AN EVALUATION OF THE NUTRITIONAL STATUS OF PRESCHOOL CHILDREN LIVING IN A RURAL HEALTH DISTRICT:

IMPLICATIONS FOR A COMMUNITY BASED NUTRITION PROGRAMME IN THE NORTHERN PROVINCE.

Submitted for the degree of MSc(Med): Paediatrics and Child Health by -

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DECLARATION

I, **ROMY SAITOWITZ**, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work or any part of it has been, or is to be submitted for another degree in this or any other university.

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ABSTRACT

INTRODUCTION

An overall pattern of undernutrition has emerged in South Africa that is characterised by a low prevalence of underweight, moderate to high prevalence of stunting and varying levels of wasting. There is a wide variation in nutritional status within and between provinces and ethnic groups (Vorster et al, 1997). The Northern Province has the highest prevalence of stunting amongst pre-school children (SAVACG, 1995).

Despite the observation of poor dietary intakes amongst rural black primary- (Leary, 1969) and pre-school children (Steyn et al, 1993), there remains a shortage of information for children under 2 years (Vorster et al, 1997). Of the information available, it appears that dietary energy intake of these children is frequently insufficient (Dannhauser et al, 1996; Steyn et al, 1993; Richter et al. 1984). In addition to poor dietary intake, a variety of other factors are thought to contribute to the high rates of malnutrition in South Africa, including sub-optimal breastfeeding (particularly exclusive breastfeeding), complementary feeding practices, and infection (Vorster et al, 1997).

Past nutrition programmes to address malnutrition, have been mostly fragmented and ineffective (McLachlan, 1995). In 1994, the Integrated Nutrition Programme (INP), was introduced, which emphasised the need for a multi-sectoral approach to malnutrition (INP, 1998). The role of community-based nutrition programmes (CBNPs) was highlighted as pivotal, and the Department of Health (DOH) has set the goal of establishing two CBNPs per health district by the year 2001 (INP, 1998).

In 1997, the Child Health Unit at the University of Cape Town was requested to provide assistance to a CBNP situated in the Ngwaritsi health district of the Northern Province - Hlatlolanang Health and Nutrition Education Centre (HHNEC). Since 1991, HHNEC has provided nutrition services in the Nebo and Sekhukhune magisterial districts that make up the Ngwaritsi health district.

Given the new emphasis on community-based initiatives to combat malnutrition, HHNEC wanted to develop a more comprehensive nutrition strategy for the area which would be able to function within the context of the INP. Since its inception, the HHNEC programme has never been evaluated. In addition, there was no information available on the nutritional status of pre-school children living in the area serviced by HHNEC.

AIM AND OBJECTIVES OF THE STUDY

The study aimed to evaluate the nutritional status of pre-school children (0-6 years), and the activities of a local CBNP serving these children, in the Ngwaritsi health district of the Northern Province. The following objectives were identified:

- To determine the anthropometric status of children 0-6 years
- To determine the dietary intake of children 0-6 years
- To evaluate the nutrition services offered to these children by a local CBNP
- To make recommendations, based on these findings, for improving existing strategies to address malnutrition in the area.

METHODS

In determining the anthropometric status of the children, weights, heights, age and sex were recorded for each child (see Appendix 2) and indices of weight-for-age, weight-for-height and height-for age were calculated and compared to international growth reference charts (WHO,1986).

Dietary data was collected using a single 24-hour dietary recall (see Appendix 3). For this purpose a training manual was developed (see Appendix 12) and six community health workers collected the data. Data on breastfeeding and complementary feeding practices were collected using a structured questionnaire (see Appendix 4).

A framework, based on the experiences of internationally successful nutrition programmes (see Appendix 5), was used to guide the evaluation of the HHNEC programme. All available reports were reviewed and interviews were conducted with staff members using a structured questionnaire (see Appendix 7).

RESULTS

Of the total number of children (N=362), 27.3% were stunted, 6.1% wasted and 16.9% underweight. Undernutrition is prominent at an early age, with a prevalence of 14% wasting and 14% stunting in children 0 to 11 months of age. The prevalence of stunting increases steadily and peaks amongst children 36 to 47 months (36.8%). The prevalence of wasting has a second peak in the same age-group (8%).

The diets of the majority of children were low in energy (56.8%) and more than two-thirds of the children took in less than 67% of the RDA for vitamin A (66.1%), iron (75.5%), calcium (93.7%), zinc (86.6%) and vitamin C (80.1%). The diet of most children did not have much variety and the most common food item consumed by children was *bogobe*, a medium-stiff maize porridge (eaten by 79.8% of children), followed by brown bread (eaten by 57.1% of children).

Although breastfeeding initiation rates were high (92.9%), few mothers breastfed exclusively (17.85%) for 4 months. Most mothers introduced solid foods by the age of three months (79.3%) - most commonly soft maize porridge (70.5%).

HHNEC has four programmes namely, a health and nutrition programme, an income generating programme, an adult basic education and training programme and a household food security programme. Although these programmes were intended to address malnutrition in a holistic manner, there is little co-ordination between the programmes and even fewer linkages with state health structures. On a more positive note, there are strong links with village women's groups. The training that has been received by staff members is very limited and there is no ongoing training programme in place. The result is, that the growth monitoring activities are far from optimal.

DISCUSSION

The findings of this study suggest that in the NMTTS health district, children mainly have a problem of chronic malnutrition. Stunting has been linked to long-standing dietary inadequacy, reflecting socio-economic deprivation and aggravated by poor environmental conditions (Solarsh et al, 1994).

Although no significant correlation was found between the dietary intake and anthropometric status of children in this study, the choice of dietary methodology could in part explain this. The 24-hour recall has been criticised for not representing *usual* dietary intake making it difficult to relate consumption in the recent past (previous 24-hours) to nutritional status which develops over a longer period of time. This is especially relevant for stunting which has its origins in early childhood (Beaton, 1990).

Although indicators of socio-economic status were not collected as part of this study, there is no doubt that poverty has a substantial impact on the nutritional status of these children. The NMTTS health district is located within the former homeland of Lebowa, an area, with one of the highest unemployment rates in the country (41%) (CSS, 1995). An estimated two-thirds (69.1%) of households do not have access to running tap water (Chabikuli, 1998) and only 13,8% of the

population have their refuse removed by the local authority (CSS, 1994), creating an environment vulnerable to the spread of disease.

The levels of wasting and stunting, in this study, are prominent in children under 12 months. Dannhauser (1996) reported similar levels of wasting (14%) in children 6 months to <1 year, living in a farming area in Bloemfontein. According to the authors, the finding of poor dietary intake, coupled with the high prevalence of wasting in that age-group, points to a problem with the introduction of complementary feeding. Indeed, infant feeding practices in the NMTTS health district are far from satisfactory with the majority of mothers introducing solids by 3 months. An examination of the dietary intakes of these children reveal that they are of poor quality with over a third (36.7%) of children in the age-group 0-11 months having a deficient intake of energy and micronutrients (see Appendix11).

The high level of stunting in the first year of life could be due to a number of factors, including low birth weight. However, data on low birth weight was not collected, and remains a limitation of the study.

RECOMMENDATION

- The results of the survey show that malnutrition in the NMTTS health district is too vast a problem to be tackled by any one organisation. It is thus imperative that formal linkages should be made between HHNEC (and other NGOs), the local health facilities and other district role-players.

- Rather than provide a large range of services on a superficial level, the Centre should focus their activities on a smaller geographical area, based on available resources.

- The aim and objectives of the programme need to be defined better and accompanied by realistic targets and goals. The activities of the programme need to be stream-lined and must contribute to the achievement of the overall programme aim.

- Training programmes on basic health and nutrition, need to be implemented as a priority. Mechanisms also need to be put in place to ensure ongoing training and development of skills.

- Growth monitoring should assume a central role, and should function as the mechanism for referral to other programmes.

- The programme needs to target a smaller geographic area (10-15 villages) based on the number of available personnel. As the programme activities become more stream-lined, the number of villages can be increased. Age-specific targeting should continue to focus on the under 6's with a particular focus on the under 3's. GMP activities should be supported by the development of case management guidelines, growth monitoring protocols and training manuals for health workers.

- Nutrition education needs to focus on promotion of exclusive breastfeeding for the first 4-6 months, appropriate complementary feeding practices and the economic preparation of meals. Emphasis needs to be placed on ways of increasing the energy and micronutrient content of the diet.

- More in-depth and qualitative research around the factors that contribute to infant feeding practices would be useful in shaping a more relevant nutrition education strategy.

- A management information system needs to be put in place to monitor and evaluate the activities of the programme.

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DEFINITION OF TERMS

ANTHROPOMETRIC STATUS

Anthropometric measurements are used to assess body size and reflects the growth pattern of individuals and/or groups. For children height-for-age, weight-for-height, and weight-for-age can be used to determine different aspects of nutritional status.

HEIGHT-FOR-AGE

Height-for-age is an indicator of past nutritional status. Low height-for-age is indicative of stunting, which is a result of chronic, long-term dietary inadequacy, reflecting socio-economic deprivation (Vorster et al, 1997).

WEIGHT-FOR-HEIGHT

Weight-for-height reflects current nutritional status. A low weight-for-height reflects wasting, a result of acute nutritional stress and severe food shortages or serious illness (Vorster et al, 1997).

WEIGHT-FOR-AGE

A low weight-for-age indicates that a child is underweight. If 20-40% of a population or group is underweight, it is considered to be moderately affected by undernutrition. If more than 40% is underweight, a severe problem exists (Vorster et al, 1997).

COMPLEMENTARY FOODS

Complementary foods are foods that are introduced to "complement" breastmilk. They are often called weaning foods. Most infants require complementary foods in addition to breastmilk by the age of 6 months to make certain that the child grows well.

EXCLUSIVE BREASTFEEDING

Exclusive breastfeeding means that a baby has no other food or drink besides breastmilk - not even water. Exclusive breastfeeding is sufficient for most infants until 4-6 months of age.

GROWTH MONITORING

Growth monitoring involves following the changes in a child's physical development, by regular measurement of weight, and sometimes length. It is an important tool in individual care, for **early detection** of health and nutrition problems in growing children (Healy et al, 1990). The use of growth monitoring extends beyond problem detection and has also been used as a basis for communicating with mothers and health workers about child health and to stimulate thinking about the causes of poor growth and malnutrition (Beaton et al, 1990).

MICRONUTRIENTS

Micronutrients are natural substances found in small amounts in food (e.g. vitamins and minerals) as compared to macronutrients (e.g. protein, fat and carbohydrates) which are found in larger amounts. Although the body only requires small amounts of micronutrients, they are very important in maintaining good health.

NUTRITIONAL STATUS

Nutritional status can be assessed using a number of methods including the measurements of anthropometric status, dietary intake and biochemical markers of macro- and micronutrient status.

NUTRITION SURVEILLANCE

The term nutrition surveillance refers to a system of routine data collection which provides information on nutrition conditions and associated factors in different population groups and monitors their changes over time. Nutrition surveillance

emphasizes the detection of malnutrition using representative samples of children. Thus the focus is on groups of children and not on the individual child as with growth monitoring. An essential feature of nutrition surveillance is that it must inform and be linked to decision-making.

RECOMMENDED DIETARY ALLOWANCE (RDA)

The RDA specifies the amount of macro- and micronutrients that are needed daily for different age-groups to ensure good health and nutrition.

Z-SCORES AND PERCENTILES

The indices weight-for-age, weight-for-height and height-for-age are most commonly expressed in terms of Z-scores and percentiles. These expressions can be used to compare an individual or a group with a reference population. A Z-score refers to the amount by which a child's weight or height deviates from the median value of a reference population (see Appendix 10).

Percentiles refer to the position of an individual on a given reference distribution, stated in terms of what percentage of the group is equal to or exceeded by the individual. Therefore a child of a specific age, whose weight falls in the 10th percentile, weighs the same or more than 10% of the reference population of children of the same age.

ABBREVIATIONS

ABET	Adult Basic Education and Training
CBNP	Community-Based Nutrition programme
CHPI	Child Health Policy Institute
CHU	Child Health Unit
GMP	Growth Monitoring Programme
HFBNP	Health Facility-Based Nutrition Programme
HHNEC	Hlatlolanang Health and Nutrition Education Centre
IMR	Infant Mortality Rate
INP	Integrated Nutrition Programme
INS	Integrated Nutrition Strategy
NMTTS	Ngwaritsi-Makhudu-Thamaga-Tubatse-Steelpoort
RDA	Recommended Dietary Allowance
UCT	University of Cape Town
UNICEF	United Nations Children's Fund
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND TO THE STUDY

In 1997, the Child Health Unit was requested by the Henry J. Kaiser Family Foundation [1] to assist and support the Hlatlolanang Health and Nutrition Education Centre (HHNEC), a CBNP situated in the Northern Province, to develop a comprehensive nutrition strategy for the area.

The first phase of the partnership aimed to provide baseline data on the nutritional status of children under 6 years and an assessment of the current nutrition interventions provided to these children by the HHNEC. Based on these findings, recommendations could be put forward for transforming the existing HHNEC interventions, so that they address, more specifically, the nutritional problems of the area.

The purpose of the survey was to assist in determining the most appropriate community-based nutrition interventions for the district and to identify the most needy individuals within the district who could benefit from nutritional support. The survey was also intended to provide baseline information on nutritional status, against which the impact of future nutrition interventions could be compared, through a follow up survey after three years.

The second phase of the partnership, the intervention phase, would focus on the implementation of the recommended nutrition activities and an evaluation of their impact on the nutritional status of pre-school children. As an overall principle, the partnership endorsed the facilitation of skills development and capacity building of both partner organisations.

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[1] *The Henry J. Kaiser Family Foundation is a funding organisation based in the United States. The CHU was specifically approached , as child nutrition and district development, are key focus area*

1.2 DESCRIPTION OF THE HHNEC

The Hlatlolanang Health and Nutrition Education Centre (HHNEC) was established in 1991 in response to the high rate of malnutrition which prevailed in the Sekhukhune area at that time (HHNEC, 1996). Initially the HHNEC was conceived as a kwashiorkor rehabilitation centre, however this evolved into a broader strategy which aimed to prevent malnutrition through a more comprehensive approach (HHNEC, 1996).

The Centre is situated in the small town of Jane Furse that lies at the centre of the Sekhukhune and Nebo magisterial districts, in the Northern Province. These two magisterial districts have recently been amalgamated to form the Ngwaritsi-Makhudu-Thamaga-Tubatse-Steelpoort (NMTTS) health district (Chabikuli, 1998). The HHNEC targets its activities to the entire NMTTS health district.

There are currently four programmes operating within HHNEC including a Health and Nutrition programme, an Adult Basic Education and Training programme (ABET), a Household Food Security programme and an Income Generating programme (see Figure 1).

The Health and Nutrition programme currently focuses on:

- community-based growth monitoring
- nutrition and health education
- community rehabilitation of mentally and physically disabled children
- child-care development (educare)

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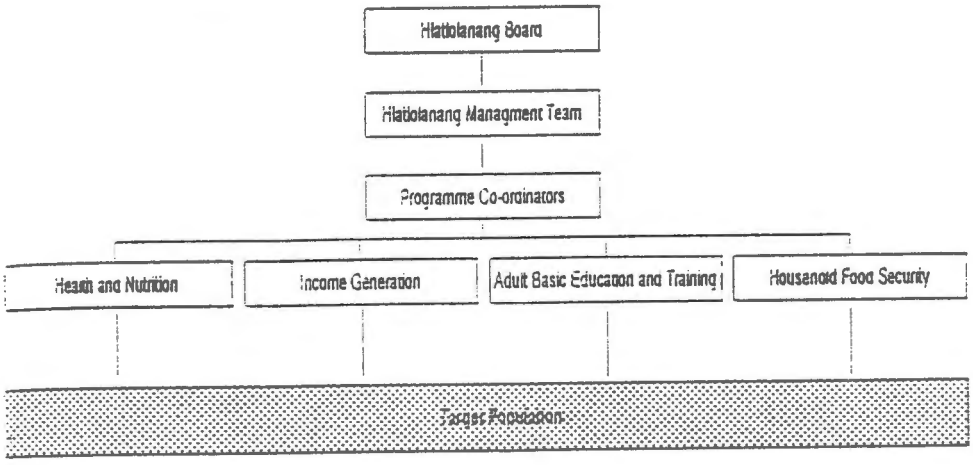
of the unit. In addition, the Henry J. Kaiser Family Foundation has a long history of involvement with both the Child Health Unit and the HHNEC.

Figure 1: Organisational structure of HHNEC



1.3 DESCRIPTION OF THE STUDY AREA – THE NGWARITSI-MAKHUDU-THAMAGA-TUBATSE-STEELPOORT (NMTTS) HEALTH DISTRICT

The NMTTS health district is located in the Southern Region of the Northern province (see Figure 2 and 3). It consists mainly of areas that formed part of the former homelands of Lebowa, Venda and Gazankulu (Health Systems Trust, 1996). The Northern Province is one of the least urbanised provinces in South Africa with approximately 92% of the population living in rural areas consisting of scattered villages (Health Systems Trust, 1996). The southern region consists of five health districts namely,

- Ngwaritsi-Makhudu-Thamaga-Tubatse-Steelpoort (NMTTS)
- Hlogotlou-Lepelle-Greater-Nebo-North
- Eastern-Tubatse-Ohrigstad-Dilokong
- Zebediela-Greater-Lebowakgomo
- Nokotlou-Fetakgomo

The NMTTS health district comprises the two magisterial districts of Nebo and Sekhukhune (Chabikuli, 1998) (see Figure 2 and 3).

1.3.1 POPULATION

The total population of the Northern Province is 5.1 million (Health Systems Trust, 1996) and approximately 160 000 people live in the NMTTS health district. Children under 5 years make up approximately 18% of the population (Health Systems Trust, 1996).

1.3.2 PUBLIC HEALTH SECTOR FACILITIES IN THE NMTTS HEALTH DISTRICT

There are two hospitals in the NMTTS health district namely, the Jane Furse Memorial hospital and St Rita's hospital. The former is the district hospital while the latter is the regional referral hospital. There are 14 fixed clinics affiliated to the hospitals (Chabikuli et al, 1998).

1.3.3. HEALTH STATUS AND HEALTH INDICATORS

In 1990, the infant mortality rate (IMR) in the Northern Province was the highest of all provinces in South Africa (52.9) (Health Systems Trust, 1996). In 1993, the IMR in the former Lebowa was found to be substantially higher than the provincial average, at 61 deaths per 1000 live births (Health Systems Trust, 1995).

