The End Point: Example of a Good Survey Report

This chapter serves to conclude with how important and crucial is to undertake an accurate assessment and present the findings in a comprehensive and standard manner. Accurate assessment is key to effective and appropriate interventions. It is crucial to present your findings in a way that reflects following issues:

- Have the objectives been clearly stated?
- Methodology including sampling is appropriate?
- WFP strategic priority indicators reported (+ other standard indicators)?
- Causes of malnutrition and mortality included?
- Are confidence limits reported and derived correctly?

For your easy reference we have included an example of a good survey report in order to provide guidance and reference when writing or reviewing a report. The checklist mentioned in Chapter 4 has been applied to the report “Nutrition Survey in Saharwi Refugee Camps-Tindouf, Algeria” to highlight the strengths of the survey and the report.

### Application of checklist to Tindouf, Algeria survey report

**Objectives**
- Have the objectives been stated clearly and are they realistic?

**Survey planning & implementation issues**
- Have the survey area and target group been specified?
- Has the questionnaire been translated into local language and back-translated into the original language?
- Has the questionnaire been piloted in the survey area (but with people who were not part of the sample)?
- Has the training been long enough (minimum 3-5 days depending on background of personnel)?
- Were enough qualified supervisors available to assure quality of measurements and interviews?
- Were all team members trained in the same way?
- Were the interviewers able to read questions in a standardized way from the questionnaire?

**Survey methodology**
- Has the sampling frame been adjusted for recent population movements?
- Was the sample representative of the target population, i.e., nobody was left out in the sampling approach?
- Has the sample size calculation been described in detail, including sample size calculations that are based on different outcomes?
- Is the sample size large enough for appropriate precision? If the sample size calculation has not been described, did the survey follow international standards, i.e., 30 x 30 cluster sample for nutrition and mortality surveys? (see section on sample size in Chapter 3)
Survey Reporting

✓ Has the proportion of severely malnourished children with oedema been reported?
✓ Are case definitions provided, and do they meet international standards?
✓ Was software used for analysis that allows adjusting for cluster survey design?
✓ Have weight-for-height Z-scores been used to measure malnutrition?
✓ Has oedema been included in the definition of severe acute malnutrition?
X Has the survey questionnaire been provided in the report?

Results

✓ Do the results reflect the objectives of the survey?
✓ Does the report contain standard information (i.e., survey area, date of survey, population, survey conducted by, acute malnutrition, acute severe malnutrition, oedema, measles immunization coverage, vitamin A distribution coverage, women’s anthropometric status, crude mortality, under-5 mortality)?
✓ Have 95% confidence intervals been reported with prevalences and rates?
✓ Does the report provide detailed information and discussion of causes of malnutrition and mortality?

Discussion

X Does the report include a discussion of results, including limitations of the survey?
✓ If results are compared to a baseline, is the quality of the baseline information discussed (e.g., organization that conducted assessment, methods, one or multiple years, did those years qualify as baseline)?

Conclusions

✓ Are conclusions based on results?
✓ Are conclusions realistic (e.g., a solid interpretation of what the data can provide and what it cannot)?

Recommendations

✓ Are recommendations based on science and best practices and not driven by politics?
✓ Are the recommendations useful, i.e., could they have been made without the study?

ANTHROPOMETRIC AND MICRONUTRIENT NUTRITION SURVEY

Sahrawi Refugee Camps
Tindouf, Algeria
September 2002

A Collaborative Survey Conducted by:

UNITED NATIONS HIGH COMMISSIONER FOR REFUGEES
WORLD FOOD PROGRAMME
CENTRE FOR INTERNATIONAL CHILD HEALTH INSTITUTE OF CHILD HEALTH
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Anthropometric and Micronutrient Nutrition Survey, Saharawi Refugee Camps, Tindouf, September 2002
Summary

An anthropometric and micronutrient, two stage cluster survey was performed in Tindouf refugee camps from 12th - 22nd September 2002, with the aim of assessing the prevalence of malnutrition and its probable causes. The survey was funded and initiated at the request of UNHCR and WFP and carried out by their implementing partners in collaboration with the Saharawi Ministry of Health.

Four population groups: children (6-59 months), adolescents (10-19 years), women (15-45 years), and infants (0-5 months) were included in the survey. Anthropometric measurements were taken on children and infants and infant feeding practice was measured using a 24-hour recall questionnaire. Peripheral blood haemoglobin was measured in children and women and iron status was assessed in children by measuring the levels of serum transferrin receptor (sTfR). Urinary iodine levels were determined in adolescents and visible goitre was assessed by clinical examination. In addition, the general ration distribution records were analysed for nutritional content.

Acute global malnutrition (wasting and/or oedema) was found in 10.6% (95% CI, 7.7 - 13.5) of 6-59 month old children when assessed using weight for height Z-scores (WHZ < -2), and 0.5% (95% CI, 0.4 - 0.6) when using weight for height % of the median (WHM < 85%). No cases of nutritional oedema were detected. Severe wasting was found in 2.2% (95% CI, 1.3 - 3.1) and 0.7% (95% CI, 0.2 - 1.2) when using WHZ and WHM respectively. Chronic malnutrition (stunting, HAZ < -2) was present in 12.6% (95% CI, 9.7 - 16.0). The mean mid upper arm circumference (MUAC) in children 1-5 years was 14.8 cm (95% CI 14.5 - 14.6).

In infants less than 6 months, (wasting and/or oedema) was found in 6.1% (95% CI, 3.0 - 9.4) of when assessed using weight for height Z-scores (WHZ < -2), and 0.9% when using weight for height % of the median (WHM < 80%). No cases of severe acute malnutrition were found. Chronic malnutrition (stunting, HAZ < -2) was present in 2.3% (95% CI, 0.0 - 6.3).

No targeted selective feeding programmes are currently operational so programme coverage was not assessed.

Breastfeeding was widely practiced with 97.3% (95% CI, 96.3 - 98.4) of mothers having fed their infants/young children at some point in their lives. However, only 12.7% (95% CI, 8.8 - 16.7) initiated breastfeeding within one hour of birth and the prevalence of exclusive breastfeeding in infants < 5 months was very low at 2.3% (95% CI, 0.8 - 3.8). Timely introduction of complementary infant/feeding food was also low with only 58.1% (95% CI, 49.4 - 66.2) of mothers introducing appropriate foods between 6 - 10 months, 26.7% (95% CI, 17.5 - 36.7) of mothers fed infant formula to their infants before 6 months of age and there was also widespread feeding of other liquids and foods in this age group. The prevalence of diarrhoea in infants/children, as reported by the mother, was 22.3% (95% CI, 16.6 - 27.8), with a pronounced age trend peaking at 6-12 months. In agreement with international health recommendations, 90.7% (95% CI, 75.6 - 97.2) of mothers continued to feed their children during episodes of diarrhoea.

Vaccination coverage in children of 12-23 months was determined by vaccination card record. 76.8% (95% CI 69.8 - 83.4) possessed a vaccination card and vaccination coverage was 78.6% (95% CI 69.4 - 87.1) for BCG, 77.0% (95% CI 68.4 - 85.6) for DPT3 and only 66.7% (95% CI 58.3 - 75.1) for measles.

Anaemia (Hb<11.0 g/dl) was present in 30.3% (95% CI, 26.7 - 34.1%) of children and there were no cases of severe anaemia (Hb<7.0 g/dl). In non-pregnant women, anaemia (Hb<12.0 g/dl) was found in 47.5% (95% CI, 38.5 - 56.5) and severe anaemia (Hb<9.0 g/dl) was found in 44.6% (95% CI, 32.1 - 57.6). The mean level of haemoglobin was 11.5 g/dl (SD 1.8) in children and 11.0 g/dl (SD 2.0) in non-pregnant women.

Serum transferrin receptor (sTfR) levels were measured in children and 34.1% (95% CI 27.4 - 41.7) were found to be iron deficient, based on a cut-off of >8.5 µg/ml. Iron deficiency was
strongly associated with anaemia: $\beta = 2.07$ (95% CI: 1.8 - 2.4), and is therefore likely to account for a significant proportion of this condition.

There is a wide range of risk factors for anaemia and it was not possible to assess all of these in detail during the current survey. However, observation and key informant interviews confirmed the widespread and frequent consumption of tea by this population. Data collected on infant feeding confirms that this begins at an early age. Due to the established role of tea in reducing the bioavailability of iron, it is likely that this is a major factor in the measured iron deficiency.

Urinary iodine excretion in adolescents was measured using the Sandell-Kolthoff reaction and found to have a median of 1200 µg/L with a range of 500 - 3500 µg/L. This level is extremely high compared with the upper limit of 300 µg/L for normal excretion. All four camps had high levels ranging from 760 µg/L in Dhakka to 1754 µg/L in El Aun. Visible goitre was also assessed in adolescents and found to have a prevalence of 7.1% (95% CI: 3.6 - 10.7).

Examination for clinical signs of scurvy and rickets was performed on children aged 6-59 months (n=843). Two cases showed signs of possible rickets and 1 case showed signs of possible scurvy. It should be noted that this sample size is only large enough to reliably detect severe public health problems for these conditions and significant problems at a lower level of seriousness might remain undetected.

Analysis of the general ration food distribution records for the previous 6 months revealed large variations in the distribution of commodities with serious problems of erratic supply. The micronutrient and mineral content of the ration is variable with good levels of vitamin A, thiamine and niacin but low levels of vitamin C, calcium and riboflavin. These nutrients are seen to remain consistently low with an average of only 38%, 70% and 78% of the minimum requirement being supplied during the last six months.

Recommendations for action based on the findings of this survey are provided following the discussion.

---

1 Vitamin A analysis from the 2001 survey is being conducted separately by the National Research Institute for Food and Nutrition (NIRAM) in Khartoum and results will be made available by them as soon as they are completed.
Introduction

A Joint Food Assessment Mission involving donors and implementing partners was conducted within the Saharawi refugee camps in February 2002. The report from this mission recommended that UNHCR and WFP assess the needs of vulnerable groups within the refugee population. Objectives of such an assessment would include:

- Determine the global malnutrition rate
- Assess the prevalence of micronutrient deficiencies
- Evaluate feeding practices of young children
- Recommend actions necessary to redress the situation

In line with this recommendation and normal operational procedures, UNHCR organised a nutrition survey in collaboration with WFP and the relevant Saharawi Ministries. UNHCR Genève contracted the Institute of Child Health (ICHI) to implement the survey, which was conducted in collaboration with a WFP nutrition consultant. ICHI made a preliminary field visit to the Saharawi refugee camps during June 2002 to discuss the implementation of the nutrition survey. Following meetings with a wide range of stakeholders (including WFP, ECHO, Red Crescent Societies, and relevant Saharawi ministries) it was agreed that the survey should be carried out during September 2002.

