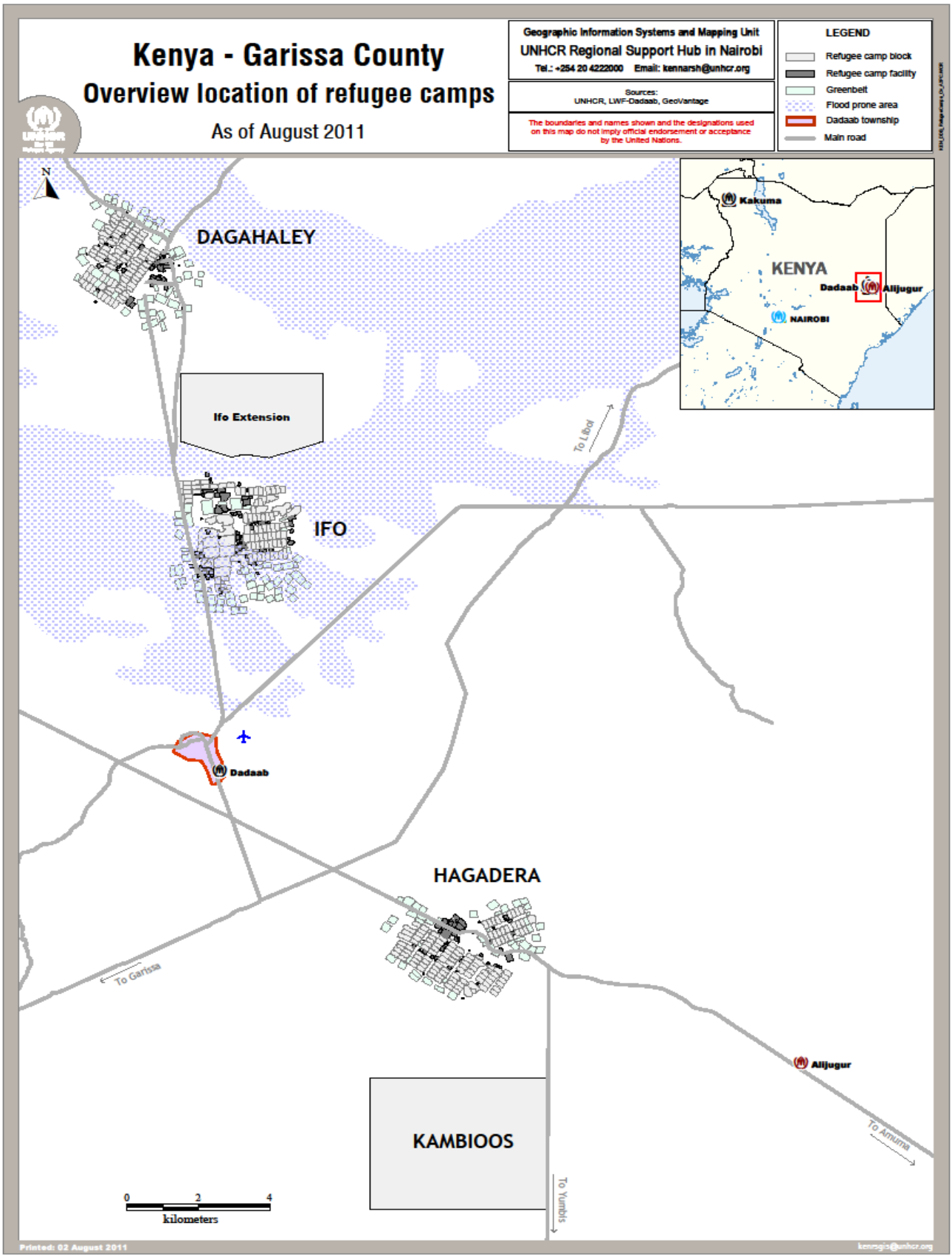
Attribute	BMI	MUAC
Can be used in oedematous cases	✗	✓
Can be used in pregnant women	✗	✓
Functional significance does **not** vary with age	?	✓
Functional significance does **not** vary with ethnicity	✗	✓
Feasible to measure in **all** older people	✗	✓
Suited to assessing individuals for case-finding	✗	✓
Suited to frequent screening of large populations	✗	✓
Not subject to large inter-observer and intra-observer error *	✗	✓

* Errors larger for BMI than for MUAC

To conclude: neither indicator is ideal, but the available evidence favours the use of MUAC. This is particularly true in Somali populations where BMI is biased downward by body shape.

Annex 2: Map of the camps

The survey was done in Dagahaley, Ifo and Hagadera.