1.3.4 SOCIO-ECONOMIC PROFILE

Very little information is available regarding the socio-economic circumstances at the district and regional level. Therefore, provincial statistics will be used in this section. Unemployment in the province is estimated to be amongst the highest in the country (41%) (Central Statistical Services, 1995). Only 17.3% of the population in the Northern Province is economically active (Central Statistical Services, 1995).

1.3.5 WATER AND SANITATION

Most households in the district obtain water from boreholes equipped with handpumps. Most of the population still travel long distances to fetch water and only 31.9% of households have access to running tap water (Chabikuli, 1998). Most households in the district have pit holes for refuse dumping and only 13.7% of the population have their refuse removed by the local authority (Central Statistical Services, 1994). Few houses have access to flush toilets (Central Statistical Services, 1994).

FIGURE 2: MAP SHOWING THE SIX REGIONS IN THE NORTHERN PROVINCE

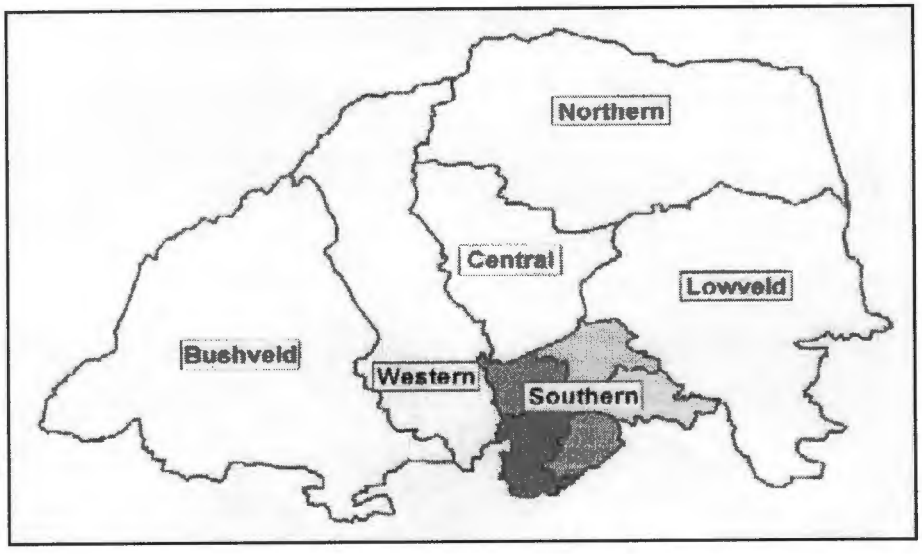
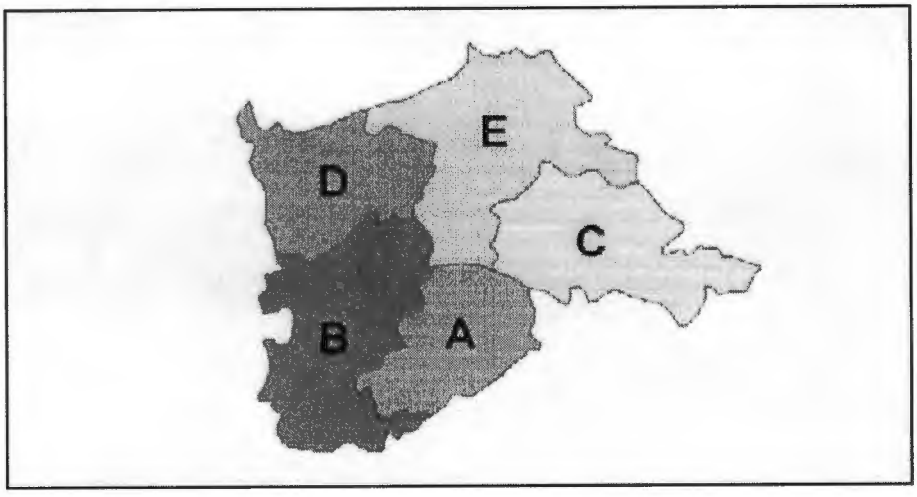


FIGURE 3: MAP SHOWING THE FIVE HEALTH DISTRICTS IN THE SOUTHERN REGION



A = *NGWARITSI-MAKHUDU-THAMAGA-TUBATSE-STEELPOORT (NMTTS)*
B = *HLOGOTLOU-LEPELLE-GREATER-NEBO-NORTH*
C = *EASTERN-TUBATSE-OHRIGSTAD-DILOKONG*
D = *ZEBEDIELA-GREATER-LEBOWAKGOMO*
E = *NOKOTLOU-FETAKGOMO*

1.4 THE NMTTS HEALTH DISTRICT AS A PILOT SITE FOR IMPLEMENTATION OF THE INP

One of the most timeous district initiatives for the NMTTS area, has been the extension of the Health System Trust's Initiative for Sub-district Support (ISDS) to this area of the Northern Province. This initiative aims at improving the delivery of district health services in a number of pilot sites throughout South Africa. This is an initiative which has been implemented in collaboration with the national DOH.

The ISDS began working with the NMTTS district towards the end of 1997. Some of the activities that have taken place so far include the establishment of a district co-ordinating team (DCT), who have conducted a situation analysis of the district and have identified a number of priority health issues. One of the key health issues identified, was malnutrition. One of the major challenges now, is the implementation of the INP within the district.

To support this challenge, the CHU has extended their partnership with the HHNEC. The purpose of the new partnership is, together with ISDS, the DOH and all other district role-players, to develop a model for a district-based INP. This partnership will continue for a 3 year period and will ultimately contribute to the development of sustainable district INPs on a national basis. CHU will provide technical support and expertise in defined areas throughout the duration of the project.

CHAPTER 2: LITERATURE REVIEW

In 1987, the United Nations sub-committee on nutrition and the World Health Organisation estimated that one third to two-thirds of children in developing countries show some degree of growth retardation (Scrimshaw et al, 1993). UNICEF has estimated that 190 million children younger than five years of age are chronically malnourished (Grant et al, 1994). In South Africa, approximately 1,5 million preschool children are stunted as a result of long-term malnutrition (SAVACG, 1995).

The adverse effects of malnutrition on childhood mortality, even when present in a mild or moderate form, have been well documented (Pelletier et al, 1993). It is thus imperative that nutrition interventions target children during the peak period of growth failure (6-24 months), if stunting and its subsequent effects on growth and intellectual development are to be reversed (Gillespie et al, 1991).

2.1 MALNUTRITION AMONGST PRE-SCHOOL CHILDREN IN SOUTH AFRICA

The extent of malnutrition amongst preschool children in South Africa has been illustrated by the findings of a recent national survey of children 6-71 months of age which showed that nearly one in four children (22.9%) were stunted, one in ten (9.3%) were underweight and 2.6% were wasted. Rural areas had a higher percentage of children who were underweight (11%) than urban areas (7%). A similar pattern was seen for stunting, with a prevalence of 27.6% in rural areas compared to 16.1% in urban areas (see Figure 4). Considerable variation was also noted between provinces with the Northern Province having the highest prevalence of stunting of 34.2% (see Figure 5).

FIGURE 4: ANTHROPOMETRIC STATUS OF CHILDREN PER AREA (SAVACG, 1995)

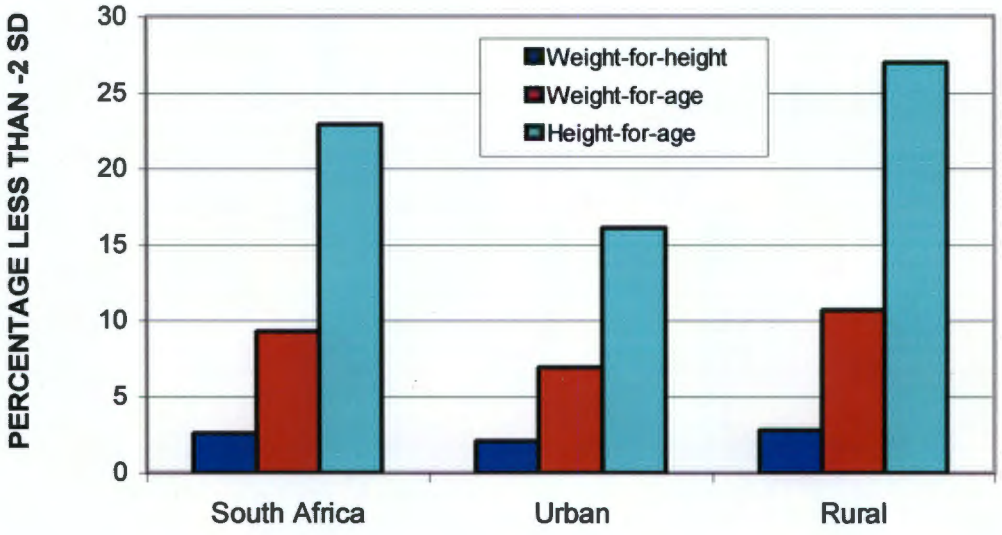
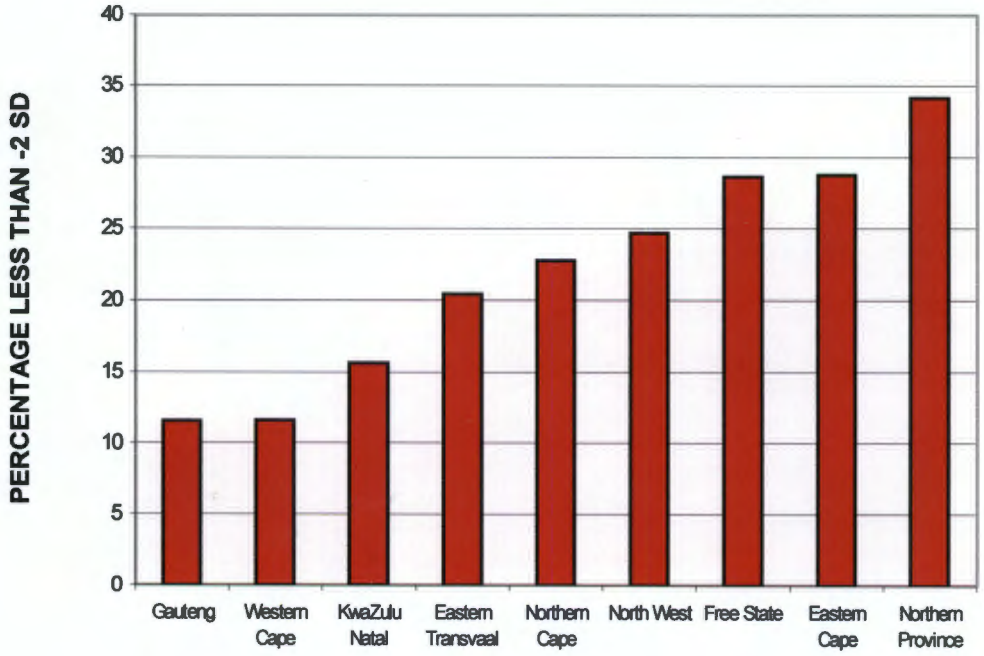


FIGURE 5: STUNTING PREVALENCE OF CHILDREN PER PROVINCE (SAVACG, 1995)



However, in a review of several smaller studies on nutritional status, it was estimated that the proportion of preschool children who are malnourished may be higher than that reported by the national survey. The review also indicated that the extent of malnutrition in children varied within provinces and confirmed the existence of several pockets of especially high prevalences of malnutrition relative to their mean provincial rates (Vorster et al, 1997).

For example, a study of Pedi children, 3-5 years of age, living in two rural villages in the former Lebowa (Northern Province), revealed higher levels of stunting (36%), compared to the provincial rates of stunting in under-six year olds (34%), especially amongst young boys (see Table 1). An earlier survey, conducted by Leary (1969) found that malnutrition amongst Pedi pre-school children persisted in the school-age population, and reported that 39% and 33.2% of children 7-15 years of age were underweight and stunted, respectively.

TABLE 1: PERCENTAGE OF PRE-SCHOOL CHILDREN WITH ANTHROPOMETRIC INDICES < THE 5TH PERCENTILE (Steyn et al, 1993)

	Children below the 5th centile (%)	
	Boys	Girls
Stunting	36	22
Underweight	30	16
Wasting	5	2

The authors concluded that the mean Pedi height and weight findings, showed a pattern which suggested a delay in the puberty growth spurt, which is thought to be accounted for by prolonged undernutrition during the earlier growth period (Leary, 1969).

These findings are compatible with the results of an earlier anthropometric survey conducted in 1986 amongst children (0-59 months) living in rural South Africa (Department of National Health and Population Development, 1987).

Stunting, as indicated by a low height-for-age, was observed in 24.5% of the children, 8.4% were underweight and 1.8% were wasted.

From the literature, it would seem that a pattern of malnutrition has emerged amongst pre-school children in South Africa, which is characterised by a low prevalence of underweight, moderate to high prevalences of stunting and the virtual absence of wasting (Vorster et al, 1997). This pattern has also been observed in a number of other developing countries in Africa, Asia and South America, with the greater proportion of young children being stunted rather than wasted (Pinstrup et al, 1993).

A deficit in height-for-age, or stunting (<-2 SD) is an index of past nutritional history and can be interpreted as evidence of chronic undernutrition (Torun et al, 1994), caused by a diet low in energy and essential nutrients over a long period of time, leading to sub-optimal growth (Solarsh et al, 1994; Bourne et al,1994).

Long-standing dietary inadequacy, reflects poor socio-economic deprivation which is frequently aggravated by poor environmental conditions (Solarsh et al, 1994). It has thus been suggested that the prevalence of stunting can be significantly reduced, with improvements of socio-economic conditions (SAVACG, 1995).

2.2 *DIETARY INTAKES AMONGST PRE-SCHOOL CHILDREN IN SOUTH AFRICA*

It is estimated that about 780 million people in developing countries do not have access to enough food (WHO, 1992) and more than 13 million children under the age of five years die annually due to infections, as a direct or indirect result of hunger and malnutrition (FAO, 1992).

The measurement of what people eat can provide valuable information on nutritional status. Dietary intake data can be used to evaluate the adequacy of diets and to study the relationship between dietary intake and health and disease (Vorster et al, 1997).

The interpretation of dietary data in terms of foods as opposed to nutrients is of interest to health and nutrition policy makers and nutrition educators, since the implementation of effective nutrition interventions have to be based on a knowledge of existing food habits (Bourne et al, 1994). In 1984, a large survey (N=750) of the dietary intakes of children aged 6 months to 8 years and lactating women was conducted on behalf of the Ciskeian Government to provide a baseline from which to formulate a nutrition policy for the country (Richter, 1984).

The importance of dietary intake data has been recognised by the South African DOH which has recently made funds available for a national food consumption survey. The main aim of the survey is to identify a suitable food vehicle, as part of a national micronutrient food fortification programme. Although this is the first survey of its kind in South Africa, similar surveys have been conducted in a number of other countries including the United Kingdom (Gregory et al, 1990), the United States (Kuczmarski et al, 1994) and the Phillipines (Food and Nutrition Research Institute, 1994).

Although nationally representative dietary intake data is not currently available in South Africa, several authors have published data obtained from smaller studies throughout the country. The findings of these studies suggest that poor dietary intakes amongst pre-school children is a major contributing factor to the prevalence of malnutrition in this age group (Bourne et al, 1994; Steyn et al, 1993; Mckeown et al, 1989; Richter et al, 1984).

One of the earliest dietary surveys of rural South African children was conducted by Leary in 1965. He investigated the food items consumed by Pedi school children living in the then "Sekhukhuneland". The most commonly consumed foods were maize meal porridge (eaten by 52% of children for breakfast and 96% for supper), *morogo* (wild spinach), eaten by 34% of children for breakfast and 68% for supper and bread (eaten by 29% for breakfast). Tea was the most popular beverage and was consumed with breakfast by 35% of the children (Leary, 1969). Although the study gave an indication of the range of foods consumed, it did not measure the quantity of food consumed, making it difficult to determine the nutrient adequacy of the diet. The authors, however, suggested that "...[the diet] seems to be monotonous, and in many respects deficient" (Leary, 1969).

A study conducted by Steyn et al (1993) of Pedi pre-school children (aged 3-5 years), provided information on the range of food items eaten as well as the quantities consumed (see Table 2). Although the study was conducted some thirty years after the study by Leary (1969), and among a younger age group of children, it showed that the diet of these children remained largely unchanged and consisted predominantly of refined maize meal, tea and brown bread. *Morogo* was also commonly consumed and was eaten on average three times per week (Steyn et al, 1993).

TABLE 2: MOST COMMON FOOD ITEMS CONSUMED BY PEDI PRE-SCHOOL CHILDREN IN LEBOWA (Steyn et al, 1993)

Food items consumed	Average amount (g/child/day)
Maize meal porridge	568,2
Tea	180,9
Brown bread	90,6
Morogo (wild spinach)	48,8
Fried egg	27,8
Tomato and onion stewed	27,8
Stewed chicken	23,2
White bread	21,8
Oranges	18,8
Sour milk	18,1
White sugar	15,1
Cooked cabbage	14,5
Fresh milk	13,9
Mangoes	11,9
Bananas	10,0

McKeown et al (1989), examined the most common food items eaten by four- and five-year-old rural black children in the former Transvaal and found tea to be the most common item consumed, followed by maize meal porridge. Thus it appears that these food items feature prominently in the diets of both rural pre-school and school-aged children (Leary, 1969; McKeown et al, 1989; Richter et al, 1984).

Richter et al (1984), measured the nutrient adequacy of the diets of pre-school and school-aged children from the Ciskei, by comparing them to that recommended by the WHO (Passmore et al, 1974). The findings showed that 16% and 26% of infants [2] and toddlers [3], respectively, had energy intakes below 75% of the WHO standards. The prevalence of inadequate energy intake was higher for school-aged children compared to pre-school children, with as many as 62% not meeting the recommended intake (Richter et al, 1984). For both age groups, the most deficient vitamins were nicotinic acid, riboflavin and ascorbic

[3] *Infants are defined in this study as 6-23 months of age.*
4 Toddlers are defined in this study as 2-3 years of age.

acid – a deficiency pattern resulting from a diet consisting predominantly of maize porridge (Richter et al, 1984).

Dannhauser et al (1996), determined the dietary intake of children between 6 months and 6 years on farms in the Bloemfontein district, using a dietary history and a food frequency questionnaire. Their findings of food and nutrient intakes were similar to those reported in other rural parts of South Africa, except for the unusually high intake of milk and higher vitamin A and calcium intakes. This is in sharp contrast to findings from other studies which reported a median milk intake of ½ a portion (Bourne et al, 1994; Steyn et al, 1993) where only 28% of children received as much as one cup of milk per day.