The preliminary survey report was issued in October 2002. This final report contains additional data from the laboratory analysis of biological samples, infant feeding and food distribution monitoring data collected during the survey.

Background

The Saharawi refugees have been present in camps in Tindouf, Southwest Algeria, since 1975 when they left Western Sahara. Since that time, the Government of Algeria has supplied relief aid and UNHCR has also been providing a protection and assistance program. WFP has supplied food aid since 1995 and a range of donors and bilateral arrangements currently support the refugee population. The major food donors include donations targeted via WFP and direct donations from ECHO.

The Saharawi refugee camps exist in a harsh desert environment characterized by high temperatures, low rainfall and little productive soil. However, various income generation and diet diversification activities do exist within the camps. These include a poultry farm and pilot livestock and horticultural projects. There is also at least one cooperative enterprise manufacturing a range of handicraft products although marketing opportunities are in need of strengthening. Refugees commonly undertake foreign visits for education and other purposes. However, the contribution that any of these activities make to food security and diet diversification for the whole population is unclear as no formal food security or household food economy assessments have been performed. There is a widespread assumption of food aid dependence.

As stated above, the food rations that are distributed within the camps are derived from a number of donors including WFP and ECHO. By the standards of most refugee operations in recent times, the planned general ration appears to be fairly well diversified and adequate in energy. However, humanitarian agencies use a population figure of 155,430 for service and ration planning and although there appears to be no independent, real time updating of this figure, it has been estimated to be as high as 165,000. In addition, although some food distribution monitoring is undertaken there is no regular reporting of these activities and there is no weighing of the food basket (on site distribution monitoring). Without these data it is hard to make any firm objective judgement on the equity or adequacy of the distribution although anecdotal evidence suggests that the distribution is equitable and there have been no reports of distribution problems of this nature. An additional critical problem is the precarious nature of the food pipeline and unpredictable delays in deliveries.

 However, latest data from the Saharawi Red Crescent give a population figure of 154,878.
A number of previous nutrition surveys have been conducted in Tindouf and these include those conducted by CISP in 1997 and 2001. Key findings from these surveys included:

- Anaemia was highly prevalent in children and women of childbearing age and, although it had decreased between 1997 and 2001, it remained a serious problem.
- Global acute malnutrition of children 6-59 months had increased between 1997 and 2001. In 2001 a severe malnutrition rate of 4.5% was found. This finding was of particular and urgent concern given the lack of a therapeutic feeding programme in the camps.
- Infant feeding practices were particularly poor and these may have had a major impact on child malnutrition.
- Obesity in women of fertile age had increased markedly between 1997 and 2001.

As well as conducting two comprehensive surveys, CISP, with support from UNHCR, have also initiated various micronutrient interventions including a trial of supplementary feeding and me-hemoglobin treatment of children, and supplementary feeding of pregnant women. They also designed a nutrition surveillance system, but it is not clear what the current coverage and effectiveness of this programme is. There is currently no routine vitamin A supplementation programme, although UNHCR has implemented a one-off distribution as part of a WHO mass polio immunisation campaign during the summer of 2002 and the Saharawi MOH has planned to carry on vitamin A supplementation as a routine activity. Iron tablets are reportedly distributed through ANIC clinics although no data is available on programme effectiveness. Anecdotal reports indicate that coverage and compliance are likely to be low.

Coeliac disease is known to be a problem amongst children in the Saharawi population and a previous survey has reported a prevalence in the child population of about 5%. The NGO COSPE is currently providing diagnostic and education services for patients but it is reported, anecdotally, that the requirement for special feeding products for this group of patients is difficult to meet.

There appears to be a lack of a functioning health information system and indicators such as the crude mortality rate and under five mortality rate are not available. Likewise, no quantitative information on infectious disease prevalence is available. These information gaps have made a full appraisal of the health and nutrition situation in the camps impossible. They also limit the interpretation of the results of the current survey as described below.

Survey Objectives

A preliminary visit was conducted by ICH, the UNHCR implementing partner, to assess the need and feasibility of providing technical support for a nutritional survey to be conducted in the Saharawi refugee camps, Tindouf. Based on these discussions it was decided that the survey should combine a conventional anthropometric survey of child malnutrition with an assessment of micronutrient malnutrition. The TOR for the survey were issued by UNHCR, Algeria and are included as annex 1.

Following detailed discussions with key informants and a variety of stakeholders, specific survey objectives were identified. This survey is designed to complement, update, and build on the useful data obtained during the two previous surveys conducted by CISP. Adult malnutrition/obesity and other aspects have been well described in these surveys and are unlikely to have changed significantly in the last year so were not scheduled for the 2002 survey. The work on infant feeding during the 1997 survey indicated serious cause for concern and it was intended to confirm these findings by using a larger sample size, so as to provide a baseline for any possible future intervention work. The objectives of the survey were therefore:

1. Determine the prevalence of global and severe acute malnutrition
2. Investigation of the aetiology of anaemia by measurement of haemoglobin and iron status
3. Measurement of iodine status
4. Assessment of clinical signs for goitre, anaemia and rickets
5. Establish baseline information on infant feeding practices
6. Build capacity in nutrition survey design and implementation

Methods

Staff training and team organisation
All survey team members were Saharawi refugee staff with the exception of one UNHCR Algerian staff member. Suitable staff were identified by the Saharawi Ministry of Health. Staff training was conducted over 4 days prior to the survey and covered the following areas:

- Survey methodology
- Sample selection
- Anthropometry
- Rationale and importance of looking for micronutrient deficiencies in a population
- Recognition of signs and symptoms for micronutrient deficiencies
- Correct recording of information
- Correct methodology for testing and collection of peripheral blood and urine samples
- Overview of the treatment of severe malnutrition

Practical training sessions were held on anthropometry and sample collection and volunteer children were used to provide practice. Designated team members were responsible for questionnaire administration, sample collection, and anthropometry. Questionnaire staff were selected during the training session on the basis of accuracy and written legibility using a mock interview test. Sample collection staff were qualified doctors, nurses or laboratory technicians. Each team had an agreed leader who was responsible for the organisation of the teamwork, household selection, and collation of the questionnaires and samples.

A pilot survey was conducted prior to the start of the full survey during which teams gained experience in selection of cluster staff points, use of questionnaires and sample taking. During the survey, regular supervision and support to the field teams was also provided by the two international nutritionists who spent much of their time working with teams in the field.

Target Population Groups for the Survey

Table one shows the different population groups that were sampled with in each cluster and the measurements taken.

Table 1 - Target Population Groups and Procedures

<table>
<thead>
<tr>
<th>Population Group</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants (0-5 months)</td>
<td>Questionnaire, weight, height, MUAC</td>
</tr>
<tr>
<td>Children (5-59 months)</td>
<td>Questionnaire, weight, height, MUAC, clinical examination for rickets and scurvy, haemoglobin measurement, peripheral blood collection, dTRR analyses for determination of iron status</td>
</tr>
<tr>
<td>Adolescents (10-19 years)</td>
<td>Questionnaire, clinical examination for goitre, urine sample collection</td>
</tr>
<tr>
<td>Women (15-45 years)</td>
<td>Questionnaire, haemoglobin measurement</td>
</tr>
</tbody>
</table>

Sample Size Calculation

The following calculations were carried out using EpiTable in EpInfo 6.04d to determine the required sample sizes for the different aspects of the survey.

Global acute malnutrition (GAM, wasting) in children 6-59 months

Based on the expected 6-59 month global malnutrition figure of 13.2% (obtained during last years survey), a required precision of +/- 5%, 95% confidence (5% alpha risk) and an expected design effect of 2, the minimum sample size required is 202 children (+/5% refusal) = 308. However, due to sample size requirements for other parameters given below and the requirement to detect small changes from previous surveys a full 30x30 sample size of 900 will be taken.

Anthropometric and Micronutrient Nutrition Survey, Saharawi Refugee Camps, Timbuktu, September 2002
Infant feeding indicators in children 0 - <24 months

To measure the prevalence of continued breastfeeding at 12 and 24 months a sample of 34 infants aged 20-23 months would be required for each age. This assumes a prevalence of 30% and a desired precision of ± 5%. This sample size requirement should be met from within the OAM sample if a standard sample size of 600 were used.

A separate sample of 176 (150 + 10% refusal) 0 - < 6 month infants was aimed for in addition to the 6-50 month children (i.e. 6 per cluster) so as to allow for the measurement of exclusive breastfeeding. This assumed that the true prevalence of exclusive breastfeeding was 5% and that we wished to detect an improvement of 10 percentage points following any subsequent intervention with an alpha risk of 5% and 80% power. In reality it proved difficult to achieve this required sample size due to the apparently low birth rate and survey time constraints.

Iodine status

Median urinary iodine concentration is usually measured in a sample of 40 or more school aged children. As it was hypothesised that any iodine deficiency or excess problem would be associated with a common water supply, the population was stratified into the three regions receiving water from the same boreholes, i.e. Dharak, Smara and Auswerd, combined, and El Airun. A total sample size of 120 was required and the urine sample collection within each cluster was adjusted so that a sample of 40 would be obtained within each of the 3 regions or strata. Therefore, within each cluster in Dharak and El Airun 5 urine samples were required. Within each cluster in Smara and Auswerd 3 samples were needed.

Anemia

The sample size calculation for haemoglobin measurement was 210 children and women (i.e. 7 of each population group per cluster). This sample size is based on an assumed prevalence of 4%, a desired precision of 10%, a design effect of 2, and 10% refusal.

Sampling

Households were selected based on a standard two stage 30 cluster sampling method. Each of the four camps is divided into 6-8 administrative units called Dana. These were used as sections for the allocation of clusters by PPS [see Annex 2] using population figures obtained from the Saharawi Red Crescent (CRC). The population figure used in the cluster selection does not include the school-based population given as being resident in the boarding schools. As these schools were on holiday during the survey and there was no evidence that pupils would be selected preferentially from particular camps this should not have affected the probability of cluster allocation to sections.