References

Boelaert M, Davis A, Le Lin B, Michelet M, Ritmeijer K, Van Der Kam S, *Nutrition guidelines* (1st Edition), Paris, Médecins Sans Frontières, 1995

Borkan GA, Norris AH, "Fat redistribution and changing body dimensions of the adult male", *Annals of Human Biology*, 1977, 49(3), pp.495–514

Borrel A, *Addressing the nutritional needs of older people in emergency situations in Africa: ideas for action*, HelpAge International Africa Regional Development Centre, April 2001

Collins S, "The need for adult therapeutic care in emergency feeding programmes", *Journal of the American Medical Association*, 1993, 270(5), pp.637–8

Collins S, "The limit of human adaptation to starvation", *Nature Medicine*, 1995, 1(8), pp.810–14

Collins S, "Using middle arm circumference to assess severe adult malnutrition during famine", *Journal of the American Medical Association*, 1996, 276(5), pp.391–5

Collins S, Myatt M, Golden B, "Dietary treatment of severe malnutrition in adults", *American Journal of Clinical Nutrition*, 1998, 68(1), pp.193–9

Collins S, Myatt M, "Short-term prognosis in severe adult and adolescent malnutrition during famine: Use of a simple prognostic model based on counting clinical signs", *Journal of the American Medical Association*, 2000, 284(5), pp.621–6

Collins S, Duffield AE, Myatt M, *Adults: assessment of nutritional status in emergency-affected populations*, Geneva, Administrative Committee on Coordination/Subcommittee on Nutrition (United Nations) (ACC/SCN), July 2000

Centers for Disease Control and Prevention (CDC), "Mortality among refugees fleeing Somalia: Dadaab refugee camps, Kenya, July–August 2011", *Morbidity and Mortality Weekly Rep*ort, Atlanta, USA, August 26, 2011

Duffield A, "Anthropometry, morbidity and mortality in rural Sarawak", PhD dissertation, London School of Hygiene & Tropical Medicine, 1998

Feldesman MR, "Femur/stature ratio and estimates of stature in children", *American Journal of Physical Anthropology*, 1992, 87(4), pp.447–59

Feldesman MR, Kleckner JG, Lundy JK, "Femur/stature ratio and estimates of stature in mid- and late-Pleistocene fossil hominids", *American Journal of Physical Anthropology*, 1990, 83(3), pp.359–72

Ferro-Luzzi A, James WPT, "Adult malnutrition: simple assessment techniques for use in emergencies", *British Journal of Nutrition*, 1996, 75, pp.3–10

Forbes GB, Reina JC, "Adult lean body mass declines with age: some longitudinal observations", *Metabolism*, 1970, 19(9), pp.653–63

Forbes GB, Halloran E, "The adult decline in lean body mass", *Human Biology*, 1976, 48(1), pp.162–73

Friedman P, "Severe arm-muscle wasting: sign of lethal malnutrition in sick elderly men", *Nutrition*, 1991, 7(3), pp.223–6

Gallagher D, Visser M, Sepulveda D, Pierson RN, Harris T, Heymsfield SB, "How useful is body mass index for comparison of body fatness across age, sex, and ethnic groups?", *American Journal of Epidemiology*, 1996, 143(3), pp.228–39

Gassull MA, Cabré E, Vilar L, Alastrue A, Montserrat A, "Protein-energy malnutrition: an integral approach and a simple new classification", *Human Nutrition – Clinical Nutrition*, 1984, 38(6), pp.419–31

Heymsfield SB, McManus CB, Seitz SB, Nixon DW, Smith Andrews J, *Anthropometric assessment of adult protein-energy malnutrition*, Boston, Blackwell Scientific Publications, 1984

Hiernaux J, *La diversité humaine en Afrique Subsaharienne: recherches biologiques*, Brussels, Editions de l'Institut de Sociologie Université Libre de Bruxelles, Etudes Ethnologiques, 2000

Ismail J, Manandhar M, *Better nutrition for elderly people: assessment and action*, London, HelpAge International and the London School of Hygiene & Tropical Medicine, 1999

Keys A, *The biology of human starvation* (1st Edition), Minnesota, Minnesota Press, 1950

Leiter LA, Marliss EB, "Survival during fasting may depend upon fat as well as protein stores", *Journal of the American Medical Association*, 1982, 248, pp.2306–7

Leiter LA, Marliss EB, "Survival during fasting", *Journal of the American Medical Association*, 1983, 250(8), p.1026

Mazariegos M, Wang ZM, Gallagher D, Baumgartner RN, Allison DB, Wang J, Pierson RN, Heymsfield SB, "Differences between young and old females in the five levels of body composition and their relevance to the two-compartment chemical model", *Journal of Gerontology*, 1994, 49(5), pp.201–8