It is noteworthy that the studies by Bourne (1994) and Steyn (1993), used the 24-hour recall as a method for measuring dietary intake, whereas the study by Dannhauser (1996) used a food frequency questionnaire, which is often thought to overestimate food intake (see Appendix 14). This, together with the farm environment in which the study was conducted, could explain in part the unusually high intake of milk. Energy intake amongst a large proportion of children under 1 year were found to be insufficient (between 36% and 50%).

According to the authors, the findings of poor dietary intake, coupled with the high prevalence of wasting in the age group 6 months to 2 years, points to a problem with the introduction of complementary feeding. The investigators recommended that education strategies be developed for improving breastfeeding and complementary practices.

A number of investigators have reported that undernutrition develops at the time of weaning (Molteno et al, 1991; Delport et al, 1994). Some of the main reasons include the risk of diarrhoeal disease from contaminated food and utensils, the dimunition of breast milk intake through irregular and weaker suckling (Richter et al, 1994) and its replacement with poor quality, low energy foods. According to

Zollner et al (1993), in a study of Vendan children (0-2 years), early complementary feeding was not accompanied by the introduction of an adequate diet. The studies of Lazarus (1984) and Molteno (1989) also identified insufficient breastfeeding and inappropriate complementary feeding practices as major contributors to undernutrition in South African children.

2.3 MALNUTRITION AND ITS DETERMINANTS

Nutritional status expresses the degree to which an individual's needs for food and nutrients are being met. The balance between nutrient intake and nutrient requirements of the body is influenced by a large number of physiological, pathological, psychological and socio-economic factors (Vorster et al, 1997).

UNICEF has put forward a conceptual framework to guide the understanding of the complex and inter-related factors which underlie malnutrition (see Figure 6). The framework identifies inadequate dietary intake and disease as the most significant *immediate* causes of malnutrition (UNICEF, 1990). Disease, in particular infectious disease, affects dietary intake and increases nutrient requirements. At the same time, malnutrition exacerbates the disease state.

Underlying factors contributing to inadequate dietary intake include poor breastfeeding and complementary feeding practices amongst infants and young children as well as household food insecurity, defined as a lack of access to adequate, affordable and nutritious food. Clearly, many socio-economic factors influence household food security, which in turn are shaped in part by the *basic* political and ideological environment of the country.

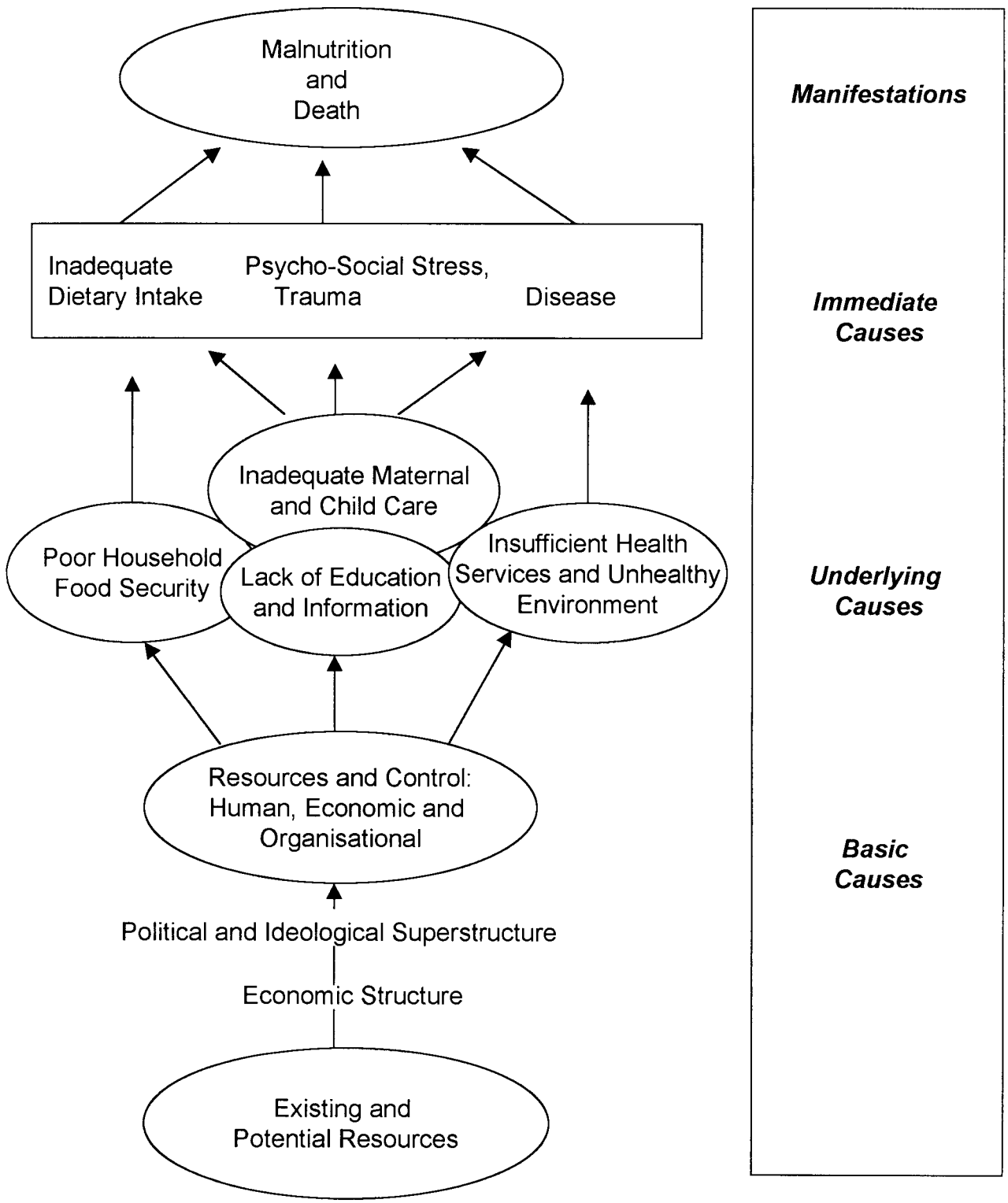
In South Africa, the pattern of poverty has a strong race and regional distribution, reflecting the political agendas of the past. The majority of the poor are Africans (95%) and live in rural areas (75%). The Eastern Cape and the Northern Province have the highest poverty rates (RDP, 1995).

In addition to unemployment and low incomes, it has been suggested that inequalities to access of agricultural land in the past has led to household food insecurity and has contributed significantly to undernutrition, especially in rural areas where agriculture contributes little to household income (Health Systems Trust, 1995). A smaller study confirmed this suggestion and reported that protein-energy malnutrition in pre-school children in Lebowa was *inter alia* caused by inadequate local food production (Booth, 1992).

Although there is no doubt that poverty plays an major role in the development of undernutrition, it is important to note that not all poor people are undernourished (Vorster et al, 1997). Clearly, other factors mitigate the extent of malnutrition. Community infrastructures which help to maintain a healthy environment, including access to health services, clean and safe drinking water, sanitation and refuse removal, help to protect children against disease and reduce the risk of malnutrition. The role of maternal care, education and access to resources have also been identified as factors which contribute to the nutritional well-being of children (UNICEF, 1990).

Although the UNICEF framework provides a good background for understanding the multiple causes of malnutrition, it does not distinguish between the causes of growth failure at different ages. The importance of taking age into account, is now being re-emphasized (Martorell, 1989). This is because causes of growth failure are generally age-specific and the required interventions often depend on age (Martorell, 1989). At birth, infant weight and length are primarily determined by maternal factors such as maternal nutritional status and gestational age. During the first 4 to 6 months, infant feeding practices (especially breastfeeding) and child-care are the main influences on nutritional status. From 4 to 6 months until two years of age, complementary feeding practices and exposure to infection have a major influence on growth. As the age of the child increases, household access to food begins to play a greater role in attained growth (Beaton et al, 1990).

FIGURE 6: UNICEF CONCEPTUAL FRAMEWORK ON THE CAUSES OF MALNUTRITION (UNICEF, 1990).



2.4 NUTRITION INTERVENTIONS FOR PRE-SCHOOL CHILDREN IN SOUTH AFRICA

2.4.1 Past nutrition programmes

Until 1994, the major state-funded nutrition programmes that targeted pre-school children, were the National Nutrition and Social Development Programme (NNSDP) and the Protein Energy Malnutrition (PEM) Scheme. In addition, several non-governmental organisations also implemented nutrition intervention programmes (Vorster et al, 1997).

The PEM Scheme has been in operation in South Africa since 1971 (INP, 1998). The aim of the Scheme was to provide support to malnourished children (aged 1-6 years) and those at risk of developing malnutrition, by providing them with food supplements [4] through the local authority clinics and health centres (Health Systems Trust, 1995). Originally the scheme operated on a small scale. However, in 1991 the scheme was extended to include other vulnerable groups including pregnant and lactating women, the aged and the chronically ill (Hendricks et al, 1997).

Despite the extension of the PEM Scheme, there was a perception that it did not make a significant contribution to the improvement of nutritional status (Vorster et al, 1997). The main reason for this was that the Scheme operated almost exclusively as a vertical feeding programme, and neglected to address the underlying causes of malnutrition (McLachlan et al, 1995). In addition, it was not linked to other services offered at health centres or to more sustainable, community-based initiatives (Hendricks et al, 1997.)

[4] *Milk enriched with vitamins and minerals*

As it operated at health facilities, the PEM Scheme was inaccessible to the most needy children and has resulted in poor coverage. The lack of geographic targeting, and the exclusion of the scheme from the former TBVC states (with the exception of Venda and Kwa-Zulu) exaggerated poor programme coverage (McLachlan et al, 1995).

Other factors that have hindered the success of the programme include the absence of well defined programme goals, limited nutrition education and inadequate community participation (McLachlan et al, 1995).

The NNSDP was established in 1991 as a food aid programme, primarily in response to the government's newly imposed value-added tax (VAT) on basic foodstuffs and the implication that this would have on poor communities. The programme was implemented at a local level through non-governmental and community-based organisations, based on project proposals approved by local and provincial committees (Hendricks et al, 1997). Beyond feeding, the programme aimed to support community-based projects in improving household food security. However, despite the programme's broad vision, it focused almost exclusively on food distribution (Health Systems Trust, 1997) and its overall contribution to sustained household food security is judged to have been modest (McLachlan et al, 1995). As with the PEM scheme, no form of geographic targeting was applied, and the demand-driven nature of the programme meant that urban areas were over-served despite the greater need in rural areas (McLachlan et al, 1995).

2.4.2 Current nutrition interventions, the Integrated Nutrition programme (INP)

In August 1994, the new Minister of Health, appointed a National Committee on Nutrition to develop a more comprehensive nutrition strategy for South Africa. The Committee recommended the development of an Integrated Nutrition Programme (INP, 1998).

Instead of the fragmented programmes of the past, the INP is based on the UNICEF conceptual framework and focuses on integration of services and a multi-sectoral approach to the problem of malnutrition. In so doing, the former nutrition programmes (PEM scheme, NNSDP) have been phased out and integrated within the INP (INP, 1998).

The aims of the INP include:

- Enabling all women to breastfeed their children, exclusively until six months of age and thereafter to continue breastfeeding in addition to the introduction of appropriate complementary foods, until twenty-four months of age and beyond.
- Ensuring optimal growth of infants and young children.
- Reducing the prevalence of malnutrition in children.
- Promoting the health of women and in particular pregnant and lactating women.
- Preventing an increase in mortality due to diseases of lifestyle.
- Improving capacity at all levels to solve the problems of malnutrition and hunger.
- Improving intersectoral collaboration and community ownership of the programmes and resources.

The INP has been structured on the basis of three components:

A Community-Based Nutrition Programme (CBNP), with the aim of strengthening household food security, improving knowledge about nutrition, supporting the care of women and children and promoting a healthy environment (Health Systems Trust, 1997). Elements of the NNSDP and PSNP have been incorporated in this programme.

A Health Facility-Based Nutrition Programme (HFBNP), which is intended to be part of the primary health care package and will focus on problems of undernutrition, micronutrient deficiencies and chronic diseases of lifestyle. The programme will provide nutrition education, growth monitoring and micronutrient and food supplementation. It has been proposed that the PEM scheme be integrated into this programme (INP, 1998).

A Nutrition Promotion Programme, which will focus on nutrition promotion through policy development, improved communication, advocacy and appropriate legislation (INP, 1998). Priority areas for this programme include:

- Promotion and protection of breastfeeding
- Marketing of infant foods
- Food fortification

The INP will target nutritionally vulnerable communities and groups. Targeting of geographic areas and communities will be guided by socio-economic indicators as well as anthropometric and nutritional indicators (INP, 1998). Within these areas, priority target groups for nutrition interventions have been identified as:

- Children under 6 years
- At risk pregnant and lactating women
- Primary school children from poor households

- Persons suffering from chronic diseases of lifestyle or communicable diseases
- At-risk elderly persons

Supporting the INP are a human resource development strategy and an information strategy, which includes nutrition surveillance (McLachlan, 1996).

2.4.3 Strengths and weaknesses of the INP

Several key factors appear to be related to the success of most international nutrition programmes (Gillespie et al, 1991; Lotfi et al, 1991). These include clearly defined objectives, political support and strong leadership, adequate training and supervision of programme staff, appropriate targeting strategies, community participation and mobilisation and effective programme management and a multi-sectoral approach (Jennings et al, 1991). (see Appendix 5). It is useful to examine the extent to which the INP has attempted to address these key factors.

2.4.3.1 Political support and strong leadership

At a national level, political commitment has been demonstrated by the introduction of an INP. However, this commitment, in many instances, has not extended to the provincial and district level. This is reflected, in part, by a reduction in provincial nutrition budgets (for selected provinces), and fewer staff being allocated for nutrition programmes (Malek, et al, 1997).

In addition, at a district level most nutrition activities have to compete with other health interventions and have to be implemented by an already overburdened staff. The result is that support for nutrition at the local level (site of nutrition service delivery) is often absent (Malek et al, 1997).

2.4.3.2 Clearly defined objectives

The objectives of any nutrition programme must be clearly defined (Beaton et al, 1982) and be based on a deeper understanding of the causes of poor nutrition.

While the new INP is based on the UNICEF conceptual framework for addressing malnutrition, it lacks the operational strategies for the implementation of a broad inter-sectoral approach. In addition, there is little evidence of formal inter-sectoral collaboration, particularly within the district (Hendricks et al, 1997).

This is of great concern, because if the INP is to impact positively on the nutritional status of women and children, it is essential that the programme is effectively implemented at the district level (Hendricks et al, 1997).

2.4.3.3 Adequate training and supervision of programme staff

Most nutrition programmes utilise a combination of existing health staff and community nutrition workers to implement programme activities. It is essential that these implementers receive adequate training, both at the beginning of the programme (start-up) and on an ongoing basis. The success of programmes such as the **Tamil Nadu Integrated Nutrition Programme (TINP)** and the **Joint WHO/UNICEF Nutrition Support Programme (JNSP)** in Tanzania, have been attributed to their strong training and supervision elements (Jennings et al, 1991).

The JNSP offered an initial 6 month training for village health workers, which was followed by a continuous series of courses, seminars and refresher training. The programme also developed a number of manuals to support the training initiatives (Jennings et al, 1991).

The implementation of the INP has been met by a number of difficulties. Staff capacity to adopt a new approach to nutrition programmes has been difficult for a

number of reasons including the general shortages of staff and the inadequate training that they have received on the critical issues associated with malnutrition and implementation of the INP (Health Systems Trust, 1997). Although the need for a human resource development strategy (McLachlan, 1996) has been recognised, it remains to be implemented. It is unclear what the content of the training will be, the duration and the target group.

2.4.3.4 Appropriate targeting strategies

A review of programmes in Latin America by the World Bank found that 'targeted programmes are five times more efficient as general food subsidies in achieving reductions in malnutrition' (Kennedy et al, 1987).

Usually programmes target through the following methods:

- Geographical targeting of high-risk areas, based on nutritional or socio-economic status,
- Age-specific targeting of members of the community who are most at risk of malnutrition, such as children under 5 years of age and pregnant and lactating women,
- Individual targeting of high-risk individuals or households, based on anthropometric and/or socio-economic status.

Unlike the past nutrition programmes, the new INP has a clear set of targeting criteria, based on a three-tiered approach including geographic targeting of under-resourced areas, the provision of nutrition support to vulnerable groups within these communities, and within these groups, targeting of at-risk individuals (INP, 1998).

2.4.3.5 Community participation and mobilisation

Community participation has been identified as a key element in effective implementation of nutrition programmes. Of 17 successful nutrition programmes reviewed, 12 programmes utilised local community members as project staff (Jennings et al, 1991). In most cases, these community members were responsible for growth monitoring, nutrition education and follow-up and referral of at risk children.

At a policy level, the INP has placed great emphasis on the need for communities to be involved in solving their own problems of malnutrition (INP, 1998). According to a national evaluation of the primary School Nutrition Programme "...it is not enough to have a policy that encourages community involvement, if there are no strategies to develop the capacity that can turn systems and policies into effective action". The evaluation identified a lack of training as one of the main factors impeding community participation (Health Systems Trust, 1997).

2.4.3.6 Effective programme management

Good management is essential for the success of nutrition programmes. This includes having an effective management information system, based on a system of programme monitoring and evaluation. The introduction of the INP has been accompanied by the establishment of a national nutrition surveillance strategy to improve the monitoring of nutrition interventions (Hendricks et al, 1997).

2.4.3.7 Multi-sectoral and holistic approach

The integration of poverty reducing programmes with nutrition initiatives, has been shown to enhance the success of nutrition programmes internationally (Malek et al, 1997). Although occurring on a small scale (projects like the Department of Welfare's Flagship initiative), the INP is not explicit about how these links will be forged and sustained on a large scale. This has serious implications for the success of the INP.

In summary, the Directorate of Nutrition now has a clear national policy framework that is based on a deeper and broader understanding of the causes of poor nutrition. This should allow for a move away from the legacies of the past which have left behind fragmented, poorly targeted and largely food-based nutrition programmes. The challenge of the Department of Health now is to implement its new policies (Health Systems Trust, 1997). However, cognisance must be taken of the success factors that have guided other nutrition programmes. In addition, more information at a district level is needed, to allow for the planning and implementation of community-specific nutrition interventions.

2.5 THE ROLE OF CBNPs WITHIN THE CONTEXT OF THE INP

The establishment of CBNPs is pivotal to the overall success of the INP and as a result, the Department of Health has set the goal of developing a minimum of two sustainable CBNPs per health district by the year 2001 (INP, 1998).