Within each section the Dana health dispensary lies approximately at the centre. This was used as the point for spinning of a bottle to identify a random direction. Following this direction, all the houses lying on a straight line between the Dana dispensary and the boundary of the Dana were counted. A random number was then picked from a table to identify which of these houses would be the start point for the cluster. Subsequent households were selected by exiting the household and moving to the next dwelling on the left.

Households were defined as people sharing the same tent and food. Within each household, all individuals of the appropriate age groups were interviewed and measured. Households were selected within each cluster until the required numbers from each age group was obtained. All eligible subjects were invited and encouraged to take part. If any refused or absent then they were not replaced in the sampling plan. Subjects who were reported to be in health centres or hospitals were located for interviewing and measurement. If a dwelling was empty neighbours were asked about the normal occupants. If reliable information was obtained, eligible individuals from within these households were included in the sample frame and not replaced. Time did not permit re-visiting to locate absent family members.


*It should be noted that no independent verification of beneficiary numbers has been undertaken since July 2000.

Data Collection

All questionnaire, anthropometry data and biological sample collection was performed in the household.

Measurement of Haemoglobin

Measurement of haemoglobin was performed directly in the household using a portable photometer ‘Hemocue B-hemoglobin’ Photometer9, utilising the azidemethemoglobin principle. Peripheral blood collection was collected from a finger prick made using a safety lancet (Hemocue). The first drop was allowed to form and wiped away using tissue paper. The second drop was transferred into a Hemocue cuvette for the measurement of haemoglobin. The cuvette was filled from one drop using a continuous action and any blood was wiped away from the faces of the cuvette before immediate insertion in to the photometer.

Table 2 shows the cut off values used to define anaemia in this study. It should be noted that a number of different cut-off values are used in surveys and routine work. The ones used here are based on those recommended by WHO but differ slightly from those used in previous surveys of the Saharanai camps by CBSP.

Table 2 - Cut-off Points for Defining Anaemia

<table>
<thead>
<tr>
<th>Categories of Anaemia</th>
<th>Total (Haemoglobin levels (g/dL))</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children 6 - 59 months</td>
<td>&lt;11.0</td>
<td>10.9 - 11.0</td>
<td>9.9 - 7.0</td>
<td>&gt; 7.0</td>
</tr>
<tr>
<td>Adult females ≥10 years</td>
<td>&lt;12.0</td>
<td>11.9 - 12.0</td>
<td>10.9 - 8.0</td>
<td>&gt; 8.0</td>
</tr>
<tr>
<td>Pregnant Women</td>
<td>&lt;11.0</td>
<td>10.9 - 11.0</td>
<td>9.9 - 7.0</td>
<td>&lt; 7.0</td>
</tr>
</tbody>
</table>

Collection of Dried Blood Spots for Biochemical Analysis

The third and forth drops of peripheral blood were transferred onto strips of Whatman filter paper that had been prepared by cutting Guthrie cards into the dimensions of a microscope slide. The paper strips were labelled and stored in a microscope slide box at 0·5°C until the end of the day. Approximately 7 card strips were then transferred into a zip-lock plastic bag together with a sachet of desiccant and a humidity indicator card10, and frozen at -10 - -15°C. Humidity was maintained below 30%.

Collection of Serum for Biochemical Analysis

Approximately 200 μl of peripheral blood was then collected from the same or a second finger stick into a serum separation tube (SST) Microtainer11. This was then labelled and stored on ice in a vaccine container at 4·8°C until centrifugation at the end of the day. Following centrifugation, the serum was frozen in the same tube at between -10 and -15°C in a Celsius®. The temperature was maintained between -10 and -15°C and shipped to London on ice for storage at -80°C. Samples were stored at -80°C until analysis12.

Measurement of Serum Transferrin Receptor (sTfR)

For analysis of iron status the concentration of serum transferrin receptor (sTfR) was measured. Analysis of sTfR concentration was performed using a sandwich based enzyme linked immunosorbent assay (ELISA) kit purchased from Ramco Laboratories Inc. The kit contains a plastic plate and in which there are 96 microwells. The microwells are coated with

---

1 HemoCue AB, Box 1304, SE-382 23 Angelholm, Sweden.
3 Values are given for a population living at sea level. To correct for altitude, add 1.0 g/Litre for each 100m above 1800m altitude, up to 3000m.
4 Medispec Technologies Inc.
5 Beckon Dickinson.
6 Due to problems with freezer capacity in Diksha hospital samples collected in this camp were stored at 0-9°C for up to 4 days before freezing.
7 Revco scientific INC, Model IU-2164T.

pooled antibodies which recognize soluble human sTfR. The sTfR captured in these wells during the assay is quantified by the addition of a monoclonal antibody, which recognizes soluble human sTfR and is labelled with the enzyme horseradish peroxidase. On addition of tetramethylbenzidine (a substrate for horseradish peroxidase) a blue colour is produced, which on the addition of acid, turns yellow. The optical density of the solution is then measured with a microtitre reader at wavelength 450nm and is proportional to the concentration of sTfR in the sample. Quantification is undertaken by comparison with a standard curve prepared on the same microtitre plate. The normal range of sTfR is given in Table 2.

### Table 3 - Iron Status - Serum Transferrin Receptor (sTfR)

<table>
<thead>
<tr>
<th>sTfR normal range (μg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 - 5.5 μg/ml</td>
</tr>
</tbody>
</table>

### Collection of Urine and Analysis of Iodine

The survey teams collected urine from consenting adolescents in 100 ml collection cups or directly into collection tubes. The urine was transferred from the collection cups into a 10 ml Monovette urine collection tube or 5 ml Nalgey cryovial and labelled with the appropriate identification number of the adolescent. Urine tubes were stored in plastic bags at 0 - 5 Celsius until the end of the day when they were transferred into a freezer for storage at -5 - -15°C.

Urine iodine was measured according to routinely used techniques. An AutoAnalyzer method was used with automatic handling of the samples, digestion with strong acid, and quantification with the Sandell-Kolhoff colorimetric reaction. This method iodine acts as catalyst for the oxidation-reduction reaction between ceric ammonium sulfate and anisoceric acid. The cut-off values for urinary iodine excretion are given in the table below.

### Table 4 - Adolescent Population Urinary Iodine

<table>
<thead>
<tr>
<th>Degree of intake</th>
<th>Population Median Urinary Iodine (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive Intake</td>
<td>≥ 300</td>
</tr>
<tr>
<td>Normal Intake</td>
<td>100 - 200</td>
</tr>
<tr>
<td>Mild deficiency</td>
<td>50 - 99</td>
</tr>
<tr>
<td>Moderate deficiency</td>
<td>20 - 49</td>
</tr>
<tr>
<td>Severe deficiency</td>
<td>&lt; 20</td>
</tr>
</tbody>
</table>

### Anthropometric Measurements

Anthropometric measurements were taken on children and infants in the household. Weight was determined using an electronic digital scale (SECA 885) measuring to the nearest 100 grams for children or the nearest 20 grams for infants. Scales on the underside of the scales were sealed with tape to prevent ingress of sand and dust. Scales were checked daily for reliability using a known weight.

Children (5-59 months) were weighed either standing alone or while being held by a carer or member of the survey team. Scales were tared to zero before the child’s weight was determined. Infants were placed on a detachable weighing tray for weighing. Children and infants were weighed either naked or, if the child or parent preferred, wearing one form of clothing such as a shirt or underwear. Weighing a selection of these clothes confirmed that they weighed less than 100 grams.

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1. Data Sheet. Roche Laboratories Inc. Texas, USA.
2. Nunn.
Height and length was taken using a Short Infant-Child-Adult Height Board\(^2\) to the nearest mm. Children and infants less than 24 months old were weighed lying down while children from 24-59 months were measured standing.

Mid upper arm circumference (MUAC) was taken using a TALC MUAC tape to the nearest mm\(^2\).

**Collection of Questionnaire Data**

Four separate questionnaires (data collection forms) were developed and used for infants, children, adolescents and women. The questionnaires were formulated in English, translated into Spanish and then field-tested and revised prior to use in the survey. Questions were addressed to the subjects in Arabic. All survey staff conducting the interviews were native Arabic speakers and fluent in Spanish.

Age and date of birth data was collected from vaccination cards for infants and children and by verbal recall for adolescents and women. For 3 children the date of birth was not obtainable from the vaccination card and age was taken from parental recall. The interviewers used a calendar sheet to determine age.

Infant feeding data was collected using the internationally recommended 24-hour recall method\(^3\). Vaccination history was taken from vaccination cards only and verbal reports were not accepted.

**Assessment of Clinical Signs of Nutritional Deficiencies**

Training was provided on the specific signs that were measured during the survey using photo cards. Medical doctors or nurses in the survey teams performed the assessments, which were conducted on children (oedema, rickets, scurvy) and adolescents (goitre).

Visible goitre was assessed as an indication of iodine deficiency or excess. While total goitre prevalence is often used as an indicator in surveys, the difficulties in ensuring reliable detection of palpable goitre makes this a difficult parameter to measure in routine nutrition surveys. For visible goitre, a cut-off of 10% has been proposed as an indicator of a severe public health problem\(^4\).

Clinical rickets was assessed by looking for bowlegs and costo-chondral bending (rachitic rosary). Scurvy was assessed by examining for bleeding gums and peri-articular haemorrhage on the arms and back of the legs.

Bipedal pitting oedema was assessed by placing thumb pressure on to both feet of children and infants for a period of 3 seconds. After releasing the pressure, the presence or absence of an indent was noted.

**Qualitative data collection**

Time did not permit the holding of focus group discussions and qualitative data collection was limited to key informant interviews and observation. Key informants included medical doctors, mothers of infants and children and officials of the Sahrawi MOH.

**Data Management**

Data was entered and stored in 4 separate data files corresponding to the different age groups. Each individual interviewed during the survey was assigned a unique ID number based on their cluster, household, individual number and age group (e.g. 02-10-02-02). Epwin v6.04d was used for data entry, validation, and cleaning.

Epwin v6.04d and SPSS v11.0 were used for data analysis and Excel for file interchange and graphing.