Mollinson PL, "Observation on cases of starvation in Belsen", *British Medical Journal*, 1946, 5, pp.4–8

Myatt M, Khara T, Collins S, "A review of methods to detect cases of severely malnourished children in the community for their admission into community-based therapeutic care programs", *Food and Nutrition Bulletin*, 2006, 27(3), S7–S23

Noppa H, Andersson M, Bengtsson C, Bruce A, Isaksson B, "Longitudinal studies of anthropometric data and body composition: the population study of women in Göteborg, Sweden", *American Journal of Clinical Nutrition*, 1980, 33, pp.155–62

Norgan NG, "Interpretation of low body mass indices: Australian aborigines", *American Journal of Physical Anthropology*, 1994a, 94(2), pp.229–37

Norgan NG, "Relative sitting height and the interpretation of the body mass index", *Annals of Human Biology*, 1994b, 21(1), pp.79–82

Norgan NG, "Population differences in body composition in relation to the body mass index" (Review Article), *European Journal of Clinical Nutrition*, 1994c, 48(S3), S10–S25

Norgan NG, "Body mass index and nutritional status: the effect of adjusting body mass index for the relative sitting height on estimates of the prevalence of chronic energy deficiency, overweight and obesity", *Asia Pacific Journal of Clinical Nutrition*, 1995, 4, pp.137–39

Ohlson MA, Biester A, Brewer WD, Hawthorne BE, Hutchinson MB, "Anthropometry and nutritional status of adult women", *Annals of Human Biology*, 1956, 28(2), pp.189–202

Olukoya AA, "Identification of underweight women by measurement of arm circumference", *International Journal of Gynaecology and Obstetrics*, 1990, 31, pp.231–5

Reeves SL, Varakamin C, Henry CJK, "The relationship between arm-span measurement and height with special reference to gender and ethnicity", *European Journal of Clinical Nutrition*, 1996, 50(6), pp.398–400

Rodrigues VC, Rao RSP, Lena A, "Utility of arm circumference as a screening instrument to identify women at nutritional risk", *Tropical Doctor*, 1994, 24(4), pp.164–6

Rolland-Cachera MF, Cole TJ, Sempé M, Tichet J, Rossignol C, Charraud A, "Body mass index variations: centiles from birth to 87 years", *European Journal of Clinical Nutrition*, 1991, 45(1), pp.13–21

The Sphere Project, *Humanitarian charter and minimum standards in humanitarian response*, The Sphere Project, UK, 2011

Steele MF, Mattox JW, "Correlation of arm-span and height in young women of two races", *Annals of Human Biology*, 1987, 14(5), pp.445–7

Steele MF, Chenier TC, "Arm-span, height, and age in black and white women", *Annals of Human Biology*, 1990, 17(6), pp.533–41

Stoudt HW, Damon A, McFarland R, Roberts J, Weight height and selected body dimensions of adults (1960– 1962), *Health Statistics Series 76–1074*, Washington, US Government Printing Office, 1965

Strickland S, Ulijaszek SJ, "Body mass index, ageing and differential reported morbidity in rural Sarawak", *European Journal of Clinical Nutrition*, 1993, 47(1), pp.9–19

Thompson DW, *On growth and form*, Cambridge, Cambridge University Press, 1942

UNHCR, *Guidelines for selective feeding: the management of malnutrition in emergencies*, Geneva, January 2011

Velzeboer MI, Selwyn BJ, Sargent F, Pollitt E, Delgado H, "The use of arm circumference in simplified screening for acute malnutrition by minimally trained health workers", *Journal of Tropical Pediatrics*, 1983, 29(3), pp.159–66

Wang J, Thornton JC, Russell M, Burastero S, Heymsfield SB, Pierson R, "Asians have lower body mass index (BMI) but higher percent body fat than do whites: comparisons of anthropometric measurements", *American Journal of Clinical Nutrition*, 1994, 60(1), pp.23–28

Winick M, *Hunger disease: Studies by the Jewish Physicians in the Warsaw Ghetto*, John Wiley and Sons, New York, 1979

Zimmer R, Weill J, Dubois M, "The nutritional situation in the camps of the unoccupied zone of France in 1941 and 1942 and its consequences", *The New England Journal of Medicine*, 1944, 230(11), pp.303–14

Older people are speaking out

we're listening

HelpAge International
PO Box 70156
London WC1A 9GB, UK

3rd Floor, Tavis House
1-6 Tavistock Square
London, WC1H 9NA, UK

info@helpage.org
www.helpage.org

Sign up for our eNewsletter at: www.helpage.org/enewsletters