Although the primary emphasis of the HFBNP is to reduce the high prevalence of malnutrition amongst children and women, it is obvious that they form part of a larger family unit which may be in need of assistance and rehabilitation. Therefore, community interventions are imperative to prevent the relapse of malnutrition.

The aim of the CBNP is to build the capacity of communities, to be able to solve their own nutritional problems (INP, 1998). CBNPs will be encouraged to follow a process of assessment, analysis and action (Triple A process) of the nutrition situation in their community so as to identify relevant activities and interventions. Some of the activities suggested as suitable for for CBNPs include:

- Nutrition education
- Food production and household food security
- Income generation linked to nutrition education and household food security
- School feeding linked to food production and income generating projects
- Community-based growth monitoring and promotion
- Community-based nutrition rehabilitation

This highlights the need to establish a link between CBNPs and the formal health services, which should consist of a two-way referral system of patients between the hospitals, community health centres and community support structures (INP, 1998).

CHAPTER 3: AIM AND OBJECTIVES

Aim

The aim of this study was to evaluate the nutritional status of children under six years, and the activities of a community based nutrition programme serving these children, in the NMTTS health district of the Northern Province.

Objectives

These were to:

1. Determine the anthropometric status of children 0-6 years.

2. Determine the dietary intake of children 0-6 years.

3. Evaluate the nutrition interventions provided to these children by a local community-based nutrition programme.

4. Make recommendations, based on these findings, for improving existing strategies to address malnutrition in the area.

CHAPTER 4: METHODS

4.1 STUDY DESIGN

The study consisted of two main components – an analytic component incorporating a cross-sectional household survey of anthropometric status and dietary intake, and a qualitative component focusing on an evaluation of a local community-based nutrition programme.

4.2 POPULATION AND SAMPLING

Study population

The study population included all children under 6 years of age living in the Nebo and Sekhukhune magisterial districts during the study period (March-May 1998). These districts comprise 43 rural villages (18 villages in Nebo and 25 villages in Sekhukhune) which are inhabited by the Pedi people.

Sampling method and sample size

A cluster sampling method was chosen to select a suitable sample for reasons of feasibility and cost –

- There was no list of all the individuals in the study population, however, a list of the 43 villages (clusters) and the number of households in each (to the nearest 100), was available from the Hlatlolanang programme.
- Due to constraints of time, transport and personnel, it was necessary to sample clusters rather than individuals.

A desired minimum sample size of 340 children was arrived at using the Epi Info Epitable module in the following way –

- An expected prevalence of one of the main outcome variables (UWFA) of 12.6% for the Northern Province (Health Systems Trust, 1996)
- A desired precision, for the estimate of prevalence of UWFA, within 5% (i.e. accepting an estimate in the range of 7.6% - 17.6%) at the 95% level of confidence.
- A design effect of 2 (i.e. estimated variance of cluster sample design relative to simple random sampling) as recommended by the literature for cluster survey designs (Katzenellenbogen, 1991).

Using these assumptions produced a desired minimum sample size of 340 children, divided into 25 clusters of 14 individuals each.

A further requirement, was having at least 50 individuals in each of the six age-groups (interval size of 12 months) in order to make valid comparisons of dietary variables (Katzenellenbogen, 1991). Stratification of the ***sample*** by age was not possible due to the lack of a list of individuals and their ages, but it was decided that inflating the minimum sample, would produce sufficient numbers (i.e. a minimum of 50) in each age-group by chance, which could then be compared by stratification in the ***analysis*** stage.

After pre-testing, sampling of 18 individuals per day within a village was found to be feasible, and it was therefore decided to increase the cluster size to 18, giving a total sample size of 450.

The first cluster was randomly selected from the list of 43 villages and systematic sampling of the remaining clusters followed. A total of 25 clusters, representing a total of 21 villages were selected in this way (see Appendix 1).

From each cluster a systematic sample of 18 children was drawn in the following manner: The first child in each cluster was selected by using the "primary school method". In each cluster, 3 primary schools were selected (such that they are at least 1 km apart). From the attendance list at each school, one child was randomly selected from each school, and he/she directed a pair of community health workers to his/her home. The household next to this one constituted the start of the cluster, and each pair of fieldworkers then proceeded from house to house until the required children had been found (each pair collected information from 6 households such that the three pairs of fieldworkers, together collected data from 18 households per cluster).

4.3 METHODS TO ACHIEVE EACH OBJECTIVE

Objective 1: To determine the anthropometric status of children 0-6 years

Heights and weights were measured for all children (see Appendix 2) and the indices of height-for-age, weight-for-age and weight-for-height were calculated and compared to an international reference population, as recommended by the World Health Organisation (see Appendix 10). The cut-off point of Z-score < -2 SD was used to determine the percentage of children who were stunted, underweight and wasted.

Objective 2: To determine the dietary intake of children 0-6 years.

A single 24-hour dietary recall (see Appendix 3) was used to measure the daily consumption of a variety of food items as well as the nutrient intakes of children expressed as a percentage of the RDA. This is a well documented and accepted method for determining dietary intake (Eyberg et al, 1985; Basch et al, 1990). A structured questionnaire was used to determine the breastfeeding practices among children under 2 years (see Appendix 4).

Objective 3: To assess the Hlatlolanang's Health and Nutrition programme with particular emphasis on the Growth Monitoring programme.

In achieving this objective, a framework was developed to guide the assessment of the Programme (see Appendix 5). The framework was based primarily on the findings of a review of 17 nutrition Programmes (ACC/SCN, 1991), which showed that the success of nutrition programmes in developing countries is based on key success factors. In addition, the INP (INP,1998) has identified a number of essential components of CBNPs, which also served to direct the evaluation of the Programme (see Appendix 6). Together, these two documents provided the framework for reviewing the Programme.

The framework included the following factors:

-Programme aims and objectives
-Staff selection, training and supervision
-Community participation
-Linkages to the local health services and referral systems
-Linkages between other programmes operated by the HHNEC

In collecting this information, the following methods/tools were used:

- Interviews were conducted with staff members of the programme which included:

Formal interviews, using a structured questionnaire (see Appendix 7), with management staff - the Director and Deputy Director of the Centre and the co-ordinator of the Health and Nutrition programme.

- Direct observation of community-based growth monitoring/growth monitoring practices.

This was achieved through a one-day field trip in which the growth monitoring practices of six CHWs were observed at two community pre-schools. This included an observation of the actual weighing procedure, recording of weights and follow-up of children.

- Review of all available written reports and materials from 1995, pertaining to the Health and Nutrition programme. This included the following reports:

-Annual reports
-Bi-annual reports to funding organisations
-Minutes of meetings held with the programme staff and management
-Reports by independent researchers [5,6]
-Raw data and records of the programme activities and statistics, including growth monitoring data during 1997 only

- The Growth Monitoring programme was reviewed in terms of the following:

-programme targeting and selection of beneficiaries
-programme coverage
-programme implementation

[5] *Hlatlolanang gets a new lease on life. Thandi magazine, May 1995, pages 28-30.*
[6] *Hlatlolanang Health and Nutrition Education Centre from 1990-1996. HHNEC Directorate, 1996.*

4.4 MEASUREMENT

Anthropometric measurements

Data on age, weight, height and sex were collected for each child by trained community health workers using standardised methodology based on the recommendations of the WHO (WHO, 1983). Children were weighed using electronic scales which were standardised against a known weight on a daily basis. Scales were placed on a flat surface, and children were weighed in their underclothes to within the nearest 100g.

Height was measured using two methods. For children under 2 years of age, recumbent length was determined using a length-board. For children over 2 years, standing height was measured against a vertical meter. Length and height were measured to the nearest 0,1cm.

Dietary measurement

Dietary data were collected from each child's mother or caregiver by means of the 24-hour recall method. Six locally trained community health workers conducted the interviews in the children's homes, where the volumes of household utensils could be determined, and the labeling of commercial food items checked. For this purpose, a training manual was developed (see Appendix 12). In addition, each community health worker was provided with a food model kit representing local foods and average portion sizes, to assist with the accurate recording of dietary data. To quantify breastmilk intake, estimates were developed based on a review of a number of studies of breastmilk intake using test-weighing methods (see Appendix 9). The quantification of breastmilk intakes by infants and young children is described in detail in Appendix 9. The dietary data collected from the questionnaires were coded and quantified using

the Medical Research Council's Food Composition Tables (Langenhoven et al, 1991) and Food Quantities Manual (Langenhoven et al, 1991).

4.5 VALIDITY AND RELIABILITY

Validity

The validity of the 24-hour recall method was not measured in this study. However, both the method and its application have been validated elsewhere (Eyberg, 1985; Basch et al, 1990).

Quality Control

In order to maintain quality control, all questionnaires were checked at the end of each day. Any errors were reported and corrected with the relevant fieldworker.

Reliability

Due to time and resource constraints, reliability was not measured.

4.6 PILOT STUDY

Following the training course, a pilot study was conducted in two villages in the Sekhukhune magisterial district and included a total of 36 questionnaires. These two villages were not included in the main study. The purpose of the pilot study was to test the questionnaires as well as the logistics of conducting the survey. No major adjustments were made to the study.

4.7 ANALYSIS

Anthropometric Analysis

Height and weight were compared with the National Centre for Health Statistics (NCHS) reference standards as recommended by the WHO for international use (WHO, 1986). Anthropometric data were analysed using the Epi-info computer programme and expressed as Z-scores. The cut-off point of – 2 SD was used to classify low anthropometric status (see Appendix 10). A chi-square test was used to evaluate differences in anthropometric findings between magisterial districts. 95% C.I. were used to determine differences in anthropometric findings across ages.

Dietary data

The coded dietary data were computerised and analysed using a mainframe nutrient programme based on the South African Food Composition Tables (Langenhoven et al, 1991).

Dietary data were reported in terms of the mean daily consumption of a number of food items (grams) as well as the daily nutrient intakes which were compared with the American recommended dietary allowances (RDA) as a standard by which to evaluate nutritional adequacy (Food and Nutrition Board, 1990). However, because the RDAs exceed the nutrient requirements of most individuals (Vorster et al, 1992), two-thirds (67%) of the RDA as recommended by the National Research Council (1986) was used as a cut-off point for nutritional adequacy.

In order to assess the relationship between the dietary intake and anthropometric status of the children, a Spearman rank correlation was performed. The Wilcoxon sign-rank test ($p<0,05$) was used to determine any significant differences in the macro- and micronutrient intakes of normally nourished and undernourished children (as defined by a Z-score < -2 SD).

4.8 ETHICS

The study protocol was approved by the Research Ethics Committee of the University of Cape Town. Permission to undertake the study was obtained from the Chief of each village prior to the commencement of the study. Individual consent was requested from each mother/caregiver following a standard written explanation of the aims and objectives of the study and the demands of the survey.

CHAPTER 5: RESULTS

5.1 DEMOGRAPHIC DATA

Of the 450 questionnaires that were completed, 362 were included in the analysis and 88 were excluded because the data were inaccurate. Errors in the anthropometric data of 9 questionnaires were detected [7]. A further examination of these questionnaires revealed that they were all completed by one of the fieldworkers. It was decided that the data collected from this fieldworker were unreliable and this necessitated that all 88 of the questionnaires be removed from the study sample.

The loss of 20% of this sample, due to interviewer error reduced the sample size from 450 to 362, which is still higher than the required minimum sample size for the estimation of underweight-for-age (see METHOD section). It did however, reduce the numbers in two of the age-group strata to below 50 (i.e. 45 in the 12-23 month group and 44 in the 60-71 month group), which compromised the dietary comparisons. Table 3 presents the number of respondents per age group and Table 4 presents the number of respondents per magisterial district.

Table 3: Number of children included in the study, per age-group

Age (months)	Sample size	Percentage (%)
0-11	50	13.9
12-23	45	12.4
24-35	66	18.2
36-47	87	24.0
48-59	70	19.3
60-71	44	12.2
All ages	**362**	

[7] *The height measurements of all nine questionnaires were exactly the same.*

Table 4: Number of children included in the study, per magisterial district

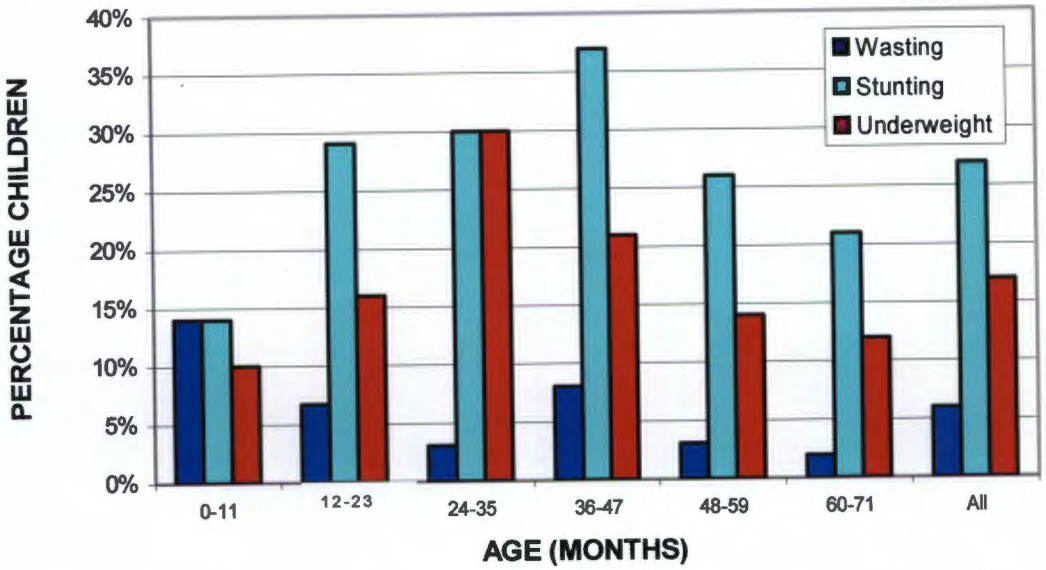
Magisterial district	Number	Percentage (%)
Nebo	176	48.6
Sekhukhune	186	51.4
Total	362	

5.2 ANTHROPOMETRIC STATUS OF CHILDREN 0-6 YEARS

Of the total number of children (N=362), 27.3% were stunted, 6.1% were wasted and 16.9% were underweight (see Figure 7). No statistically significant differences in anthropometric status was found between children in the two magisterial districts (all p-values > 0.1). However, the children in the Sekhukhune magisterial district had higher prevalences for all three nutritional indices (see Figure 8). Undernutrition is prominent at an early age, with a prevalence of 14% wasting and 14% stunting in children 0 to 11 months of age (see Table 5). The prevalence of stunting increases steadily with age and peaks amongst children 36 to 47 months of age (36.8%). The prevalence of wasting decreases steadily with age and then rises dramatically, reaching a second peak in children 36 to 47 months of age (8%).

APP: 7

FIGURE 7: ANTHROPOMETRIC STATUS OF CHILDREN BY AGE (N=362)

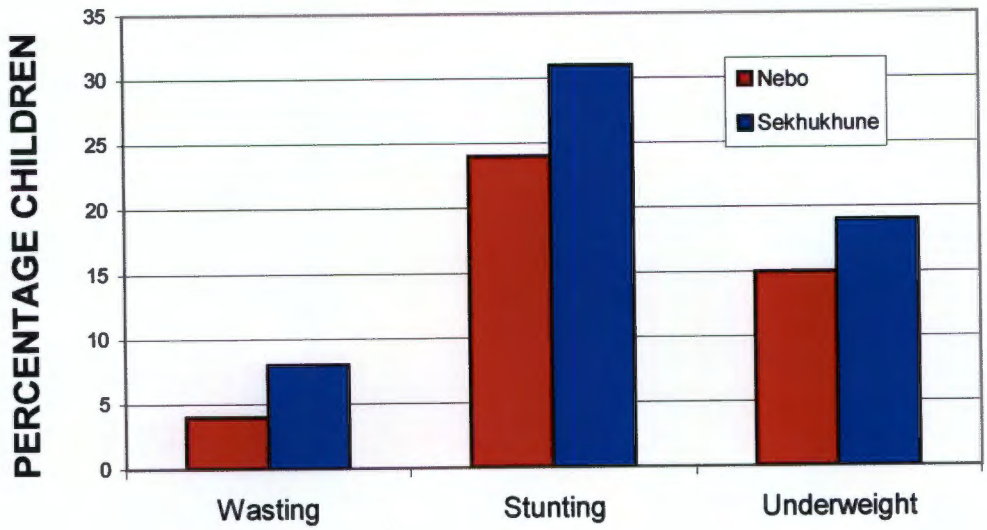


Note: Wasting: Defined < -2 SD of the norm for weight-for-height, reflecting acute undernutrition.
Stunting: Defined < -2 SD of the norm for height-for-age, reflecting chronic undernutrition.
Underweight: Defined < -2 SD of the norm for weight-for-age.

TABLE 5: ANTHROPOMETRIC STATUS OF CHILDREN BY AGE, WITH 95% C.I.

Age (months)	% Wasting (95% C.I.)	% Stunting (95% C.I.)	% Underweight (95% C.I.)
0 – 11	14,0 (4.2-34.7)	14,0 (4.2-34.6)	10,0 (2.2-29.9)
12 – 23	6,7 (0.8-27.3)	28,9 (12.8-51.8)	15,6 (4.6-37.8)
24 – 35	3,0 (0.2-17.5)	30,3 (16.2-48.9)	30,3 (16.2-48.8)
36 – 47	8,0 (2.3-21.4)	36,8 (23.1-52.8)	20,7 (13.3-44.1)
48 – 59	2,9 (0.1-16.6)	25,7 (13.1-43.6)	14,3 (5.4-31.0)
60 – 71	2,3 (0.0-21.8)	20,5 (7.3-43.4)	12,3 (2.5-33.3)
All ages	**6,1**	**27,3**	**16,9**

FIGURE 8: ANTHROPOMETRIC STATUS OF CHILDREN BY MAGISTERIAL DISTRICT.



Note: Wasting: Defined < -2 SD of the norm for weight-for-height, reflecting acute undernutrition.
Stunting: Defined < -2 SD of the norm for height-for-age, reflecting chronic undernutrition.
Underweight: Defined < -2 SD of the norm for weight-for-age.

TABLE 6: ANTHROPOMETRIC STATUS OF CHILDREN BY MAGISTERIAL DISTRICT, WITH P-VALUES.