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\(^2\) Short Productions, USA
\(^3\) A full set of anthropometric and other equipment was purchased for the survey and shipped to Algeria. This equipment is now in storage at the UNHCR SD in Tripoli where it is available for future survey work.
Age was calculated by EpiInfo using the formula: Age on months = (date of interview-date of birth)/365.25*12. The difference in calculated ages and recorded ages was determined and discrepancies between the two were resolved during data cleaning.

Ethics and Informed Consent
The aims and objectives of the survey were discussed and agreed with members of the Sahrawi leadership (Ministry of Health, Ministry of Cooperation, Women’s Union etc.) Information about the survey was disseminated before commencement of the survey by the Sahrawi leadership.

During the survey, when teams arrived at a household they first explained the purpose of the survey using an information sheet translated into Arabic. If agreement was given the team then entered the household sitting area within a tent or solid building. For questionnaire administration, weight, height, and MUAC measurements verbal consent was obtained. For sample collection, written consent was obtained from the subject, in the case of women or adolescents, or from the mother for children aged 0-59 months.

Individuals were able to be measured for anthropometry but decline sample collection if they so wished. All records collected during the survey were considered confidential and were not stored with name or address identifying data.

The English version of the information sheet used in the survey is given in Annex 5.

Implementation Schedule
A preliminary visit was conducted by the ICH in June 2002 during which agreement and provisional planning for the survey was undertaken. The ICH and WFP nutritionists arrived in Algiers at the start of September and travelled to Tindouf on the 3rd and 4th of September. A detailed schedule of the survey work undertaken in Tindouf is provided in annex 3.

Logistics
UNHCR Tindouf and the Sahrawi NCH provided transport during training and survey periods. The Nursing School provided training venue and accommodation for the team during the training. Accommodation for the survey teams was provided by the Warshaya administration while in the camps.

Results
Data was collected over 11 days from 12th to 22nd September 2002. The survey was conducted on consecutive days and included two Fridays. Table 5 summarises the number of people sampled during the survey in the different population groups and their ages and gender.

A total of 231 eligible women were sampled of which one refused to participate and 2 were absent from the household at the time of the survey. Data was therefore collected on 228 but after ages were calculated from reported birth dates during analysis, only 223 fell within the desired age range of 15-45.

A total of 603 adolescents were sampled of which 3 refused to participate, 12 were absent from the household and 3 were later found to be outside the desired age range. Data was collected and analysed on the remaining 598. It is interesting to note that the higher ages of 16-18 are under represented in comparison to younger age groups. The gender distribution for adolescents is also biased in favour of females. This may reflect the demographic composition of the camps or be due to some unknown selection bias. However, in terms of goitre and urinary iodine measurements it is unlikely to bias the results.

A total of 907 children were sampled during the survey of which 13 were absent from their household. Consent refused consent for 9 children to participate in the survey. In addition, agreement for blood collection from two children was refused but consent was obtained for them to participate in questionnaire and anthropometric data collection. Three children were found to be out of the desired age range during analysis and data was therefore excluded. One child was excluded from analysis due to missing data.
Anthropometric and questionnaire data was therefore analysed from 881 eligible children and blood samples were taken from 204 for analysis of haemoglobin.

Ninety-two infants were sampled and data was collected from 91 participants.

Table 5 - Characteristics of the population sample groups

<table>
<thead>
<tr>
<th>Population Group</th>
<th>Eligible Age Range</th>
<th>N</th>
<th>Actual Age range</th>
<th>Mean Age</th>
<th>Median Age</th>
<th>% Male</th>
<th>% Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants</td>
<td>0 - 5 months</td>
<td>87</td>
<td>0 - 6</td>
<td>2.7</td>
<td>2.8</td>
<td>42.9</td>
<td>57.1</td>
</tr>
<tr>
<td>Children</td>
<td>6 - 59 months</td>
<td>881</td>
<td>6 - 59</td>
<td>32.6</td>
<td>33.0</td>
<td>49.0</td>
<td>50.1</td>
</tr>
<tr>
<td>Adolescents</td>
<td>10 - 19 years</td>
<td>550</td>
<td>10 - 19</td>
<td>13.4</td>
<td>13.0</td>
<td>48.0</td>
<td>52.0</td>
</tr>
<tr>
<td>Women</td>
<td>15 - 45 years</td>
<td>325</td>
<td>14 - 45</td>
<td>29.5</td>
<td>29.0</td>
<td>-</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Anthropometry in 6-59 month children

The age and sex distribution of children included in the anthropometric and questionnaire surveys is shown in table 6. There are no significant differences in the age or sex distribution of the subjects (p>0.05) although fewer girls in the eldest age category were included in the sample.

Table 6 - Age and Sex Distribution of 6 - 59 Month Children

<table>
<thead>
<tr>
<th>Age class (months)</th>
<th>Boys</th>
<th>Girls</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 - 17</td>
<td>89</td>
<td>111</td>
<td>200</td>
</tr>
<tr>
<td>18 - 29</td>
<td>96</td>
<td>79</td>
<td>175</td>
</tr>
<tr>
<td>30 - 41</td>
<td>83</td>
<td>96</td>
<td>181</td>
</tr>
<tr>
<td>42 - 53</td>
<td>88</td>
<td>80</td>
<td>168</td>
</tr>
<tr>
<td>54 - 59</td>
<td>72</td>
<td>54</td>
<td>126</td>
</tr>
<tr>
<td>Total</td>
<td>429</td>
<td>422</td>
<td>850</td>
</tr>
</tbody>
</table>

The overall prevalence of global and severe acute malnutrition is shown in table 7 and a breakdown of acute malnutrition by age is given in table 8. It should be noted that the analysis was performed on records (n=985) excluding out of range values identified using the standard EpisSniff flag criteria. Prevalence is given for the weight for height (WFIH) index in both z-scores and % of the median. The internationally recommended method of reporting malnutrition is through the use of z-scores as these provide a more statistically valid and comparable indication. However, the % of the median indices is also widely used, as it is conceptually easier to understand and calculate and forms the basis for admission and discharge criteria for supplementary and therapeutic feeding programmes. As normally found, the z-score indicator gives a higher estimate of the prevalence of malnutrition than the % of the median. The global prevalence of acute malnutrition is at a moderate level. The average MUAC in children 1-5 years was 14.6 cm (95% CI 14.6 - 14.8; n=779).

Table 7 - Prevalence and Mean Levels of Acute Malnutrition (Wasting) in Children

<table>
<thead>
<tr>
<th>Acute Malnutrition</th>
<th>Global (95% CI)</th>
<th>Severe (95% CI)</th>
<th>Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHF z-score</td>
<td>(7.7 - 13.5)</td>
<td>(1.3 - 3.1)</td>
<td>-0.81 (-0.88 - -0.72)</td>
</tr>
<tr>
<td>WHF % median</td>
<td>(0.6 - 8.6)</td>
<td>(0.7 % (0.6 - 1.2)</td>
<td>93.1 (92.3 - 93.9)</td>
</tr>
</tbody>
</table>
Figure 1 - Distribution of Weight for Height z-scores in 6-59 Month Children

Table 8 - Acute Malnutrition (Wasting) by Age Class

<table>
<thead>
<tr>
<th>Age class (months)</th>
<th>Severe &lt; -2 z-scores n</th>
<th>Severe &lt; -2 z-scores %</th>
<th>Moderate ≥ -2 &lt; -3.5 z-scores n</th>
<th>Moderate ≥ -2 &lt; -3.5 z-scores %</th>
<th>Normal ≥ -3 ≤ 2.5 z-scores n</th>
<th>Normal ≥ -3 ≤ 2.5 z-scores %</th>
<th>Cessation ≥ 2.5 z-scores n</th>
<th>Cessation ≥ 2.5 z-scores %</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 - 17</td>
<td>6</td>
<td>3.0</td>
<td>19</td>
<td>9.5</td>
<td>175</td>
<td>87.5</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>18 - 29</td>
<td>2</td>
<td>1.1</td>
<td>14</td>
<td>8.0</td>
<td>159</td>
<td>90.0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>30 - 41</td>
<td>3</td>
<td>1.7</td>
<td>19</td>
<td>10.5</td>
<td>159</td>
<td>97.8</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>42 - 53</td>
<td>3</td>
<td>1.2</td>
<td>16</td>
<td>4.6</td>
<td>156</td>
<td>94.0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>54 - 59</td>
<td>6</td>
<td>4.6</td>
<td>11</td>
<td>8.7</td>
<td>101</td>
<td>88.5</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>2.2</td>
<td>71</td>
<td>6.4</td>
<td>760</td>
<td>59.4</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

No significant differences in acute malnutrition by age were detected (p=0.05). The analysis of acute malnutrition by camp revealed significantly higher levels of acute malnutrition in El Arou compared to the other camps (Chi square; p=0.05). This was true for both global and severe wasting.

No significant difference in global malnutrition was seen between genders with 11.9% for boys vs. 9.2% for girls. There was also no difference in the prevalence of severe acute malnutrition.

The number of other children less than 5 years old in the same family ranged from 1 to 5 with a mean of 1.9. No relationship between the number of children under five and global malnutrition in the household was observed in this situation (Chi squared; p=0.9).

Chronic Malnutrition

The prevalence of chronic malnutrition (stunting) is given in Table 9 and a breakdown by age in Table 10 using the height for age (HFA) z-score index. No difference in stunting by sex was found (33.6% for boys vs 32.0% for girls) or by age category (Chi square; p=0.3).

Table 9 - Prevalence of Chronic Malnutrition in Z-scores (Stunting) in Children

<table>
<thead>
<tr>
<th>Chronic Malnutrition</th>
<th>Global (95% CI)</th>
<th>Severe (95% CI)</th>
<th>Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFA z-score</td>
<td>32.8% (29.7 - 36.1)</td>
<td>11.2% (8.2 - 13.5)</td>
<td>-1.48 (-1.97 - -1.36)</td>
</tr>
</tbody>
</table>

Anthropometry in Infants <6 months

The age and sex distribution of infants <6 months who were included in the anthropometric and questionnaire surveys is shown in table 11. There are no significant differences in the age or sex distribution of the subjects (p=0.41) but the sample size is small.