	Nebo (%)	Sekhukhune (%)	P-value
Wasting	4,0	7,9	0,12
Stunting	23,7	30,7	0,14
Underweight	15,0	18,5	0,38

5.3 DIETARY PRACTICES OF CHILDREN 0-6 YEARS

The diets of most children in the Nebo and Sekhukhune districts were low in energy with 56.8% of children having an inadequate energy intake (see Table 7). The intake of protein was insufficient amongst a minority (9.3%) of children. Micronutrient intake was low particularly for calcium, iron, zinc, vitamin A, thiamin, riboflavin, niacin, vitamin B6, vitamin B12 and vitamin C.

TABLE 7: DAILY NUTRIENT NTAKES OF CHILDREN 0-6 YEARS, LIVING IN THE NMTTS HEALTH DISTRICT (N=362)

Nutrient	Mean intake/day	Std Dev	Percentage children with intakes < 67% RDA	Percentage children with intakes >120% RDA
Energy (kilojoules)	3925,8	1457,7	56.8	2.5
Protein (g)	28,2	14,2	9.3	61.6
Plant protein (g)	19,1	9,9	*	*
Animal protein (g)	9,0	9,2	*	*
Fat (g)	19,1	9,6	*	*
Carbohydrate (g)	169,2	69,7	*	*
Sucrose (g)	13,45	12,8	*	*
Calcium (mg)	216,5	180,9	93.7	0.5
Iron (mg)	5,3	3,9	75.7	5.5
Zinc (mg)	3,9	2,2	86,6	1,1
Vitamin A (RE)	305,7	619,6	66.1	13.1
Thiamin (mg)	0,7	0,3	26,8	25,4
Riboflavin (mg)	0,5	0,4	71,0	7,7
Niacin (mg)	5,1	3,7	73,5	6,3
Vitamin B6 (mg)	0,4	0,3	84,2	2,5
Folate (μg)	69,6	41,3	15,8	47,0
Vitamin B12(μg)	1,3	5,3	59,3	27,0
Vitamin C (mg)	17,4	33,3	80.1	4.6

Note: < 67 %RDA reflects a deficient nutrient intake
67 - <120 %RDA reflects an adequate nutrient intake
>= 120 %RDA reflects a high nutrient intake
* Data not generated

The food most commonly consumed (79.8%) by children was *bogobe*, a medium-stiff porridge prepared from maize meal (see Table 8). Brown bread was also a popular food choice and was consumed by 57.1% of children. The most popular vegetable consumed (22.4%) was *morogo* (a wild vegetable similar to spinach), followed by potato (16.9%). (see Table 8).

TABLE 8: TOP TEN MOST COMMON FOOD ITEMS CONSUMED BY CHILDREN 0-6 YEARS, RANKED BY FREQUENCY OF CONSUMERS (%)

Food items consumed	% of consumers	Average amount (g/day)
Bogobe, maize	79.8	588.1
Tea, brewed *	60.7	265.3
Bread, brown	57.1	95.2
Sugar, white	54.4	15.2
Sugar, brown	22.7	15.2
Morogo	22.4	67.9
Milk, whole, powder	22.1	17.1
Soft porridge, maize	19.9	272.9
Breastmilk *	19.4	399.8
Potato, cooked	16.9	94.0

* Measured in millilitres (mls).

High energy foods such as margarine and oil were not consumed by many children. Margarine was consumed by 16% of children and generally in small quantities (10 g/day). Oil was added to some foods during preparation e.g. fried cabbage and potato dishes. Maize was consumed by more children and in greater quantities than *mabele* (Northern Sotho word for sorghum).

5.4 RELATIONSHIP BETWEEN DIETARY INTAKE AND ANTHROPOMETRIC STATUS

No significant correlations were found between the macronutrient intake (total energy, protein, fat and carbohydrate), micronutrient intake and anthropometric indices (weight-for-height, height-for-age and weight-for-age) for children under 6 years. The highest correlation was found between weight-for-age and vitamin D intake (r=0.205).

When stratified according to anthropometric status, no statistically significant differences between normally nourished and undernourished children (as defined by a Z-scores of <2 SD) were found for all macro- and micronutrient intake (p=0.194).

5.5 BREASTFEEDING AND COMPLEMENTARY FEEDING PRACTICES

Breastfeeding initiation rates were high (92.9%) with only 7.1% of mothers choosing to bottle feed their infants from birth. The average duration of breastfeeding could not be determined because 84.6% of the children < 2 years of age, in the survey were still being breastfed. Instead, the proportion of children under 2 years, who were still being breastfed, was assessed by age intervals (see Figure 9). As shown in this figure, all children in the age-group 0 to 12 months were being breastfed at the time of the survey. Of the children in the 12 to 15 month age-group, 95% were being breastfed. The proportion of children being breastfed dropped in the 16 to 19 months age-group to 62.5%, with only 27.3% of children in the 20 to 23 month age-group receiving breastmilk.

Exclusive breastfeeding practices were determined based on mothers whose children were at least four months of age at the time of the survey and who responded to the question "Up to what age did you feed your child breastmilk alone?" (see Appendix 4). Only 17.85% of children were exclusively breastfed for between 4 to 6 months of age.

COMPLEMENTARY FEEDING PRACTICES IN CHILDREN UNDER 2 YEARS

The majority (79.3%) of mothers had introduced solids by the age of 3 months. The most common food first introduced was soft maize porridge (70,5%).

FIGURE 9: CHILDREN UNDER 2 YEARS WHO WERE BEING BREASTFED AT THE TIME OF THE SURVEY (N=87)

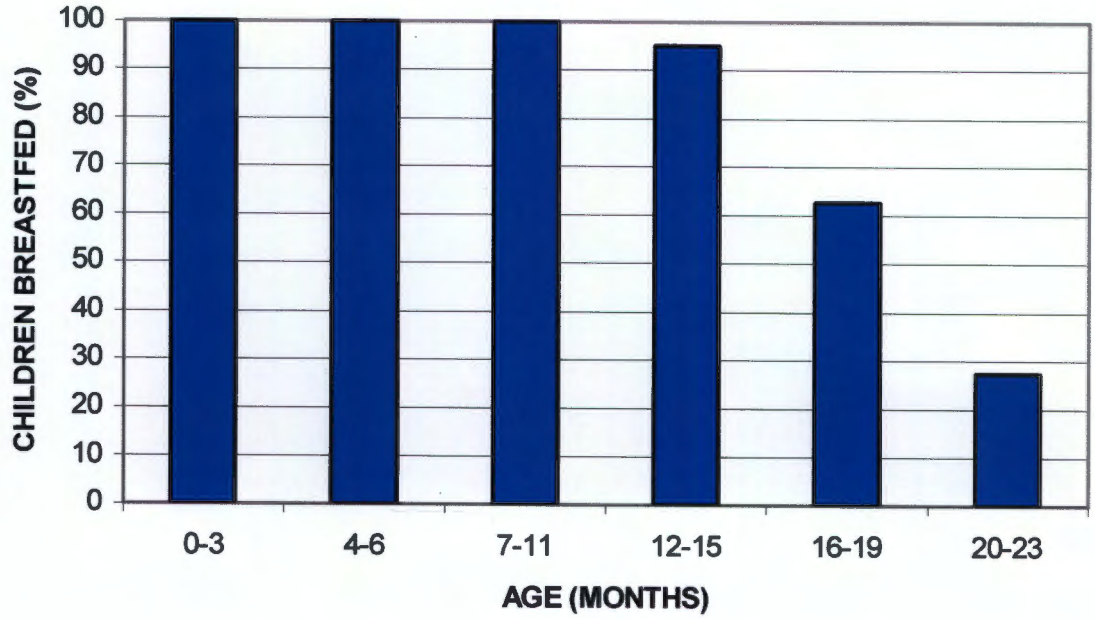
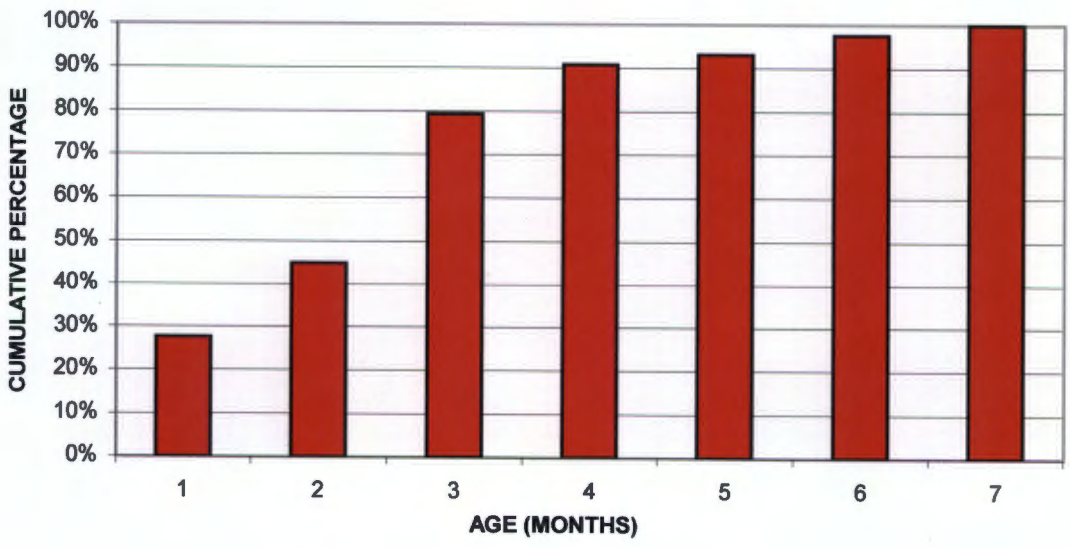


FIGURE 10: AGE OF INTRODUCTION OF SOLID FOODS (N=87)



their prevention. The choice of topic for nutrition education is determined following a visit to the community to identify what their information needs are. Suggestions are also made by the Health and Nutrition programme.

5.6.2.2 Growth monitoring

This programme operates every 3 months and involves all Health and Nutrition staff. The main components of the programme include weighing of children, identification of nutritional status and referral and follow-up of malnourished children (see ***Review of the Growth Monitoring Programme***).

5.6.2.3 Child care development (Educare)

This is an ongoing programme which targets toddlers and children at preschools through the provision of educational support to preschool teachers such as developing educational tools and creative teaching methods.

5.6.2.4 Community rehabilitation

Community rehabilitation is a programme which provides support for mentally and physically disabled people (adults and children) through the identification of untreated individuals and rehabilitation of existing clients. This programme also provides assistance with application for disability grants, the provision of aids and mother-to-mother training for mothers of disabled children.

5.6.3 LINKAGE BETWEEN PROGRAMME COMPONENTS

There are no overlapping activities between the main components of the Health and Nutrition programme, e.g. the Community Rehabilitation programme does not engage in any growth monitoring activities, despite the high prevalence of malnutrition amongst physically and mentally retarded children.

Meetings are held twice a month at which all the health workers report back on their activities during the month. These are collated in the form of a monthly report by the Health and Nutrition co-ordinator and are submitted to the Director of HHNEC to compile a monthly report.

5.6.4 STAFF SELECTION, TRAINING AND SUPERVISION

All staff have completed their secondary education and have attended an introductory course in primary health care offered by Jane Furse Hospital. There is no on-going training in health and/or nutrition.

TABLE 9: HEALTH AND NUTRITION PROGRAMME STAFF AND TRAINING

Staff	**Training and educational qualifications**
1 Programme co-ordinator	Bachelor's degree in home economics
1 Educare health worker	Currently enrolled in a child care development course
2 Community rehabilitation health workers	Certificate in community rehabilitation

5.6.5 COMMUNITY PARTICIPATION

There is considerable community participation within the Health and Nutrition programme, most notably at the level of programme implementation. All the programme staff has been selected from the local community. The programme has also developed strong linkages to other existing community groups (e.g. local Women's' groups).

5.6.6 LINKAGE BETWEEN HEALTH AND NUTRITION PROGRAMME AND OTHER HHNEC PROGRAMMES

Linkages between the Health and Nutrition programme and the Income Generation, Adult Education and Food Security programmes of Hlatlolanang are informal. There is no established referral system between programmes e.g. caregivers of malnourished children are not referred to any of the above-mentioned intervention programmes, even though monthly meetings are held between the co-ordinators of all the programmes.

5.7 REVIEW OF THE GROWTH MONITORING PROGRAMME

5.7.1 TARGETING AND SELECTION OF BENEFICIARIES

All children under 5 years of age in the Sekhukhune and Nebo districts are targeted. This includes two groups of children namely children attending preschools, referred to as "preschool" children and those who do not attend preschools, referred to as "community" children. According to the Health and Nutrition programme, the purpose of differentiating between the two groups is for easier follow-up of children identified with malnutrition.

Coverage of villages

The Growth Monitoring programme operates in approximately 21% of the villages comprising the two districts which Hlatlolanang services.[8] These villages are not selected according to any specific health or socio-economic criteria but are selected on the basis that they have already established women's' groups.

Coverage of pre-schools

All pre-schools in each selected village are visited. There are usually between one and three pre-schools per village with about 20-40 children in each.

Coverage of children

Approximately 1200 children are weighed per year. This number corresponds to approximately 4% of children under 5 years living in the 2 districts serviced by Hlatlolanang.[9] However, if one considers that Hlatlolanang is really only operating growth monitoring in 21% of villages, their coverage constitutes approximately 20% of children in the 21% of villages. [10]

5.7.2 PROGRAMME IMPLEMENTATION – WEIGHING, RECORDING, INTERPRETATION, FOLLOW-UP

Weighing

Children are weighed using bathroom scales (for children over 2 years) and spring scales (for children under 2 years and those unable to stand). Weighing takes place over a period of approximately 1 month. No growth monitoring protocols are used and as a result children are often weighed incorrectly (with clothing and shoes). Scales are also not checked for accurate measurement (against a standard weight).

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[8] *An average of 9 of the 43 villages which are serviced by HHNEC are included in the Growth Monitoring programme per year (the same villages are selected every 3 months). Note that the coverage of other Health and Nutrition activities, such as Nutrition Education is greater.*

[9] *Calculated on a population estimate of 160 000 (HHNEC, 1998) for the two magisterial districts with 20% representing children under 5 years of age.*

[10] *This is based on the assumption that there is a uniform distribution of children across the villages comprising the Nebo and Sekhukhune magisterial districts.*

Recording weights

Weight data is recorded in two stages: at the site of weighing and at the Hlatlolanang Centre (also referred to as the data "grouping" phase).

In the first stage, the health workers record the childrens' weights, name and surname, address (description), date of birth and gender in an A4 book. The weight of the child is then written on another piece of paper and is given to the mother to keep. The mothers can then compare this weight to the next weight collected in the following growth monitoring cycle. No plotting of weights on the Road-to-health card is done at this stage and there is no interpretation of children's weights at the time of weighing.

This is followed by the data "grouping" phase (lasting approximately two weeks), where the date of birth of the child is converted into age (months) and the child's recorded weight is compared to his/her expected weight-for-age (see Appendix 13).

Interpretation of data

The health workers identify the children as "nourished", "underweight" and "malnourished" according to the following classifications (see Table 10).

TABLE 10: CLASSIFICATION OF THE NUTRITIONAL STATUS OF CHILDREN WEIGHED IN THE GROWTH MONITORING PROGRAMME.

Nutritional status	Classification	Centile
Nourished *	A child whose weight is equal to or above his/her expected weight-for-age	>50
Malnourished *	A child whose weight falls below the cut-off point for weight-for-age	<3
Underweight *	A child whose weight falls between those indicated for nourished and malnourished	3-50

* Terms used by HHNEC

Source: Based on Appendix 13

Referral and follow-up of malnourished children

There are three levels of response to children identified with malnutrition:

- The health workers respond immediately if clinical signs of malnutrition are observed at the point of weighing by referring to the nearest hospital. However, the health workers have not received any training in the identification of malnutrition. Rather identification of malnutrition relies on recognition from posters of marasmus and kwashiorkor that are available to the health workers.

- The health workers also respond to malnourished children after their identification in the data "interpretation" phase which is completed approximately 6 weeks after initial measurement of weight, by following up the malnourished child in the village and referring to the nearest hospital.

- The health workers also follow-up children discharged from the hospital. During home visits, they try to identify the factors resulting in the child's poor nutritional status and give general nutrition advice (e.g. food gardening, eating a varied diet of sufficient quantity etc.).

Feedback of data to the community

Feedback of data to the community takes place in the final phase of the growth monitoring programme. Weight data that has been collected for individual children from each village is plotted onto two master cards, one for "pre-school" children and another for "community" children.

The Health and Nutrition team present the master cards to the community and discuss the findings and general function of growth charts with mothers and pre-school teachers.

5.7.3 LINK BETWEEN THE GROWTH MONITORING PROGRAMME AND LOCAL HEALTH SERVICES

There are informal links between the Growth Monitoring programme and the local health services. Health and Nutrition staff refer malnourished children to the hospitals and clinics and also follow-up on the children's progress (see section on *Referral and follow-up of malnourished children*). Children from the Nebo area are referred to St Rita's hospital and those from the Sekhukhune area are referred to Jane Furse hospital. Referrals are also made to the hospital social worker.

CHAPTER 6: DISCUSSION

6.1 NATURE OF MALNUTRITION

The findings of this study suggest that in the NMTTS health district, children under six years of age mainly have a problem of chronic malnutrition as characterised by a high prevalence of stunting (27,3%) and underweight (16,9%). The results also suggest a substantial level of acute malnutrition or wasting (6,1%).

A similar pattern of low prevalence of underweight and moderate to high prevalence of stunting was reported in the national survey of children 6-71 months of age (SAVACG, 1995). The latter survey reported that nationally, nearly one in four children (22.9%) were stunted and one in ten (9.3%) were underweight. The survey reported a much lower prevalence of wasting (2.6%) than was found in this study.

Stunting is thought to be the result of long-standing dietary inadequacy, reflecting socio-economic deprivation which is frequently aggravated by poor environmental conditions (Solarsh et al, 1994).

In this study, no significant correlation was found between the dietary intake and anthropometric status of children under 6 years. This could be explained in part by the dietary method used in this study namely, a single 24-hour dietary recall. Validation studies have found that dietary intake estimates obtained using the 24-hour recall method are often lower than those obtained using other methods (Pelto, 1981). In addition, the 24-hour recall has been criticised for not representing *usual* dietary intake and rather reflecting consumption only during the previous 24 hours. It becomes difficult to relate consumption in the recent past (previous 24-hours) to nutritional status which develops over a longer period

of time. This is especially relevant for growth faltering which has its origins in early childhood, as is commonly the case with stunting (Beaton, 1990).

Normal growth in children is influenced strongly by socio-economic circumstances (Zumwari, 1987). Molteno et al, in 1991, reported that socio-economic status was related to all growth factors except head circumference at birth, in coloured preschool children. Although indicators of socio-economic status were not collected as part of this study, there is no doubt that they play a major role in the determination of the nutritional status of these children. The NMTTS health district is located within the former homeland of Lebowa, a historically under-resourced area, with one of the highest unemployment rates in the country (41%) (CSS, 1995). An estimated one third (31,9%) of households have access to running tap water (Chabikuli, 1998) and only 13,8% of the population have their refuse removed by the local authority, creating an environment vulnerable to the spread of disease (CSS, 1994). Although data on childhood disease was not collected as part of this study, it is probable that a combination of infection, low quality diet supported by underlying socio-economic difficulties and a poor environment are contributing factors to the nutritional status of children in this area.

6.2 ANTHROPOMETRIC STATUS ACROSS MAGISTERIAL DISTRICTS

A comparison between the anthropometric status of children between magisterial districts, did not show any statistically significant differences, indicating that malnutrition amongst children is widespread geographically. Although the differences were not statistically significant, the Sekhukhune magisterial district shows a higher prevalence for all three nutritional indicators.

A likely explanation for these findings is the fact that the Sekhukhune district is mountainous and rocky, with sandy soil and very little water. Soil erosion has left many of the villages virtually inaccessible with only small patches of arable land.

The Nebo district is less dry and situated on a flatter region, making villages more accessible with larger areas for agricultural production (HHNEC, 1996).

6.3 ANTHROPOMETRIC STATUS ACROSS AGE-GROUPS

A detailed analysis of the growth pattern of children in this study shows a high prevalence of malnutrition in infancy. Stunting (14%) and wasting (14%) are already prominent in children under 12 months.

The high level of wasting in this study is compatible with the findings of Dannhauser (1996), who investigated the anthropometric and dietary status of pre-school children living in a farming area in Bloemfontein. In that study, wasting was found in 14% of children aged 6 months to 11 months. The authors reported that the energy intake of children in this age-group were markedly insufficient (between 36 and 50% of children took in <67% RDA for energy). According to the authors, the finding of poor dietary intake, coupled with the high prevalence of wasting in that age-group, points to a problem with the introduction of complementary feeding. Richardson (1984) monitored the growth of Tswana infants in the rural North west Province and found that infants maintained satisfactory weights for 7 months but faltered thereafter, despite continuous breastfeeding. They concluded that breast milk alone was not sufficient and that complementary feeding practices were not adequate.

Indeed, infant feeding practices in the NMTTS health district are far from satisfactory with the majority of mothers introducing solids by 3 months. The negative effect of early introduction of solids on reducing breastmilk intake, have been well documented (Kusin, 1985). The early introduction of solid foods are associated with a number of other factors which contribute to the development of malnutrition including the increased risk of infection and the replacement of breastmilk with poor quality complementary foods (see Section *6.4.2 COMPLEMENTARY FEEDING PRACTICES*). Indeed, the dietary intake of

children 0 to 11 months in this study, is markedly inadequate, with 36.7% of children having an inadequate intake of energy (see Appendix 11).

The initially high prevalence (14%) of wasting in children 0 to 11 months, is followed by a steep decline in the age-group 12 to 23 months (6.7%). The level of wasting then drops to 3% in children 24 to 35 months and a second peak occurs at 36 to 47 months (8%). The latter peak in wasting corresponds to a peak in stunting in children of the same age-group (36.8%).

A closer analysis of children aged 36 to 47 months, showed that no significant differences were found between the prevalence of wasting and stunting in this age-group compared to that in any of the other age-groups, nor the group as a whole. However, the small sample sizes make it difficult to detect whether any real differences exist.

The high level of stunting in infants included in this study, is compatible with the findings of the national survey which reported a level of 16.7% in children aged 6 to 11 months (SAVACG, 1995). A number of factors could contribute to this finding, including a high prevalence of low birth weight. However, this data was not collected, and remains a limitation of the study. The prevalence of stunting increases dramatically increase in the 12 to 23 month age-group reaching a prevalence of 23.4%. The increase was found to be statistically significant (SAVACG, 1995). In contrast, the increase is stunting between these age-groups in the NMTTS health district, is not statistically significant.

6.4 *DIETARY INTAKE AND INFANT FEEDING PRACTICES*

The diets of most children in the NMTTS health district are very low in energy (56.8% of children have an inadequate intake of energy) and micronutrients, most notably calcium, iron, zinc, vitamin A, thiamin, riboflavin, niacin, vitamin B6, vitamin B12 and vitamin C. Although the results show that the majority of children have adequate protein intakes (91.7%) there is the concern that in the face of a low energy diet, as seen amongst these children, dietary proteins could be used as an energy source and not for protein synthesis. A similar pattern was evident in a study of pre-school children living in Khayelitsha, where 86% of children had high protein intakes (> 120% RDA), yet 39% of these children had a deficient intake of energy (Bourne et al, 1994).

A closer look at the food intake of these children, allows for a better understanding of why their energy and micronutrient intakes are so poor. The overall impression of the diet in the present study is that it is typical of the traditional rural diet eaten by blacks residing in the Northern Province. The diet has little variety and consists predominantly of maize staples. The food most commonly consumed by children is *bogobe*, a medium-stiff maize porridge (588.1 g/day), which is commonly eaten by the Pedi people. Tea (265.3 g/day) and brown bread (95.2 g/day) are also popular food choices.

In two rural communities in the former Lebowa, Steyn (1993) also reported that maize-meal porridge was the food item making up the bulk of the diet of pre-schoolers (568.2 g/day) followed by tea (180.9 g/day) and brown bread (90.6 g/day). Although the diets are both extremely similar in quality and quantity of food items consumed, the consumption of fruits and vegetables is markedly different. Steyn (1993) reported that "green and yellow fruit and vegetables featured prominently in the diets", in contrast, the present study found that the consumption of fruits and vegetables was very low. The most commonly

consumed vegetable was *morogo* (a wild spinach plant) which was consumed by less than a quarter of the study sample (22.4%).

The difference in findings between the two studies could be explained by the fact that they were conducted during different times of the year. Data for the present study was collected between the months of March and May whereas the study by Steyn (1993) was conducted between November and February. The different seasons could, in part explain the different consumption patterns of fruits and vegetables. It is interesting to note that the consumption of staples seem less affected by the seasons.

The findings of poor energy and micronutrient intakes in this study sample are not surprising, given the high consumption of maize meal (a poor source of energy), and virtual absence of fruit and vegetables from the diet. Other factors contributing to the poor energy intake of these children, is the low intake of high-energy foods such as margarine, which was found to be consumed by only 16% of children and in small quantities (10 g/day). The consumption of oil is also low and is usually added during food preparation e.g. fried cabbage and potato dishes.

A number of studies have looked at the contribution of different food groups to overall energy intake (Bourne et al, 1994; Steyn et al, 1989; Richardson et al, 1991). Richardson et al (1991) compared the contribution of fat intake to the total energy intake of a group of urban and rural children and found that fat contributed 30% to the energy intake of the urban group compared to 23% in the rural children. Children from Lebowa had an even lower fat intake, contributing 19% to their total energy intake (Steyn et al, 1989).

These findings deviate considerably from the dietary guidelines suggested by the South African Diet Consensus Panel (Diet Consensus Panel, 1989), and the American Heart Association (American Heart Association, 1988) which suggest

that the diet should consist of up to 30% fat, 60% carbohydrate and 15% protein and points to the need to encourage the consumption of fat by rural children.

6.4.1 BREASTFEEDING PRACTICES

The majority of mothers in the study area initiated breastfeeding (92.9%) and continued to breastfeed for a relatively long period of time. Of the children in between 12 to 15 months of age, 95% were still being breastfed, this proportion dropped to 62.5% in children 16 to 19 months of age and 27.3% of children between the ages of 20 to 23 months were still receiving breastmilk.

These results compare well to the findings of Steyn et al (1993) who reported that 90% of mothers breastfed their children for at least 6 months and that 61% of mothers were still breastfeeding their infants at 18 months of age. In a rural area of Kwazulu-Natal, 98.7% of mothers were reported to have initiated breastfeeding, the study did not however, report the duration of breastfeeding (Faber et al, 1997).

According to a review of breastfeeding studies in South Africa, (Moodley et al, 1997) breastfeeding initiation rates are fairly high throughout South Africa (national rate above 80%), with rates being higher in rural areas as compared to urban areas. The duration of breastfeeding is generally longer in rural areas compared to urban areas. However, there appears to be a problem of poor exclusive breastfeeding practices and early introduction of complementary foods.

In a study conducted in an urban community in Johannesburg, only 10% of mothers were reported to exclusively breastfeed their infants for up to 3 months (Ransome et al, 1988). Similar findings were reported in an urban community in Cape Town (Hoffman et al, 1984). Despite the fact that 17.85% of mothers in this study breastfed exclusively for 4 to 6 months, this practice deviates

considerably from the recommendations put forward by the WHO and UNICEF (1989).

The positive effects of breastfeeding on morbidity and mortality are well documented. In 1990 the WHO stated that more than one million deaths could have been avoided if babies had been exclusively breastfeeding for 6 months (Whitfield, 1996).

Breastfeeding provides ideal nutrition for infants and contributes to their healthy growth and development and reduces the incidence and severity of infection (particularly diarrhoeal disease) (Victora, 1987), thereby lowering morbidity and mortality. These benefits increase with increased exclusiveness of breastfeeding during the first 6 months of life (WHO, 1990).

Exclusive breastfeeding also reduces the likelihood of the infant being exposed to infection that arises when contaminated food is introduced (Victora, 1987; Kovar, 1984). Even small amounts of additional food to breastfed infants, has been shown to increase rates of infectious disease (Auerbach, 1991). Exclusively breastfed for 6 months has also been shown to be associated with positive weight gain and fewer incidences of malnutrition (Seward, 1984).

6.4.2 COMPLEMENTARY FEEDING PRACTICES

Most mothers (79,3%) introduced solid food to their babies by the age of 3 months and of these, 44,8% introduced solids as early as 2 months. The most common food first introduced was soft maize porridge (70,5%).

The National Department of Health recommends that complementary food be introduced to infants in addition to breastmilk around the age of six months (DOH, 1996). A review of the literature shows that the time of introduction of complementary feeding amongst South African mothers deviates considerably

from this. Studies from Venda, Lebowa and Pretoria showed that the majority of mothers had introduced solids by 3 months (Zollner, 1993; Steyn, 1993; Delport, 1997; Faber, 1997).

It appears that a common pattern of infant feeding practices has emerged. Despite the fact that most mothers, especially in rural areas, initiate and sustain breastfeeding for relatively long periods, this is accompanied by various undesirable complementary feeding practices, such as early introduction of solids and nutritionally inadequate complementary foods (Zollner, 1993; Steyn, 1993; Delport, 1997; Faber, 1997).

The early introduction of complementary foods to infants younger than 4 months is discouraged by child health professionals for a number of reasons including the affect that this has on breastfeeding.

The early introduction of solids is thought to result in a reduction of breastmilk production through less frequent sucking by the infant. Infants satisfy their hunger with solid food and are then less interested in breastmilk resulting often in the early termination of breastfeeding (Kusin, 1985).

The solid foods that begin to replace breastmilk are commonly of poor nutritional value. The use of maize meal porridge as an introductory solid food has been reported to be a popular practice amongst mothers from rural communities. A survey of breastfeeding and complementary feeding practices amongst Pedi mothers in Lebowa, reported that 82% of mothers indicated that the first complementary food introduced was refined maize meal porridge (Moodley, 1997). Similar findings were reported by two other surveys conducted in rural communities in Ga-Rankuwa and Kwazulu-Natal (Faber, 1997; Brink, 1984).

Although maize meal porridges, are important complementary foods (they are popular with children, availability in most communities, easy to prepare and

cheap to purchase), plain porridges are not sufficient by themselves as they are bulky and do not provide enough energy and nutrients. The use of such complementary foods is thought to contribute to the high prevalence of malnutrition during the first 18 months of life (Faber, 1997).

For this reason it is important to add high energy foods (such as margarine or oil) to porridges to improve their energy content. It is also important to advise mothers to offer infants a varied diet, so as to ensure that they obtain sufficient nutrients (Cameron, 1983).

Other important reasons why solid foods should be discouraged before 4 months is the risk of introducing infection, most notably diarrhoeal disease through the preparation of unhygienic foods. Numerous studies have shown that contaminated complementary account for a substantial proportion of diarrhoeal disease amongst infants, especially in developing countries (Motarjemi, 1993).

6.5 REVIEW OF THE HHNEC PROGRAMME

It is clear from the results of the nutritional survey that there is a significant problem of malnutrition in the area. The problem is largely that of chronic malnutrition as evidenced by the high rates of stunting, but wasting is also very prevalent. It is also clear that a number of factors underlie this problem. Poor dietary intake and household access to food play a major role as well as sub-optimal breastfeeding and complementary feeding practices and infection. However, many factors lie outside of the direct domain of the formal health, the overriding factor is that of poverty, coupled with poor environmental conditions. Therefore, the problem of malnutrition needs to be addressed in a way that includes various other sectors and activities in addition to direct health interventions.

The programmes offered by HHNEC namely - Income Generation, Adult Basic Education and Training, Household Food Security, and Health and Nutrition programme, reflect an attempt to respond to the multiple factors that contribute to malnutrition in the NMTTS health district.

Although the HHNEC fits most of the criteria for CBNPs, as outlined in the INP, a closer review of its structure and operation, reveal that to a large extent, the four programmes function independently of each other, with no formally defined relationships. There are no clear referral criteria between programmes (e.g. families of children identified with malnutrition in the Health and Nutrition programme are not referred to the other programmes e.g. Income Generation). Rather, each programme has their own target group and method of selecting programme beneficiaries.

HHNEC has placed a strong emphasis on community participation with the majority of staff members having been selected from the community. Hlatlolanang has also engaged with local women's' groups who serve as a linkage between the programme and the community. The women's' groups function in an advisory capacity by identifying nutrition information needs of the community, they also play a role in disseminating information about the programme (e.g. dates and meeting places for growth monitoring activities).

The involvement of community workers is an important way of ensuring community participation and community ownership of the programme. In 12 of 17 successful nutrition programmes reviewed, local community members were selected as project staff (Jennings et al, 1991). In most cases, these community members were responsible for growth monitoring, nutrition education and follow up and referral of at risk children.

The training received by these staff members to perform these activities, is insufficient, particularly training in GMP. Basic training in health and nutrition has

been minimal and there is no ongoing training in place to maintain and upgrade skills.

According to a review of successful nutrition programmes, training is an essential component for ensuring programme efficiency (Jennings et al, 1991). The two key aspects to training are the initial training and ongoing in-service training. The ***Joint WHO/Unicef Nutrition Support Programme*** in Tanzania offered an initial 6 month training period for local village health workers, which was followed by a continuous series of courses, seminars and refresher training. The programme also developed a number of manuals to support the training initiatives.

A closer examination of the GMP activities of HHNEC highlight the urgent need for training. There are no growth monitoring protocols to guide management and follow-up of at risk children. Children are weighed using bathroom scales which are generally criticised for their inaccuracy. In addition children are not weighed in a standardised manner, and are often clothed and wearing shoes, compromising the accuracy of the data collected. In addition, rather than plotting childrens' weights onto their RTHCs, weights are written onto record sheets and the interpretation is based on a single weight at one point in time only. There is a considerable delay between the interpretation and follow-up of each child, which raises doubt as to the impact that this system has on early detection and prevention of malnutrition. In fact, one might argue that these activities do not constitute a growth monitoring programme at all and if anything, serve only to screen the level of malnutrition in the community.

These problems, however, are not unique to HHNEC and many reviews of growth monitoring programmes have reported that they are poorly conducted and have disappointing results. According to Chopra (1997), problems with accurate weighing, plotting and interpretation of children's growth are common and fairly intensive training and supervision are prerequisites for mastering these technical skills.

Another important aspect contributing to the success of growth montoring programmes, is the targeting and availability of the programme to the most at-risk. According to Beaton (1990), if well applied, targeting can increase both programme efficiency and implementation. Programmes usually target high-risk geographic areas as well as high risk age-groups within high-risk areas.

Geographic targeting needs to be based on relevant information. Information commonly used by nutrition programmes to define geographic targets includes information on nutritional status and socio-economic data.

The Health and Nutrition programme currently targets a vast geographic area (radius of 50km) consisting of 2 districts comprising a total of 43 villages with only 4 available staff. Clearly geographic targeting needs to be more focused so as to improve the efficiency of the programme which is currently only reaching 21% of villages (see section on ***Coverage***).

Although a comparison between the anthropometric findings of the two districts did not show any statistically significant differences, the Sekhukhune district exhibited higher prevalences for all three of the nutritional indices (see ***Anthropometry***). Thus, geographic targeting should give preference to the Sekhukhune district.

Targeting also needs to take into consideration the resources available to the organisation, in particular, human resources and transport. Based on the number of personnel currently available, the Health and Nutrition programme should rather aim to target between 10-15 villages. The range takes into consideration the distance of the selected villages from the Centre and the number and frequency of services that will be offered to the community. As the programme becomes more focused, this number can be increased.

The identification of which 10-15 villages should be included is a decision that should be taken in consultation with all the main role-players in the district. Preference however, should be given to villages in the Sekhukhune magisterial district.

Programme efficiency can be further improved through the implementation of age-specific targeting and by directing interventions towards members of the community who are commonly most under threat from malnutrition and where interventions can have the biggest impact. Children under 5 years of age continue to be the primary target group of most nutrition programmes, with a new focus on children of weaning age (under 2's and under 3's) in addition to pregnant and breastfeeding women (Beaton, 1990).

HHNECs Growth Monitoring programme currently targets all children under the age of 5 years. The results from the baseline anthropometric survey show that the prevalence of undernutrition is well established among the younger children, with 30,3 % of under 3's being stunting, 30,3 % underweight and 3,0 % wasted (see **Anthropometry**). This group of children should therefore receive particular attention.

For Growth Monitoring to function as an effective screening tool it is essential that the coverage of the population is high and regular and that the poorest and most vulnerable members of the community are covered (Chopra, 1997; Lotfi, 1988). The overall coverage of Hlatlolanang's Growth Monitoring programme is poor. The programme has attempted to cover an extremely large geographical area with a very limited number of staff.

Although the coverage of pre-schools is good, there is the concern that these children represent the "better off" children from the community who can afford such facilities. A nutrition survey conducted in a rural community in South Africa found that the prevalence of stunting amongst young children from the

community was twice that of children attending the local health clinic (Solarsh, 1994).

A strategy needs to be put in place to ensure that all children from the community are covered by growth monitoring, with a particular focus on the under 3's. In addition, more time should be allocated to growth monitoring activities which according to UNICEF and other international agencies should play a central role in the strategy to fight Malnutrition (Chopra, 1997).