Table 11 - Age and Sex Distribution of Infant Sample

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>10</td>
<td>67</td>
<td>5</td>
<td>33</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>38</td>
<td>33</td>
<td>21</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>44</td>
<td>9</td>
<td>56</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>40</td>
<td>9</td>
<td>50</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>29</td>
<td>10</td>
<td>71</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>40</td>
<td>6</td>
<td>60</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>43</td>
<td>52</td>
<td>57</td>
<td>91</td>
<td>100</td>
</tr>
</tbody>
</table>

Three subjects could not have their weight for length determined, as they were less than 48 cm in length (the lower cut-off for the reference data). Length data was missing for one subject. Anthropometric data was analysed on the 87 infants for which complete data was available.

The overall prevalence of global and severe acute malnutrition is shown in table 12. Prevalence is given for the weight for height (W/H) indices in both z-scores and % of the
MEASURING AND INTERPRETING MALNUTRITION AND MORTALITY

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CHAPTER 6

THE END POINT: EXAMPLE OF A GOOD SURVEY REPORT

Table 12 - Prevalence and Mean Levels of Acute Malnutrition (Wasting) in Infants

<table>
<thead>
<tr>
<th>Acute Malnutrition</th>
<th>Global (95% CI)</th>
<th>Severe (95% CI)</th>
<th>Means (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFH z-score</td>
<td>1.1% (0.0-3.4)</td>
<td>0.0%</td>
<td>-0.27 (-0.43 to -0.10)</td>
</tr>
<tr>
<td>WFH % median</td>
<td>0.0%</td>
<td>0.0%</td>
<td>97.3 (95.4 to 99.2)</td>
</tr>
</tbody>
</table>

Similarly the prevalence of stunting is very low in this age group with only 2.5% total stunting and 1.1% severe. This data indicates that both the acute and chronic anthropometric status of the age group is good.

Table 13 - Prevalence and Mean Levels of Chronic Malnutrition (Stunting) in Infants

<table>
<thead>
<tr>
<th>Acute Malnutrition</th>
<th>Total (95% CI)</th>
<th>Severe (95% CI)</th>
<th>Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFA z-score</td>
<td>2.3% (0.0-5.3)</td>
<td>1.1% (0.0-3.3)</td>
<td>-0.00 (-0.23 to -0.23)</td>
</tr>
</tbody>
</table>

Trends in Malnutrition with Age

The prevalence of wasting and stunting against age is plotted in figure 3. It can be seen that the prevalence of stunting and wasting is low during the first 5 months of life but increases rapidly there after. The prevalence of wasting shows no clear trend between 6 and 59 months, whereas stunting is seen to increase up to 18-29 months and then gradually decline until 50 months. These data suggest that chronic malnutrition begins early and leads to rapid growth faltering, which continues through early childhood.

Figure 3 - Trends in Malnutrition with Age

Infant and Young Child Feeding Practices

To investigate infant and young child feeding practices a recall questionnaire was used to ask mothers of children aged 0-23 months, what they had fed them in the last 24-hours. This method is not accurate for determining individual normal dietary patterns, due to large day-to-day variations, but is very useful for measuring practices at a population level.

Table 14 - Indicators of Infant and Young Child Feeding Practices

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Sampled Age Range</th>
<th>N</th>
<th>Prevalence (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever Breastfed</td>
<td>0 - 23</td>
<td>371</td>
<td>97.3</td>
<td>96.3 - 98.4</td>
</tr>
<tr>
<td>Timely Initiation of Breastfeeding</td>
<td>0 - 23</td>
<td>369</td>
<td>12.7</td>
<td>8.8 - 16.7</td>
</tr>
<tr>
<td>Exclusive Breastfed (&lt;6 months)</td>
<td>&lt; 6</td>
<td>87</td>
<td>2.3</td>
<td>0.0 - 6.6</td>
</tr>
<tr>
<td>Continued Breastfeeding at 12 months</td>
<td>12 - 16</td>
<td>62</td>
<td>84.1</td>
<td>75.3 - 92.0</td>
</tr>
<tr>
<td>Continued Breastfeeding at 24 months</td>
<td>20 - 23</td>
<td>59</td>
<td>47.5</td>
<td>32.1 - 62.8</td>
</tr>
<tr>
<td>Timely Complementary Feeding</td>
<td>6 - 10</td>
<td>74</td>
<td>58.1</td>
<td>44.0 - 72.2</td>
</tr>
<tr>
<td>Infant Formula Feeding (&lt;6 months)</td>
<td>6 - 10</td>
<td>87</td>
<td>28.7</td>
<td>17.8 - 39.7</td>
</tr>
<tr>
<td>Reported Prevalence of Diarrhoea*</td>
<td>0 - 23</td>
<td>367</td>
<td>22.3</td>
<td>16.9 - 27.8</td>
</tr>
<tr>
<td>Continued Feeding During Diarrhoea**</td>
<td>0 - 23</td>
<td>75</td>
<td>90.7</td>
<td>70.6 - 97.2</td>
</tr>
<tr>
<td>Increased Feeding During Diarrhoea***</td>
<td>0 - 23</td>
<td>75</td>
<td>13.3</td>
<td>4.5 - 22.2</td>
</tr>
</tbody>
</table>

* The figure reported is for a 14-day period prevalence
** Only those mothers reporting diarrhoea in their infants/children within the last 14 days were included

Key indicators of infant feeding practice are summarised in table 14. The proportion of infants who had been breastfed at some time in their lives was high, with no significant differences by sex or camp ranging from 93% in Dhakia to 99% in Smara.

However, the prevalence of Timely Initiation of Breastfeeding is only 12.7%. This indicator defines the percentage of infants and young children <24 months who were put to the breast within one hour of birth. The purpose of this indicator is to assess whether mothers initiate early breastfeeding with its respective benefits to both mother and infant. The situation in Timbalaf is clearly far from ideal with regards to this indicator. As shown in figure 4 although all the sampled mothers did initiate breastfeeding many delayed the start of breastfeeding for some time after birth with a sizeable minority not initiating feeding within the first 24 hours.

Figure 4 - Time of initiation of Breastfeeding After Birth

The Exclusive Breastfeeding indicator shows the percentage of infants 0 - <6 months who are currently being exclusively breastfed, i.e., who are receiving only breast milk and no water, other liquids or solids. Drops or syrups of vitamins, mineral supplements, or medicines are allowed. This indicator provides a measure of the degree to which women have adopted behaviours consistent with the WHO recommendation that infants should be fed exclusively on breast milk from birth to about six months. As seen in table 14, the prevalence of exclusive breastfeeding is only 2.3% indicating that many women are not following this recommendation.

The Continued Breastfeeding at 12 Months indicator measures the percentage of children 12 - <16 months who are breastfed. This is a measure of breastfeeding duration as is the
prevalence of Continued Breastfeeding at 24 Months. In this survey the prevalence of breastfeeding at 12 months was 84.1% and at 24 months it was 47.5% implying that some women are stopping breastfeeding earlier than the recommended two years.

Use of infant formula was 24.1% overall with 26.7% use under 6 months of age and the highest use at 6-12 months old (33.6%). Although the prevalence of bottle feeding was not assessed in this survey, observations and anecdotal accounts indicate that it is a fairly common practice. Given the difficulty in maintaining hygienic preparation conditions in the camp environment this wide spread use of infant formula is a cause for concern. Figure 6 shows the frequency of infant formula use with age.

The Timely Complementary Feeding Rate indicator gives an overall measure of the degree to which women have complied with the recommendation that infants aged 6 - <10 months receive appropriate and adequate complementary foods in addition to breastmilk. The complementary feeding indicator is intended as a basic, simple indicator of feeding patterns among children in the age group 6 - <10 months. By this age, it is recommended that infants should be receiving solid foods in addition to breastmilk. “Solids” are defined as foods of mushy (semi-solid) or solid consistency such as porridge but does not include fluids such as fruit juice.

Prevalence of Diarrhoea and Feeding Response

As described below, water, sweetened water, Goji (a blended cereal food), other solid or mushy foods and other milks are introduced to some infants before 6 months of age and at increasing frequency thereafter. These other foods, especially infant formula and powdered milk, are known to carry a high risk of contamination and causing intestinal infections in young children and infants. It is interesting to note that the 14-day period prevalence for diarrhoea in this survey was 22.5%. No case definition was used, as the validity of a stool count method has not been established in young breastfed infants. Rather, we relied on the perceptions of the mother as to what were abnormal bowel movements in her child. The main purpose of this question was to assess the mother’s response when she believed her child had diarrhoea in how she fed her ill child. The age trend in diarrhoea prevalence is shown in figure 5. It can be seen that the prevalence is highly age dependent with relatively low levels up to 6 months of age, a peak of nearly 40% at 6 - 12 months of age and steady decline until 23 months. The high levels of diarrhoea at 6 - 12 months coincide with the increasing consumption of a range of foods implying that food hygiene may be an important issue.
The percentage of infants/children <24 Months offered continued feeding during diarrhoeal episodes was assessed by asking about feeding practices for those infants who had suffered diarrhoea in the last 14 days. This indicator measures the change in frequency with which foods (breastfeeding and/or other foods) are offered during diarrhoea compared to when the child is healthy.

This indicator is a measure of the mother’s reported behaviour rather than that of the child. This measure is useful for monitoring the quality of home care for childhood diarrhoea and is a measure of whether the carer is following recommended messages about the management of childhood diarrhoea. Over 90% of mothers offered continued feeding during diarrhoea but only 13.3% offered increased feeding. It is still concerning that 8% of infants/children suffering from diarrhoea had their feeding withdrawn as this can reduce the chances of a full recovery and is an important risk factor for developing severe malnutrition.

**Introduction of Different Foods By Age**

The normal introduction of different foods to infants and children is summarized in the following three figures. In figure 7 it can be seen that while breastmilk consumption decreases with age the consumption of powdered milk shows a marked increase. In figure 8 it can be seen that water is introduced at a very early age and that fruit juice is first introduced to some children between 6 and 12 months. The consumption of tea also shows an increasing prevalence from the age of 6 - 12 months. This is concerning given the established role of tea in reducing iron absorption and increasing the risk of iron deficiency.
In figure 9 it can be seen that the introduction of complementary infant foods in addition to breast milk on a daily basis increases steadily with age. However, as demonstrated by the low prevalence of the timely introduction of complementary infant foods indicator, many infants are not receiving adequate complementary food until late on in their development.
Vaccination Coverage

A vaccination health card for children was possessed by 72.5% (95% CI 68.1-76.9) of the mothers (n=848) of 6-23 month old children. Possession of vaccination health cards ranged from 70.6% in Smera to 77.1% in Alweer.