In order to respond to the nutrition problems in the area in a comprehensive manner, there needs to be close communication between the formal health services and Hlatlolanang. To guide this relationship, the roles and responsibilities of each organisation must be identified as well as a clear set of referral criteria which should function both ways.

6.6 LIMITATIONS OF THE STUDY

Dietary methodology - The use of a single 24-hour dietary recall has been criticised for not representing the usual intake of the respondent and tends to underestimate dietary intake. In addition, the 24-hour recall was not tested for reliability or validity. These factors should be kept in mind when interpreting the dietary findings.

Although the study examined the relationship of dietary intake and nutritional status of children under 6 years, data on other factors known to contribute to malnutrition, were not collected as part of the study. This did not allow for a comprehensive analysis of the causes of malnutrition in this community, allowing only for speculation. Given the high level of wasting and stunting in children under 1 year of age, the lack of data on low birth weight and the prevalence of childhood infection, is particularly limiting.

Logistical problems - The tremendous distance between the study area and Cape Town (over 1500 km), posed as a major constraint to the study.

CHAPTER 7: RECOMMENDATIONS

7.1 RECOMMENDATIONS FOR HHNEC

1. Formal linkages should be made with the local health facilities and other district role-players.

2. The Health and Nutrition programme should assume a more prominent role within the Centre and should be supported by the other programmes.

3. The activities between the different programmes should be co-ordinated and supported by a clear set of referral guidelines.

4. The Centre should focus their activities on a smaller geographical area, based on available resources.

7.2 RECOMMENDATIONS FOR THE HEALTH AND NUTRITION PROGRAMME

5. The aim and objectives of the programme need to be better defined and need to be accompanied by realistic targets and goals.

6. The activities of the programme need to be stream-lined and must contribute the achievement of the overall programme aim.

7. Training programmes in basic issues of health and nutrition needs to be implemented as a priority. Ongoing training to maintain skills also needs to be implemented.

8. Within the Health and Nutrition programme, Growth Monitoring should assume a central role, and should function as one of the indicators for referral to other programmes.

9. The programme should investigate in a more in-depth and qualitative manner the factors that contribute to infant feeding practices so as to shape an effective and locally relevant nutrition education and promotion strategy.

10. The programme needs to establish a mechanism of ensuring sustained community participation and commitment of community health workers. The role of the women's groups also needs to be strengthened.

7.3 RECOMMENDATIONS FOR THE GROWTH MONITORING PROGRAMME

11. The programme needs to target a smaller geographic area (10-15 villages) based on the number of available personnel. As the programme activities become more stream-lined, the number of villages can be increased.

12. Age-specific targeting should continue to focus on the under 6's with a particular focus on the under 3's.

13. Case management guidelines, growth monitoring protocols and training manuals for health workers need to be developed and implemented.

14. Nutrition education needs to focus on

- Promotion of exclusive breastfeeding for the first 4-6 months
- Appropriate complementary feeding practices
- Economic preparation of meals

15. A management information system needs to be put in place to monitor and evaluate the activities of the programme.

REFERENCES

American Heart Association. Dietary guidelines for healthy American adults. Position statement. *Circulation.* 1988; 77: 721A.

Auerbach K.G., Minchin M. Infant feeding comparisons: A hazard to infant health? *Journal of Human Lactation* 1991; 7(2): 63-68.

Basch, C.E., Shea S., Arliss, R. et al. Validation of mothers' reports of dietary intake by four to seven year-old children. *Amer. J. Publ. Health* 1990; 81: 13-14.

Beaton G., Kelly A., Kevany J., Martorell R. and Mason J. 1990. Appropriate uses of anthropometric indices in children. ACC/SCN State-of-the-Art Series Nutrition Policy Discussion Paper no.7. ACC/SCN, Geneva.

Block G. and Hartman A.M. Dietary Assessment MethodsChapter 6: Pgs 159 - 180. National Cancer Institute, National Institutes of Health, Maryland,

Booth W. Paediatric problems in a rural area of South Africa. *South African Medical Journal.* 1982; 61: 911-3.

Bourne L.T., Langenhoven M.L., Steyn K., Jooste P.L., Laubscher J.A., Bourne D.E. Nutritional Status of 3-6 year old African Children in the Cape Peninsula. *East Afr J Med 1994; 71: 695-702.*

Bourne L.T., Langenhoven M.L., Steyn K., Jooste P., Nesamvuni A.E., Laubscher J.A. The food and meal pattern in the urban African population of the Cape Peninsula, South Africa: the Brisk Study. *Central African Journal of Medicine.* 1994; 40 (6): 140-147.

Brink A., Boshoff E. Babavoeding in Ga-Rankuwa, Bophuthatswana. *Journal of Dietetics and Home Economics* 1984; 12: 14-17.

Cameron M. and Hofvander Y (1983). A manual on feeding infants and young children. Third edition. Oxford University Press.

Central Statistical Services. October Houshold Survey, Pretoria 1994.

Central Statistical Services. October Household Survey, Pretoria 1995.

Chabikuli O. 1998. A situation analysis of the Ngwaritsi-Makhudu-Thamaga-Tubatse-Steelpoort (NMTTS) District, Northern Province. Unpublished report.

Chopra M., Sanders D. Growth Monitoring – is it a task worth doing in South Africa? *South African Medical Journal* 1997; 87 (7): 875-878.

Coovadia H.M., Adhikari M., Mthethwa D. Physical growth of Negro children in the Durban area. *Trop Geogr Med* 1978; 30: 373-81.

Dannhauser A., Joubert G., Nel M. Nutritional status of preschool children in the Bloemfontein district. *South African Journal of Food Science and Nutrition.* 1996; 8(1): 14-22.

Delport S.D., Becker P.J., Bergh A. Growth, feeding practices and infections in black infants. *South African Medical Journal.* 1997; 87(1): 57-61.

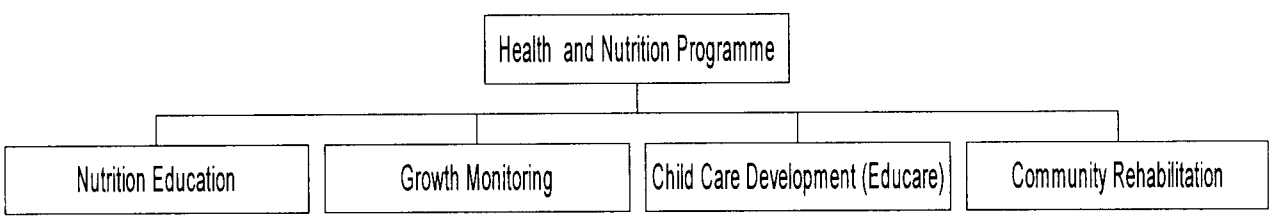
5.6 A REVIEW OF THE HHNEC WITH PARTICULAR EMPHASIS ON THE GROWTH MONITORING PROGRAMME

5.6.1 AIM AND OBJECTIVES

The stated aim of the Health and Nutrition programme is to reduce malnutrition in the Nebo and Sekhukhune magisterial districts through an integrated nutritional strategy. The focus is on long term empowerment, as "healthy children today are income generators of tomorrow" (Thandi, 1995). The programme has no specified objectives. The main programme components are outlined below.

5.6.2 MAIN COMPONENTS OF THE HEALTH AND NUTRITION PROGRAMME

FIGURE 11: MAIN COMPONENTS OF HLATLOLANANG'S HEALTH AND NUTRITION PROGRAMME



5.6.2.1 Nutrition education

Nutrition education activities are arranged on an informal basis (not according to

Gregory J., Foster K., Tyler H., Wiseman M. The dietary and nutritional survey of British adults. Social Services Division: The Office of Population Censuses and Surveys, 1990.

Hamill P.V.D., Dridz, T.A., Johnson, C.L. *et al. NCHS growth curves for children birth-18 years.* Vital and Health Statistics Series II (65) United States Government Printing Office, Washington D.C. 1977.

Health Systems Trust. South African Health Review 1995. Durban.

Health Systems Trust. South African Health Review 1996. Durban.

Health Systems Trust and the Department of Health, 1996, *Health Care in the Northern Province - Implications for Planning,* Health Systems Trust and the Department of Health, Durban.

Health Systems Trust. South African Health Review. 1997. Durban.

Healy M.J.R., Yang M., Tanner J.M., Zumrawi F.Y. (1998). The use of short-term increments in length to monitor growth in infancy. In: Appropriate uses of anthropometric indices in children . ACC/SCN state-of-the-art series nutrition policy discussion paper no.7. Beaton G., Kelly A., Kevany J., Martorell R. and Mason J. 1990.

Hendricks M., Wigton A., Dhansay A., Malek E. 1997. Nutrition interventions for women and pre-school children in South Africa. Unpublished report.

HHNEC Directorate. 1996. Hlatlolanang Health and Nutrition Education Centre from 1990-1996.

Hoffman M., Duncan N., Disler P. Breastfeeding in a socio-economically disadvantaged area of Cape Town. Part I. Analysis of breastfeeding patterns among clinic attenders. *South African Medical Journal.* 1984; 66: 64-5.

Integrated Nutrition Programme for South Africa. Broad Guidelines for Implementation. 1998. Department of Health. Pretoria.

Jennings J., Gillespie S., Mason J., Lotfi M., Scialfa T. (Eds). 1991. Managing Successful Nutrition Programmes. ACC/SCN State -of-the-Art Series, Nutrition Policy Discussion Paper no. 8. ACC/SCN, Geneva.

Katzenellenbogen J.M., Joubert G., Abdool Karim S.S. (Eds). Epidemiology: A Manual for South Africa. 1997. Oxford University Press.

Keller W., Fillmore C.M., Prevalence of protein-energy malnutrition. *World Health Statistics Quarterly.* 1983; 36: 129-167.

Kennedy E. and Alderman H. (1987). Comparative Analyses of the Nutritional Effectiveness of Food Subsidies and other Food Related Interventions. International Food Policy Research Institute. Washington D.C.

Kovar M.G., Serdula M.K., Marks J.S., Fraser D.W. Review of the epidemiologic evidence for an association between infant feeding and infant health. *Paediatrics* 1984; 74(4) supplement: 615-638.

Kuczmarski M. and Kuczmarski R. Nutrition Monitoring in the United States. Chapter 84 pages 1506-1516. In: Modern Nutrition for Health and Disease. In Shills (get reference) Shills M., Olson J. and Shike M. (eds) 1994.

Kusin J.A., Kardjati S and van Steenbergen W. Traditional infant feeding practices: right or wrong? *Social Science and Medicine.* 1985; 21(3): 283-6.

Langenhoven, M.L., Kruger, M., Gouws, E. and Faber, M. *MRC Food Composition Tables* (2nd Ed.). Medical Research Council, Parowvallei, South Africa, 1991.

Langenhoven, M.L., Conradie, P.J., Wolamarns, P. and Faber, M. MRC Food Quantities Manual. (2nd Ed.). Medical Research Council, Parowvallei, South Africa, 1991.

Leary P.M. The diet of Pedi schoolchildren. *South African Medical Journal.* 1969; 43: 792-795.

Leary P.M. The body measurements of Pedi schoolchildren. South African Medical Journal. 1968; 42 (48): 1314-1322.

Lotfi M. Growth monitoring: A brief literature review of current knowledge. *Food and Nutrition Bulletin* 1988; 10 (4): 3-10.

Malek E. An evaluation of the protein-energy-malnutrition scheme for children under 6 years of age in the Mitchells Plain District, western Cape Province. Unpublished report, 1997.

Martorell R. Body size, adaptation and function. *Human Organisation* 1989; 48 (1): 15-20.

McCoy D et al (1997). An evaluation of South Africa's Primary School Nutrition Programme. Child Health Unit and Health Systems Trust. Durban.

McKeown J.M., Cleaton-Jones P.E., Gramath L., Richardson B.D. and Sinwel R.E. A study of the relative amounts of food items consumed by South African preschool children. *S Afr J Food Sci and Nutr.* 1989; 1: 19-28.

McLachlan M., Marshall C. Nutrition in South Africa: A proposal for transformation, Development Bank of Southern Africa and Wits Department of Community Health, 1995.

Molteno C.D., Hollingshead J., Moodie A.D., Bradshaw D., Willoughby W., Bowie M.D., Smallman L.A. Growth of preschool coloured children in Cape Town. *South Africa Medical Journal* 1991; 79: 670-676.

Moodley J., Linley L., Saitowitz R. A review of the literature on breastfeeding: Implications for policy and research. Child Health Unit. University of Cape Town, 1997.

Motarjemi Y., Kaferstein F., Moy G. and Quevedo F. Contaminated weaning food: a major risk factor for diarrhoea and associated malnutrition. *Bulletin of the World Health Organization*. 1993; 71(1): 79-92.

National Research Council. Nutrient Adequacy. *Assessment using food consumption surveys*. Subcommittee on Criteria for Dietary Evaluation, Coordinating Committee on Evaluation of Food Consumption Surveys. Food and Nutrition Board, Commission on Life Sciences,. National Academy Press, Washington D.C., 1986.

Passmore R., Rao M.N., Nicol B.M. Handbook on Human Nutrition Requirements (WHO Monograph Series no. 61). Rome: Food and Agricultural Organisation, 1974.

Pelletier DL, Frongilo EA, Habicht JP. Epidemiologic evidence for a potentiating effect of malnutrition on child mortality. Am J Public Health 1993; 33(8): 1130-33

Pelto G. Methodological issues in nutritional anthropology: report of a workshop. Food and Nutrition Bulletin 1981; 3: 21-28.

Pinstrup-Anderson P., Burger S., Habicht J. and Peterson K. Protein energy malnutrition. In: D.T. Jamison, W.H. Mosley, A.R. Measham and J. L. Bobadilla (Eds.). Disease Control Priorities in Developing Countries. The World Bank. Oxford University Press, Washington, 1993.

Ransome O.J., Chalmers B., Herman A., Reinach S. Infant feeding in an urban community. *South African Medical Journal*. 1988; 74: 393-5.

Reconstruction and Development Programme, 1995.

Richardson B.D. and Sinwel R.E. Infant growth in a rural Tswana community. *South African Medical Journal* 1984; 65: 775-8.

Richardson, B.D., Sinwel, R. and Cleaton-Jones, P. *et al.* Nutrient Intake. *In: Dental caries, nutrient intake, dietary habits, anthropometric status, oral hygiene, and salivary factors and microbiota in South African black, Indian and white 4-5 year old children* (Eds.) P. Cleaton-Jones, L. Granath and B.D. Richardson. Medical research Council, Parowvallei, South Africa, 1991.

Richter M.J., Langenhoven M.L., Du Plessis J.P., Ferreira J.J., Swanepoel A.S. and Jordaan P.C. Nutritional value of diets of Blacks in Ciskei. South African Medical Journal. 1984; 65; 338-345.

Scrimshaw NS. The challenge of global malnutrition to the food industry. Food Technol. 1993; 60-71

Seward J.F. and Serdula M.K. Infant feeding and infant growth. *Pediatrics* 1984; supplement: 728-761.

Shann F. Nutritional Indices: Z, centile, or percent. Lancet 1993; 341: 526-527.

Sickle D., Wolmarans P., Saitowitz R., Chiwayo N. Training manual for field workers: The 24-hour recall. 1997.

Solarsh G.C., Sanders D., Gibson C., Gouws E. Community based surveillance versus sentinel site sampling in determining the nutritional status of children. *South African Medical Journal* 1994; 84: 747-752.

South African Vitamin A Consultative Group. Children aged 6 to 71 months in South Africa,1994: Their anthropometric, vitamin A, iron and immunisation coverage status. *South Afr J Food Sci Nutr* 1996; 8(supplement): 1-2.

Steyn, N.P., Badenhorst, C.J., Nel, J. H. and Jooste, P.L. The nutritional status of Pedi preschool children in two rural areas of Lebowa. S Afr J Food Sci Nutr 1989; 1: 15-

Steyn N.P., Badenhorst C.J., Nel J.H., Ladzani R. Breastfeeding and weaning practices of Pedi mothers and the dietary intakes of their preschool children. *South African Journal of Food Science and Nutrition.* 1993; 5(1): 10-13.

Task Group on Food Fortification. Minutes of the meeting held on 18 June 1997. Directorate: Nutrition, Department of Health, Pretoria.

Tender advertised in the Government Gazette number: RT 467 SP 16 October 1997, Supply service appointment of consultant to conduct a food consumption survey of SA children. Office of the State Tender Board.

Thandi Magazine. Hlatlolanang gets a new lease on life. May 1995 pages 28-30.

Torun B., Chew F. Protein-Energy Malnutrition. In: Shils ME, Olson JA, Shike M ed. Modern Nutrition in Health and disease, 8th Ed. Philadelphia: Lea and Febiger, 1994: 950-976.

United Nations Children's Fund. Conceptual Framework for Improving the Nutrition of Children and Women in Developing Countries. UNICEF, 1990.

Van Staden E., Langenhoven M.L., Donald P.R., Laubscher J. A. Dietary intake of children with failure to thrive. S Afr J Food Sci Nutr 1994; 6: 96-99.

Victora C.G., Vaughan J.P., Lombardi C. et al. Evidence for protection by breastfeeding against infant deaths from infectious diseases in Brazil. *The Lancet* 1987; August 8: 319-321.

Vorster, H.H. and Venter, C.S. School feeding programmes: strategies for South Africa. *South African Journal of Food Science and Nutrition* 1992; 4(4):95-102.

Vorster H.H., Oosthuizen W., Jerling J., Veldman F., Burger H. *The Nutritional Status of South Africans: A Review of the Literature from 1975-1996.* Health Systems Trust, Durban. 1997.

World Health Organisation. Measuring Change in Nutritional Status. WHO, Geneva (1983).

World Health Organisation Working Group. The use and interpretation of anthropometric indicators of nutritional status. *Bull WHO* 1986; 64: 929-941.

WHO/UNICEF. Protecting, promotion and supporting breastfeeding: The special role of maternity services. Geneva: World Health Organisation, 1989.

World Health Organization. *World Declaration on Nutrition – Plan of action for Nutrition.* Geneva: World Health Organization Division of Food and Nutrition, 1992: 1-22.

WHO Global Database on Child Growth and Malnutrition. Programme of Nutrition, WHO, Geneva, 1997.

Whitfield M. Breastfeeding in South Africa. Why the lack of support? Health Systems Trust Update 1996 Issue 19: 5-6.

Zollner E., Carlier N.D. Breast-feeding and weaning practices in Venda, 1990. *South African Medical Journal* 1993; 83: 580-583.