Vaccination coverage was calculated for children aged 12-23 months. Of these 211 children, 76.6% (95% CI 68.3 - 84.3) had a vaccination card. Vaccination coverage ranged from 76.6% for BCG down to an alarming 64.7% for measles. Verbal reports of vaccination in the absence of a card record were classified as negative. It should be noted that the recommended minimum standard for measles vaccination coverage is 95% 19

Table 15 - Vaccination Coverage from Card Records

<table>
<thead>
<tr>
<th>% Coverage of Vaccination Programme (12 - 23 month children)</th>
<th>BCG (n=196)</th>
<th>DPT3 (n=194)</th>
<th>Measles (n=195)</th>
</tr>
</thead>
<tbody>
<tr>
<td>77.2% (95% CI 69.4 - 84.7)</td>
<td>77.0% (95% CI 68.4 - 85.5)</td>
<td>66.7% (95% CI 56.3 - 75.0)</td>
<td></td>
</tr>
</tbody>
</table>

Anaemia

Peripheral blood was taken from finger sticks and used for the analysis of nutritional status and risk factors in children and women. Anaemia was tested using the Hemocue Photometer20, which measures the amount of haemoglobin in a blood drop placed into a specialised disposable cuvette.

Of 204 children tested for anaemia, 35.3% (95% CI 26.7 - 45.9) were anaemic (<11 g/dl). Boys and girls were equally affected with 36.1 and 34.4% being anaemic (RR 1.03; 95% CI 0.72 - 1.50). The mean haemoglobin level in children was 11.5 g/dl with a range of 7.0 - 15.4 g/dl. The table below summarises the prevalence and severity of anaemia in children and women.

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20 Minimum Standards in Health Care: The Sphere Project (2016)
21 Hemocue AB, Angelholm, Sweden

Anthropometric and Nutritional Survey, Liberian Refugee Camps, Timbuktu, September 2002 Page 26 of 42
MEASURING AND INTERPRETING MALNUTRITION AND MORTALITY

Chapter 6

Table 16 - Haemoglobin levels and the Prevalence (%) of Anaemia

<table>
<thead>
<tr>
<th>Population Group</th>
<th>N</th>
<th>Mean Hb (g/dL)</th>
<th>Range (g/dL)</th>
<th>Total Anaemia (%)</th>
<th>Mild Anaemia (%)</th>
<th>Moderate Anaemia (%)</th>
<th>Severe Anaemia (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>204</td>
<td>11.9</td>
<td>7.0 - 16.4</td>
<td>95.3</td>
<td>17.7</td>
<td>17.8</td>
<td>0.0</td>
</tr>
<tr>
<td>0-59 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>204</td>
<td>11.9</td>
<td>5.0 - 16.1</td>
<td>47.8</td>
<td>16.6</td>
<td>28.9</td>
<td>4.4</td>
</tr>
<tr>
<td>Women</td>
<td>19</td>
<td>9.0</td>
<td>4.0 - 13.5</td>
<td>50.0</td>
<td>11.5 - 21.7</td>
<td>19.5 - 33.5</td>
<td>1.2 - 7.6</td>
</tr>
<tr>
<td>Pregnant (PM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-45 years</td>
<td>204</td>
<td>11.9</td>
<td>5.0 - 15.1</td>
<td>38.0 - 56.5</td>
<td>11.5 - 21.7</td>
<td>19.5 - 33.5</td>
<td>1.2 - 7.6</td>
</tr>
</tbody>
</table>

Table footnotes:
- PM: Pregnant
- Mean haemoglobin levels are given with standard deviations in brackets.

Figure 10 - Distribution of Haemoglobin Concentrations in 0-59 month Children

Figure 11 - Distribution of Haemoglobin Concentrations in Women, 15 - 45 years

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Footnotes:
- The Management of Nutrition in Major Emergencies (2000), World Health Organisation

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Anthropometric and Micronutrient Nutrition Survey, Shahrak Refugee Camps, Timbuktu, September 2002 Page 25 of 42
Risk Factors for Anaemia

There are a large number of risk factors that may contribute to the development of anaemia. These include: 

- Nutritional deficiencies, parasitic and other infections, inherited conditions, and blood loss due to menstruation and other causes.
- In women, 15-45 years, 45% reported being pregnant and pregnancy was associated with anaemia with a RR of 1.7 (95% CI 1.2 - 2.3).

Iron deficiency will often precede anaemia and can be measured biochemically before it results in a reduction in haemoglobin and the development of anaemia. To assess the extent of iron deficiency and the contribution that it makes to the anaemia seen in children in Timbuktu, a biochemical test was performed and involved measuring the level of serum transferrin receptor.

Iron Status

Serum transferrin receptor levels are considered a good indicator of iron status and are less affected by infection rates than measurements of ferritin[1]. They are also reported to be independent of age and sex, although some work indicates that children may have slightly higher levels than adults. Analysis was performed using the Ranco sTfR enzyme immunoassay (EUSA) kit on all samples collected from children 6-59 months old. Two hundred samples were analysed. The results in Table 13 are for the 182 subjects in which complete data on anaemia and sTfR were available.

The overall level of iron deficiency in children is 34.1% (95% CI 27.4 - 40.7) as determined by measurement of sTfR with a cut-off of >8.5 μg/ml taken as indicating deficiency[2].

It can be seen in Figure 12 that the extent of iron deficiency increases with the degree of anaemia. Iron deficiency is strongly associated with anaemia RR = 2.87 (95% CI 2.0 - 4.2) in this population and is therefore likely to account for a significant proportion of this condition. In the absence of malaria and with no evidence of significant levels of helminth infections, the data suggests that dietary modification may be the most important intervention to tackle the identified iron deficiency anaemia. Widespread consumption of tea was observed in this population and confirmed by key informant interviews. Data collected on infant feeding confirms that this practice begins at an early age for some children (before 2 years of age). Evidence from other studies indicates that consumption of tea is an important risk factor for iron deficiency due to chelation of iron in the intestine that makes it unavailable for absorption by the body.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean sTfR level (μg/ml)</th>
<th>Iron Deficient sTfR (μg/ml)</th>
<th>% Iron Deficient (sTfR = 8.5 μg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaemic</td>
<td>67</td>
<td>12.0 (SD 5.7)</td>
<td>40</td>
<td>58.7 (48.1 - 70.0)</td>
</tr>
<tr>
<td>Non-anaemic</td>
<td>115</td>
<td>8.9 (SD 2.9)</td>
<td>22</td>
<td>19.1 (11.4 - 27.7)</td>
</tr>
<tr>
<td>Combined</td>
<td>182</td>
<td>8.6 (SD 4.6)</td>
<td>62</td>
<td>34.1 (27.4 - 40.7)</td>
</tr>
</tbody>
</table>


[2] Manufacturer’s data sheet

Anthropometric and Micronutrient Nutrition Survey, Sahelani Refugee Camps, Timbuktu. September 2002
Figure 12 - Relationship between Iron Deficiency and Anaemia

Iodine Status

Iodine status was assessed by clinical observation of goitre and measurement of urinary iodine excretion.

Urinary Iodine Excretion

Concern has been expressed in the past about possible high levels of iodine consumption in the Saharawi population. Anecdotal reports have indicated that this may be due to high environmental levels of iodine in water and soil.

To investigate these concerns, the iodine status of the population was assessed by measurement of the iodine concentration in urine samples collected from 122 adolescents (10-19 years old). Approximately 10 ml of urine was collected into sealed urine Monovette tubes or Naïve cryovials and then frozen for storage and transport. Analysis was conducted using the Sander-Kolthoff reaction automated using a Technicon AutoAnalyzer. This was performed in the laboratory of the Department of Clinical Chemistry, University Hospital Saint-Pierre, Belgium under contract to ICH, London. Results are summarised below.

<table>
<thead>
<tr>
<th>n</th>
<th>Mean (µg/L)</th>
<th>Median (µg/L)</th>
<th>Range (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>122</td>
<td>1351 (921-1781)</td>
<td>1200</td>
<td>50 - 3200</td>
</tr>
</tbody>
</table>

*We would like to express our gratitude to Dr. F. Delange and Mrs. D. Grau for their assistance in the analysis of the samples.*
Samples were collected and analysed from 68 males and 52 females. No significant differences in urinary iodine levels were found for sex or age.

The median level of urinary iodine is frequently used as a means of assessing the iodine status of populations. Median levels of 200-300 μg/L in samples taken from school age children may be considered as indicating no deficiency, while levels above 300 μg/L has been identified as being excessively high. The median level of urinary iodine excretion found in the Saharawi refugee camps indicates that there is evidence of excess iodine consumption at the population level. The concentration of urinary iodine found in this survey is high. Possible causes of excess iodine intakes are from inefficient quality control of salt iodisation combined with consumption of other diet items high in iodine.

The water sources for the camps may divided into three, with Dhiba being served by one source, Smara and Awwer by another and El Aun by a third. If iodine ingestion from the water sources is a significant source of iodine consumption then it might be expected that there would be different levels of urinary iodine according to which water source people were consuming. To investigate this possibility we divided the camps into the three water source areas and collected and analysed urinary iodine samples from each of these. The results from this analysis are given in table 15 below. Note that the table contains data on the 115 subjects for whom location information was available.

<table>
<thead>
<tr>
<th>Camp</th>
<th>n</th>
<th>Mean (μg/L)</th>
<th>Median (μg/L)</th>
<th>Range (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhiba</td>
<td>42</td>
<td>747</td>
<td>720</td>
<td>62 - 1385</td>
</tr>
<tr>
<td>Smara</td>
<td>23</td>
<td>1823</td>
<td>1600</td>
<td>350 - 3220</td>
</tr>
<tr>
<td>Awwer</td>
<td>16</td>
<td>1416</td>
<td>1335</td>
<td>126 - 2350</td>
</tr>
<tr>
<td>El Aun</td>
<td>34</td>
<td>1754</td>
<td>1770</td>
<td>350 - 3900</td>
</tr>
</tbody>
</table>

All the camps show high levels of urinary iodine. While no significant difference in urinary iodine levels were seen between Smara, Awwer and El Aun they are all significantly higher.

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[4] Food sources rich in iodine include fish and other sea foods
than levels found in Dhakka (Kruskall Wallis; p<0.00). This data suggests that environmental factors such as the water supply may significantly affect iodine intake.

These results indicate that there is an urgent need to investigate environmental sources of iodine exposure from water and soil as well as to test the distributed salt for levels of iodine to ensure that the fortification level is appropriate.

Goblet assessment
Visible goblet was assessed in a sample of 589 adolescents. As shown in table 14, there is a surprisingly high prevalence of visible goblet, which is especially high in Smara camp. As described above, the analysis of urinary iodine also indicates excessive intakes of iodine. To investigate whether there was an association between the level of iodine intake in each camp and the prevalence of visible goblet the data was analysed to compare the goblet prevalence in Dhakka compared to the other 3 camps. No significant association was detected. The exact relationship between iodine intake and goblet prevalence remains unclear. However, it should be noted that as iodine intake may be regarded as excessive in all the camps and the overall prevalence of goblet is also high, there is a need to further investigate the public health significance of these findings.

Table 10: Prevalence of Visible Goblet in Adolescents (n=589)

<table>
<thead>
<tr>
<th>Camp</th>
<th>N</th>
<th>Prevalence (%)</th>
<th>95% Confidence Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhakka</td>
<td>152</td>
<td>6.9</td>
<td>0.6 - 12.9</td>
</tr>
<tr>
<td>Smara</td>
<td>158</td>
<td>13.9</td>
<td>4.7 - 23.1</td>
</tr>
<tr>
<td>Awead</td>
<td>112</td>
<td>4.6</td>
<td>0.4 - 8.6</td>
</tr>
<tr>
<td>El Alian</td>
<td>157</td>
<td>2.6</td>
<td>0.0 - 5.6</td>
</tr>
<tr>
<td>Combined</td>
<td>589</td>
<td>7.1</td>
<td>3.6 - 10.7</td>
</tr>
</tbody>
</table>

Clinical signs of scurvy and rickets
Assessment of children for clinical signs of rickets (n=849) revealed only two individuals (0.2%) with signs of bowlegs and none with rickets. There is therefore no evidence of rickets existing as a large-scale public health problem. However, it should be noted that criteria for defining a public health problem are not well defined and the appropriate sample size calculation was therefore not possible. Sporadic cases of rickets occur in deprived communities throughout the world and are often associated with poor infant feeding/practise. Promoting awareness of this important health problem within the Saharawi refugees is recommended.

Examination of children (n=849) for signs of scurvy (bleeding gums and periostitis in children) revealed no evidence of scurvy existing as a large-scale public health problem. It has been proposed by WHO that a mild public health problem exists even if only isolated cases are detected and a severe problem exists if the prevalence exceeds 5%. The sample size used in this survey would only be sufficient to reliably detect a severe public health problem. The event, the survey revealed one case with suspected periostitis but no other clinical signs were detected. In the absence of other signs of deficiency the significance of the observation remains unclear. It is recommended that any cases presenting with these signs are followed up through the medical facilities and receive appropriate nutritional supplements.

Food Distribution Analysis
The CR/CRA distribution records for the last 6 months were obtained from UNHCR and were analysed for energy and micronutrient content. The records include foods supplied by WFP and other donors. There has been a tendency for reported figures to only include WFP supplied foods when in reality the contribution from other sources is significant. A full analysis is given below.

The beneficiary number of 155,430 is used in the calculations below. As noted previously, this number has not been updated recently.

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Commodities distributed through the CISP supplementary feeding programme are excluded from the analysis. Items such as tuna and dates are included as they formed part of the general ration distribution.

Complete identification information was not available for all commodities and it was not possible to obtain fortification specifications for all items. In some cases the nearest equivalent product composition was used (e.g. the composition of USA manufactured CSB was used to analyse the nutrient contribution from the various fortified blended foods that were distributed).

Eggs produced from the farm income generation/self-sufficiency activities such as the poultry farm project are not included and camel meat obtained from occasional distributions of livestock are also excluded as no quantitative data was available. UNHCR distributions of tea and yeast are also excluded due to their minimal nutritional contribution. However, it should be noted that frequent consumption of sweet tea is widespread and it contributes to the energy consumption patterns of the population and may influence the levels of adult obesity described in previous surveys.46

Reviewing the distribution records for the last six months reveals that the food basket in Timbuktu is diversified in terms of the number of different commodities included in the distributions. During the six-month period prior to the survey, no less than 16 different commodities were distributed including 3 different types of blended foods, dates, fish and milk powder. However, the supply of these commodities was not consistent leading to a very variable and unpredictable ration for the refugees and distributing agencies to manage. The variation in commodity supply is indicted in the following figure for blended food, oil and pasta.

This data illustrates the important role of ad hoc food donations in filling holes in the food pipeline and emphasizes the importance of maintaining stable donor support.

Using NutVal, a spreadsheet application developed by UNHCR, Geneva and ICH, the nutrient content of the distributed ration was analysed for macro and micronutrient content. The graphs below indicate the levels of energy and nutrients over the six months prior to the survey. It can be seen that the energy content of the ration consistently exceeded 100% with an average of 125% of the 2100 kcal minimum requirement.47 The protein and fat content of the distributed ration were generally good except in June, which corresponded with the lack of oil distribution. However, this was followed by an increased distribution in July.

47 The requirement for 2100 kcal per person per day was established by the WFP/UNHCR Joint Assessment Mission, February 2002.
micronutrient and mineral content of the ration is variable with good levels of vitamin A, thiamine and niacin but low levels of vitamin C, calcium and riboflavin. These nutrients are seen to remain consistently low with an average of only 59%, 70% and 75% of the minimum requirement being supplied during the last six months.

Figure 15 - Trends in Macronutrient Content of Ration

It should be stressed that the calculations above are based on the distribution records supplied by the Algerian Red Crescent to UNHCR and, although food-monitoring visits are made, there is currently no verification of the distribution by onsite distribution monitoring using an accepted random weighing procedure. In addition, the ration was only analysed for the nutrients listed above. Many other nutrients, such as iodate and zinc, are known to be


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crucial for long-term health and nutrition and a diversified diet is the best means of ensuring these requirements are met.

The requirement figures used above are calculated by WHO, UNHCR and WFP and are designed to be applied at the population level. It is important to note that it is therefore not possible to be sure that nutrient needs of particular groups within the population are being met even if the calculated population intake is adequate.

In conclusion, it should be emphasised that maintenance of the food aid pipeline and ensuring improvements in its reliability remains of the utmost importance in preventing malnutrition in this food aid dependent population.

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Anthropometric and Micronutrient Nutrition Survey, Balakot Refugee Camps, Timbuktu, September 2002  Page 32 of 42
Discussion

The interpretation of acute malnutrition data is always difficult in the absence of reliable data on mortality. This is because high levels of severe malnutrition may be obscured if the death rate is elevated i.e. if children are dying due to malnutrition then this may cause the malnutrition prevalence to appear low when measured in a survey. Although it was planned to include an assessment of crude mortality in this survey, time constraints did not permit this to occur. The malnutrition data presented here should be interpreted with the knowledge that no quantitative data on mortality was available. However, qualitative data obtained during the survey did not raise concern about an elevated mortality rate.

Other important causes of mortality and morbidity may also be going unnoticed due to the lack of a functional health information system. Consequently, opportunities to improve the public health of the Saharawi population may be missed or resources allocated inappropriately. It is strongly suggested that efforts be made to improve the collection and dissemination of health information.

To compare the results of the current survey with national data on nutritional status in Algeria the WHO Global database on Child Growth and Malnutrition was consulted. A National Algerian nutrition survey conducted in May-July 2000 found a prevalence of global acute malnutrition of 6.1% and a prevalence of 1.7% for severe malnutrition in 0 – 59 month old children in Southern Algeria. Although no confidence intervals were available from the WHO database it is clear that the results from the Saharawi refugees are consistently worse than the host Algerian population.

A comparison of some key indicators from the current data with previous surveys conducted by CISP and the National Research Institute for Food and Nutrition (INRAN) in Rome in the Saharawi camps is shown in Figure 17. It can be seen that there has been no significant change in global acute malnutrition over the last 3 surveys although the level of severe malnutrition did rise significantly in 2002 compared to the other two years. Trends in anaemia show a consistent fall with no severe anaemia in children detected in 2002. The fall in total anaemia in 6-59 month children from 71.1% to 36.9% in 2002 is truly remarkable. Anaemia in women has evidently been a harder nutritional problem to solve and the prevalence appears to have stabilised at around 48% between 2001 and 2002 while childhood anaemia has continued to improve.

The generally poor infant feeding practice measured in this survey may be mediating a significant impact on child growth and development and the persistence of relatively high levels of wasting and stunting. The trends in acute and chronic malnutrition with age, as well as the overall prevalence may be amenable to improvement if this component is focussed on, as well as well-targeted supplementary and therapeutic feeding programmes. Strengthening of growth monitoring and promotion should be considered as a strategy to increase nutritional awareness and the early detection of malnutrition.

Seasonality is always an important factor to take into account when interpreting the results of nutrition and health surveys. While little data was available to allow an assessment of seasonal trends it is reported anecdotally that the incidence of diarrhoeal disease increases during the summer. An increased acute malnutrition prevalence might therefore be expected in the autumn months during which this survey was conducted.

The analysis of the general ration distribution records indicates that, during the last six months, the energy requirements of the population were being more than adequately met. However, the micronutrient content of the ration, particularly for vitamin C, was inadequate. Indeed, the only significant source of vitamin C in the general ration is blended food and the supply of this commodity was seen to be erratic. Efforts should be made to enhance diet diversification with items rich in vitamin C, calcium and riboflavin. If this is found not to be possible through the general ration efforts to promote local production should be intensified.

While the consumption of tea was only quantified for infants and young children during the current survey it is clear from qualitative data that large volumes are regularly consumed. If anaemia is to
Combating in a sustainable way, consideration should be given to assessing how consumption could be modified so as to minimize the impact on iron deficiency.

Figure 17 - Comparison of key indicators, 1999 - 2002

[Bar chart showing prevalence rates for various indicators over the years 1999, 2001, and 2002]

Anthropometric and Micronutrient Nutrition Survey, Saharanvi Refugee Camps, Tibesta I, September 2002  Page 34 of 42
Recommendations

Based on the findings of this survey, the following recommendations are made for improving the nutrition and health situation of the Saharawi refugees.

1. **Development of the Health Information System (HIS)**
   - There is an evident lack of information on the health status of the refugee population. Basic indicators such as the crude mortality and under five mortality rates were not available at the time of the survey, and there appears to be no centralised monthly reporting on health service utilisation, disease prevalence or other key indicators. It is therefore recommended that an effective HIS is established as a high priority.

2. **Vaccination coverage**
   - The relatively low vaccination coverage found for measles, DPT3 and BCG are concerning. It is recommended that the management of the vaccination system is reviewed so as to identify reasons for the low coverage and implement improvements. The distribution of vaccinations/health cards should be improved to enable effective record keeping and monitoring.

3. **Nutrition surveillance/GMP/WIC strengthening at PHC Daire level**
   - It is recommended that the GMP ANC and other preventative activities at PHC level are reviewed and strengthened as appropriate. The feasibility and desirability of incorporating WIC treatment and prevention protocols into routine practice should be assessed.

4. **Treatment of severe malnutrition**
   - There is currently no programme for the treatment of severe malnutrition. This is concerning given the level of severe malnutrition found in this survey (2.2%). Severe malnutrition carries a high risk of mortality and should be considered a medical emergency. It is therefore recommended that a therapeutic feeding programme is urgently established at hospital level.

5. **Treatment of moderate malnutrition**
   - The global malnutrition prevalence of 10.6% (95% CI 7.7-13.5) may be considered as a moderate public health problem. It is recommended that consideration is given to introducing supplementary feeding programmes. Such a programme should be targeted using anthropometry and integrated into growth monitoring and promotion activities.

6. **Nutrition education and promotion**
   - An IEC campaign on maternal nutrition including iron folate supplementation should be introduced as compliance with iron/folate supplementation is, anecdotally, reported to be low, and maternal anaemia has been shown to be a significant problem. Other issues such as infant feeding, prevention of obesity and chronic diseases and child spacing should also be addressed as these have been demonstrated to be significant public health problems in this population and are established risk factors for poor birth outcomes and infant and young child morbidity and mortality.

7. **Vitamin A capsule distribution**
   - It is recommended that routine vitamin A capsule distribution to children between 6 months and five years is integrated into the activities of the Saharawi MOH.

8. **Food aid monitoring**
   - There is currently no on-site food distribution monitoring (food basket monitoring) performed and no post-distribution monitoring data from household or market levels were available. It is recommended that initiatives for increasing the monitoring of food aid distribution are pursued.
9. **Food security and income generation**

Little formal assessment information is available on the food security situation within the camps. It is recommended that consideration be given to carrying out a detailed assessment of food security and livelihoods with the aim of enhancing effective diet diversification and income generation activities.

10. **Obesity and chronic diseases**

While no information was collected on obesity during this survey a review of previous survey data and field observations indicate that obesity and resultant chronic diseases such as diabetes are likely to continue to grow in significance, particularly amongst the Saharawi women. It is recommended that a programme of sport/exercise promotion is considered.

11. **General ration composition and pipeline**

The general ration remains deficient in a number of micronutrients and the supply of individual commodities is erratic. It is recommended that efforts be taken to provide a more stable food pipeline and that the supply of blended food, which remains the major source of several key micronutrients, is ensured on a regular basis.

12. **Knowledge gaps**

Time and resource constraints meant that it was not possible to measure and analyse all aspects of interest during the current survey. Issues that were not addressed but should be considered for inclusion in the next survey include:

- The survey conducted by CISP in 2001 indicated an alarmingly low level of 6.8% oral rehydration therapy (ORT) in cases of diarrhoea disease. It is recommended that this is examined in more detail.
- Chronic adult malnutrition with a focus on obesity.
- Prevalence of diabetes.
- In depth assessment of the significance of the excessive urinary iodine and visible goitre prevalence.
- Qualitative data collection utilizing focus group discussions on key issues such as infant feeding and dietary preferences so as to inform and improve the effectiveness of IEC programmes.
- Assessment of the food security of the population and opportunities for further income generation and diet diversification.
ANNEXES

ANNEX 1 - Terms of Reference Issued by UNHCR Algiers

Nutritional Survey in Saharawi camps, Tindouf, Algeria
September 2002

It was agreed in February 2002, that a new nutritional survey should be conducted in the Tindouf camps. Although the latest nutritional survey was conducted by CSIP in 2001, some of the results and the methodologies were rather unclear, and therefore somewhat unreliable. Furthermore, during the last Joint Food Assessment Mission held in early February 2002, it was agreed that there is a need for UNHCR and WFP to assess the needs of vulnerable groups, and to find ways to build the capacity of the Saharawi refugees in nutrition survey design and implementation.

UNHCR, through its implementing partner, Institute for Child Health, undertook an initial review of the specific objectives of the survey, methodology, target groups and mode of implementation for the survey in June 2002. These were decided following discussions with key informants and a variety of stakeholders (including WFP, ECHO, Red Crescent Societies, and relevant Algerian and Saharawi ministries).

The overall objectives of the survey are to include:

- Capacity building to enable implementation of regular anthropometric surveys by local entities in accordance with international recommendations.
- Implementation of a survey in collaboration with partners including UNHCR, WFP, Red Crescent Societies and the relevant Algerian and Saharawi ministries.
- Production of recommendations on actions to improve the nutritional status and health of the Saharawi refugee population.

The more specific objectives were identified as follows:

- Investigation of the etiology of anaemia by measurement of haemoglobin, iron status
- Measurement of iodine status
- Assessment of clinical signs for vitamin A deficiency, goitre, scurvy and rickets
- Establish baseline information on infant feeding practice
- Estimation of the crude mortality rate
- Build capacity in nutrition survey design and implementation

Target Population Groups for the Survey

- Children 6-59 months - anthropometric, biochemical, clinical signs, questionnaire indicators
- Infants and children 0-24 months - infant feeding indicators
- Mothers of the children - anthropometric, biochemical and questionnaire indicators
- Adolescents (10-19 years) - iodine biochemical status, goitre and questionnaire indicators

Survey Schedule:

The survey has been programmed to take place throughout the entire month of September 2002, which includes feedback and de-briefing meetings in Rabouh, Tindouf and Algiers.

27/07/02 B.O. Algiers

*Anthropometric and Micronutrient Nutrition Survey, Saharawi Refugee Camps, Tindouf, September 2002*  Page 38 of 42
**ANNEX 2 - Cluster Selection Table**

### List of population

<table>
<thead>
<tr>
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<th>Daara</th>
<th>Tot pop</th>
<th>Cumul pop</th>
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Sampling interval: 49655
Random number: 89
### ANNEX 3 - Survey Timetable

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<th>Activity</th>
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<td>Tindouf and Rabouni</td>
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<td>05/09/02</td>
<td>AM</td>
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<td>Weather Haven</td>
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<td>AM</td>
<td>Preparation and translation of documents</td>
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<td>Nursing School</td>
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<td>Nursing School</td>
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<td>Team training</td>
<td>Nursing School</td>
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<td>PM</td>
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<td>PM</td>
<td>Travel</td>
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<td>Nutritionists travel</td>
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</table>
ANNEX 4

Information for obtaining informed consent (translated into Arabic)

The Institute of Child Health / UNHCR will be working with implementing partners in order to assess the nutritional status of the population in the Saharawi refugee camps. It is important to assess the nutritional status of a population in order to help humanitarian organisations plan and provide services for these people. These services include: food distributions, healthcare, and community workers, and water and sanitation. The more information that we have about the nutrition of a community, the more we can plan for their future. It is therefore important to collect information that can be used for the community. Information that we collect will help us plan for your population, and help us to understand other refugee populations and help them as well.

The survey that we are doing is similar to other surveys that have been conducted in this camp. In the past children were weighed and measured by the survey teams. This time, the same will be done but we also ask people to be examined and give samples.

In order for us to understand the internal nutritional status of the refugee population, we will need to take some blood from randomly selected members of the population. This can be done without needles, and all that is needed is a finger prick, similar to testing for malaria. This time, however, we will collect slightly more than one drop of blood.

In randomly selected adolescents (age 10 – 19) we will take some urine and test this for iodine. Adolescents are the best people to test for iodine deficiency. People who are iodine deficient for a long time will develop goitre.

In randomly selected individuals (anyone in the family) we will collect blood in a small plastic tube. We will test the blood for malaria here in the camp, and send the rest of the blood to England for analysis.

We will only test the blood for things that will help us understand the nutrition of people of this camp.

If you give us permission to take your blood and urine, then we will check it for anaemia and iodine status. We will also look for nutritional deficiencies on your skin and ask you some questions.

The risks of the study include only the risks from the finger stick. This may produce some discomfort.

If you decide not to participate in this survey, nothing bad will happen. You will continue to receive health care and food in the normal way.
## Population Level Minimum Nutrient Requirements

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<tr>
<th>ENERGY</th>
<th>PROTEIN</th>
<th>FAT</th>
<th>CALCIUM</th>
<th>IRON</th>
<th>VIT. A (Retinol)</th>
<th>THIAMINE</th>
<th>RIBOFLAVIN</th>
<th>NIACIN</th>
<th>VIT. C</th>
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<tbody>
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<td>g</td>
<td>g</td>
<td>mg</td>
<td>mg</td>
<td>mcg</td>
<td>mg</td>
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<tr>
<td>2,100</td>
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<td>1,050</td>
<td>500</td>
<td>0.90</td>
<td>1.40</td>
<td>12.0</td>
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</table>

### Notes:
- The minimum requirements (safe levels of intake) for micronutrients are taken from the 'Management of Nutrition in Major Emergencies' (WHO, 2000).
- The minimum requirements for protein and fat are taken from WFP/UNHCR Guidelines for Estimating Food and Nutritional Needs in Emergencies. These figures are based on the need to supply 10-12% of the energy as protein and at least 17% as fat.
- These figures are also in agreement with key indicators from The Sphere Project 'The Humanitarian Charter and Minimum Standards in Disaster Response' (2000). The energy requirement of 2100 kcal is taken from the same reference sources. It should be noted that it may be appropriate to adjust this figure based on factors such as the ambient temperature, activity level, demographic composition of the beneficiary population, and degree of self-sufficiency.