Zumrawi F.Y., Dimond H., Waterlow J.C. Faltering in infant growth in Khantown Province, Sudan. *Hum Nutr Clin Nutr* 1987; 41C: 383-395.

APPENDICES

APPENDIX 1: LIST OF VILLAGES COMPRISING THE NEBO AND SEKHUKHUNE MAGISTERIAL DISTRICTS AND THOSE SELECTED FOR INCLUSION IN THE STUDY.

NEBO	SEKHUKHUNE
Eenzaam	Dichoeng *
Ga Malaka *	Ga Masha *
Ga Maloi *	Ga Mmela *
Leeukraal	Ga Moela
Mamone *	Ga Ratau
Marishane *	Madibaneng *
Masemola *	Madibong *
Maseru Park *	Magnet Heights *
Mashabela	Maila Mapitsane *
Mohlarekoma	Maila Segola
Molepane	Malegale
Mokwete *	Malekane *
Phaahla	Manganeng
Phokoane *	Marulaneng
Riverside	Maseleseleng
Talane *	Mathibeng
	Mohlaletsi *
	Moraba
	Moretsele *
	Schoonoord *
	Tjatane *

* Villages selected for inclusion in the study.

APPENDIX 2: QUESTIONNAIRE FOR ANTHROPOMETRIC DATA COLLECTION.

BASELINE NUTRITIONAL SURVEY IN THE SEKHUKHUNE AND NEBO MAGISTERIAL DISTRICTS

DATE: _ _ / _ _ / _ _
DD MM YY

RESPONDENT NUMBER: _____

INTERVIEWER NAME: _____

DISTRICT: (Circle district)

Nebo Sekhukhune

VILLAGE NAME: _____

VILLAGE CODE: _____

CHECKLIST

WEIGHING SCALES
HLOBOLA
GREEN BUTTON
ZERO
MENWANA
THWII
NOMORO
CONFIRM

The Field worker must introduce herself and tell the mother the following:
Good morning, my name is _____ and I am working at the HHNEC. We are conducting a survey, so as to gather some information on the nutritional status of the children in this area as well as the ways that mothers feed their children. Will you grant me permission to ask you a few questions? May I also weight your child? Your answers will be kept strictly confidential and I will not record your name.

RESPONDENT INFORMATION:

DATE OF BIRTH: _ _ / _ _ / _ _

AGE (months): _____ SEX : _____

WEIGHT OF MOTHER (kg): _____

WEIGHT OF MOTHER + CHILD (kg): _____

WEIGHT OF CHILD (kg): _____

HEIGHT OF CHILD (cm): _____

CHECKLIST

HEIGHT STICKS
DIRETHE
MARAGO
LEHETLA
HLOOGO
THWII
NOMORO
CONFIRM

LENGTH MATS
METE THWII
GATA KALEOTO
HLOOGO THWII
MATSOGO THWII
MAOTO THWII
LENAO UPRIGHT
NOMORO
CONFIRM

APPENDIX 3: QUESTIONNAIRE FOR DIETARY DATA COLLECTION USING A 24-HOUR RECALL

Respondent number | | | |

CHILD HEALTH UNIT/HLATLOLANANG HEALTH AND NUTRITION EDUCATION CENTRE/NATIONAL PROGRAMME FOR NUTRITIONAL INTERVENTION

24-hour recall

Time	What did the child eat or drink?	How was the food prepared? (What was added/What type of food?)	How much was actually eaten or drunk?

APPENDIX 4: EVALUATION OF BREASTFEEDING AND COMPLEMENTARY FEEDING PRACTICES.

FILL IN THIS QUESTIONNAIRE FOR ALL CHILDREN UNDER THE AGE OF 2 YEARS (BORN BETWEEN NOVEMBER 1995 – NOVEMBER 1997).

RESPONDENT NUMBER: _ _ _ _ CODE OF INTERVIEWER: _ _

DATE OF INTERVIEW: _ _ / _ _ / _ _
DD MM YY

DISTRICT: Sekhukhune Nebo
(circle the district)

DATE OF BIRTH: _ _ / _ _ / _ _ AGE: _ _ _ _ (months)
DD MM YY

---

1. WHAT IS YOUR RELATIONSHIP TO THE CHILD? (circle correct answer)

Mother	Father	Grandmother	Aunt	Sibling	Other

2. WAS THIS CHILD EVER BREASTFED? (circle the correct answer)

YES	NO	DON'T KNOW

3. IF YES, UP TO WHAT AGE WAS THIS CHILD FED **BREASTMILK ALONE**?

_____ (months)

4. IF NO, WHAT WAS THE CHILD GIVEN INSTEAD OF or IN ADDITION TO BREASTMILK?

TYPE OF MILK	**TYPE OF INFANT FORMULA**
Cow's Milk	Nan
Goat Milk	Lactogen (blue container)
Sour Milk	Pelargon (orange container)
Powdered Full Cream Milk (eg Klim, Nespray)	S 26
Powdered Fat Free Milk	Infasoy
OTHER: Specify _____	OTHER: Specify _____

5. At what age were solid foods given to the child for the first time?

_____ weeks _____ months _____ Don't know

6. Why did you introduce solid foods to your child?

_____

_____

7. What was the first type of food given to your child?

_____

8. Why did you give this food first?

_____

_____

_____

9. How many times a day do you feed your child? _____

10. Which foods do you think are **GOOD** for your child and why?

Good foods	**Reason why these foods are good**

11. Which foods do you think are **BAD** for your child and why?

Unsuitable foods	**Reason why these foods are unsuitable**

12. CIRCLE IN THE CORRECT ANSWER:

Food in the hose is **ALWAYS** available	1
Food in the house is available **MOST OF THE TIME**	2
Food in the house is available **SOMETIMES**	3

13. CIRCLE THE CORRECT ANSWER/S:

Sources of food in the house:

Home growing	1
Purchase from the shop	2
Both	3

APPENDIX 5: SUCCESS FACTORS OF NUTRITION PROGRAMMES

Clear but flexible objectives
The objectives of any nutrition programme must be clearly defined and agreed upon prior to implementation. On the other hand, the use of pilot projects and feasibility studies is recommended as it is not always desirable to design a complete programme from the start.

Political support and strong leadership
Nutrition programmes need to be given the security of strong political support, especially when there are other needs and programmes competing for support. They must be administered by personnel who are capable of mobilising the available resources to prevent and resolve the problems of malnutrition.

Adequate staffing, training and supervision
Adequate staffing, training and supervision of both programme staff and community workers is a requirement of success. The use of community workers is often required to help off-load the work of health programme staff, and to perform tasks that they are better suited to undertake, such as growth monitoring, nutrition education and identifying and locating at-risk households.

Targeting
The goal of targeting is to concentrate resources on those who need them most and to increase programme efficiency and effectiveness. Targeting strategies must be flexible, simple, affordable and acceptable to both programme implementers and the community. Three levels of targeting are most commonly used namely, geographical targeting, targeting of biological population groups (specific age-groups) and targeting of individuals or households - usually based on anthropometric or socio-economic status.

Community participation
The mobilisation of community resources and the involvement of the community workers have been identified as key elements of effective nutrition programmes. Community participation can be ensured through decentralisation of the administration and authority of programmes, and through the recruitment of and training of local community workers.

Efficient administration and management
Good management is essential for the success of nutrition programmes. This includes having an effective management and information system that can plan the appropriate allocation of resources. There also needs to be a system of programme monitoring and evaluation, with indicators that are built around the targets and objectives of the programme.

Multi-sectoral and holistic approach
Because of the multi-factorial nature of nutrition, nutrition programmes should be developed collaboratively with the involvement of the health, agriculture, employment, water, land, education and welfare sectors.

Source: Adapted from United Nations Administrative Committee on Co-ordination/Subcommittee on Nutrition. 1991, Managing Successful Nutrition Programmes, Nutrition Policy discussion paper No.8 A report based on an ACC/SCN Workshop at the 14th IUNS International Congress on Nutrition, Seoul, Korea, August 1989.

APPENDIX 6: CHARACTERISTICS OF COMMUNITY-BASED NUTRITION PROGRAMMES.

The INP identified the following activities that should be undertaken by community-based nutrition programmes:

- community-based growth monitoring and promotion
- community-based nutrition education *
- community-based nutrition rehabilitation
- food production and household food security
- income generation linked to nutrition education and household food security
- school feeding linked to food production and income generation projects
- referral systems

* Topics which should be included in nutrition education
-breastfeeding
-infant feeding and weaning practices
-food production techniques
-food processing and preservation techniques
-consumption of locally available, micronutrient-rich foods
-feeding during and after illness
-food and environmental hygiene
-basic life skills e.g. household budgeting
-danger signs and risk factors for malnutrition

Source: Integrated Nutrition programme, January 1998

APPENDIX 7: REVIEW OF THE ACTIVITIES OF THE HLATLOLANANG HEALTH AND NUTRITION EDUCATION CENTRE (HHNEC)

1. What is the overall aim of the Health and Nutrition programme at HHNEC?
2. How many staff members are currently working for the Health and Nutrition programme?
3. What training in health and nutrition has each staff member received?
4. How is the community involved in the activities of the programme?
5. Does the Health and Nutrition programme compile any reports of their activities?
6. Please list the main activities of the Health and Nutrition programme.
7. How is the Health and Nutrition programme linked to other HHNEC programmes?
8. Is the Health and Nutrition programme linked to any of the health services in the area?
9. Regarding the Growth Monitoring activities, what equipment is used to weigh the children?
10. How is data collected? Please provide a detailed step-by-step answer from selecting the children to follow-up.
11. How many staff members are involved in growth monitoring?
12. Have the staff been trained in growth monitoring?

APPENDIX 8: DESCRIPTION OF THE PROGRAMMES OPERATED BY HHNEC

THE HOUSEHOLD FOOD SECURITY PROGRAMME

This programme aims to improve household access to food through a number of activities including:

- Training communities in developing food gardens
- Training communities in methods of food processing and preservation
- Constructing water tanks

The training is offered in the form of workshops and food demonstrations held at the Hlatlolanang Centre at which women's groups from the villages are invited. They are then expected to train other women from their villages.

ADULT BASIC EDUCATION AND TRAINING

This programme provides skills development for adults in the following areas:

- Reading and writing
- Numeracy
- Dictation
- Life skills

The courses are divided into four levels each and participants are grouped according to their appropriate level.

INCOME GENERATION

This programme has been designed to alleviate the problem of unemployment by introducing and supporting income-generating activities in the area. The following services are offered:

- Conduct feasibility studies
- Offer training relevant to the needs of the project including marketing, bookkeeping, project management, fundraising.

A number of projects have been initiated including brick-making, concrete making, sewing (school uniforms) and construction of ferro-dams and VIP toilets.

APPENDIX 9: ESTIMATION OF BREASTMILK INTAKE

The quantity and composition of breastmilk produced by mothers is a major issue in paediatric public health.[11] However, the measurement of breastmilk production is no easy task [12] and is influenced by a variety of factors including maternal health and nutritional status as well as genetic, economic and psychosocial circumstances. Making assumptions about breastmilk intake by infants, is further complicated due to a wide range of inter-individual variation and day-to-day fluctuations in breastmilk intake. [13] Thus any estimates of breastmilk intake must be used with caution.

1. Direct measurement of breastmilk intake

Test weighing is the most commonly employed method of directly assessing milk intake of breastfed infants [14] and has been found to correlate well with direct measurements of milk intake as measured in formula fed infants.

Ideally a study of dietary intake would use test weighing or other means of directly determining breastmilk intakes in a sample of infants from the study population.

However, specific procedures and equipment are required for test-weighing and the process is labour intensive and costly, making it often unsuitable for large-scale community-based dietary surveys. Thus for the purposes of this study, a set of estimates of breastmilk intake needed to be developed.

2. Estimating breastmilk intake

In order to develop estimates of breastmilk intake for this study population, a number of studies using test-weighing were reviewed. According to Jelliffe and Jelliffe (1978), the volumes of breastmilk intake vary greatly and seem to be lowest in communities with poor levels of nutrition and with inadequate living conditions. Thus, the review focused specifically on studies conducted in communities which refelected these conditions, so as to simulate as closely as possible the conditions of the current study area (see Table 1).

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[11] Jelliffe and Jelliffe. Human Milk in the Modern World. Oxford Medical Publications, 1978.

[12] Personal communication (email): E. Vorster, 6 April 1998, Department of Nutrition and Family Ecology, Potchefstroom, SA.

[13] Personal communication (email): H. Armstrong, 14 April 1998, Nutrition Section, UNICEF, New York.

[14] Borschel M., Kirksey A., Hannermann R. Evaluation of test-weighing for the assessment of milk volume intake of formula-fed infants and its application to breastfed infants. The Am J of Clin Nutr 1986; 43: 367-373.

Table 1: Approximate quantities of milk produced daily by mothers from poorly nourished communities.

Study	0-6 months, Breastmilk intake (mls)	6-12 months, Breastmilk intake (mls)	12-24 months Breastmilk intake (mls)
India (Belavady, 1963)	600	500	350
New Guinea (Venkatachalam, 1962)	525	525	343
Biak Island (Jansen, 1960)	427	390-430	127-338
Sri Lanka (De Silva, 1964)	475	495	506
New Guinea (Bailey, 1965)	400	400	400

1. Belavady B. Studies on human lactation. Ind. Council. Med. Res. Spec Rep Ser. 1963; 45: 1-17.
2. Vekatachalam P. (1962). A study of the diet, nutrition and health of the people of the Chimbu Area, New Guinea Highlands. Monograph no.4 Department of Public Health, New Guinea.
3. Jansen A., Luyken R., Malcolm S. and Williams J. Quantity and composition of breastmilk in Biak Island, New Guinea. Trop Geogr. Med. 1960; 12: 138.
4. De Silva C. Common nutritional disorders of childhood in the tropics. Advanc. Pediatr. 1964; 13: 213.
5. Bailey K. Rural nutrition surveys in Indonesia. Trop. Geog. Med. 1962; 14: 11.

Although the study findings report a range of breastmilk intakes, the following working estimations have been suggested (see Table 2):

Table 2: Recommended estimations of breastmilk intake.

- 500-700 ml/day in the first 6 months of life,
- 400-600 ml/day in the second six months of life and
- 300-500 ml/day in the second year of life.

3. Conclusion

Using the recommendations outlined in Table 2, the following method was used to estimate breastmilk intake in the current study:

STEP 1: Calculate the age of the child

- This was determined from the questionnaire on anthropometry (see Appendix 2).

STEP 2: Review the 24-hour recall to determine whether the child is being partially or exclusively breastfed.

- The 24-hour dietary recalls were examined to determine whether the infant was being exclusively or partially breastfed (as defined by the addition to the diet of any food or drink other than breastmilk).

STEP 3: Determine breastmilk intake according to the estimates for the child's age-group (outlined in Table 2).

- Infants who were exclusively breastfed (as determined by the 24-hour recall) were assumed to take in the upper limit of the range of breastmilk in their age-category.
- Infants who were partially breastfed (as determined by the 24-hour recall) were assumed to take in the lower limit of the range of breastmilk in their age-category.

Working example 1: Respondent number 232

Step 1: Calculate the age of the child

The child is 8 months old.

Step 2: Review the 24-hour recall to determine whether the child is being partially or exclusively breastfed

According to the 24-hour recall it is clear that the child is being partially breasfed, as it was reported that in the previous 24-hours the child received soft maize meal porridge in addition to breastmilk.

Step 3: Determine breastmilk intake according to the estimates for the child's age-group.

The child falls within the 6-12 month age-group and is estimated to have a daily breastmilk intake of between 400-600 ml/day. The lower end of the range (i.e. 400 ml/day) is selected as the estimated breastmilk intake, as it has been established (see Step 2) that the child is being partially breastfed.

Working example 2: Respondent number 217

Step 1: Calculate the age of the child

The child is 2 months old.

Step 2: Review the 24-hour recall to determine whether the child is being partially or exclusively breastfed

According to the 24-hour recall it is clear that the child is being partially breasfed, as it was reported that in the previous 24-hours the child received Nestum number 1 mixed with powder milk, in addition to breastmilk.

Step 3: Determine breastmilk intake according to the estimates for the child's age-group.

The child falls within the 0-6 month age-group and is estimated to have a daily breastmilk intake of between 500-700 ml/day. The lower end of the range (i.e. 500 ml/day) is selected as the estimated breastmilk intake, as it has been established (see Step 2) that the child is being partially breastfed.

APPENDIX 10: ANTHROPOMETRIC INDICATORS - THEIR CLASSIFICATION, ANALYSIS AND PRESENTATION.

Anthropometry can be used to assess the nutritional status at both the individual and population level. At the population level, data are most commonly available from cross-sectional surveys in which the prevalence of low anthropometric indices can be assessed be determining the proportion of the population that falls below a cut-off value. In addition, the mean or median anthropometric value of a population can be compared with the regerence value to assess the status of the study population relative to the reference population (WHO, 1986).

The reference population most commonly used as a point of comparison, is based on the growth reference curves developed by the National Centre for Health Statistics (NCHS) which was formulated in the 1970s and is based on a sample of well-nourished American children. Although these growth curves have been recommended by the WHO for international use, there has been much debate about their usefulness for developing countries (WHO, 1997).

To calculate the anthropometric indices, information is needed on each individual's age, sex, weight and height. From these data, it is possible to calculate different indices, namely height-for-age, weight-for-height and weight-for-age (Katzenellenbogen) which can them be compared to the reference population in a number of ways. The most common ways of expressing these indices, is in terms of Z-scores, percentiles or percent of median (WHO, 1986).

The Z-score

The Z-score expresses the anthropometric value as a number of SD below or above the the mean or median value of the reference population, which has a normal distribution with a mean of zero and a standard deviation (SD) of 1. The formula for calculating Z-scores is (WHO, 1995):

$$\text{Z-score} = \frac{\text{observed value} - \text{median value of the reference population}}{\text{SD value of the reference population}}$$

The Z-score cut-off point recommended by the WHO, Centre for Disease Control (CDC) and others to classify low anthropometric levels is 2 SD units below or above the reference median for the three indices. The proportion of the study population that falls below the a Z-score of -2 is generally compared to the reference population in which 2.3% will fall below this cut-off. Thus, 2.3% can be regarded as the baseline prevalence to which one can compare the results of the study population (WHO, 1997). The table below provides a classification of the severity of malnutrition in a population.

Table: Classification of prevalence of low anthropometric values.

Index	Low	Medium	High	Very high
Low WFH	<5%	5.0-9.9%	10.0-14.9%	>/=15.0%
Low HFA	<20%	20.0-29.9%	30.0-39.9%	>/=40.0%
Low WFA	<10%	10.0-19.9%	20.0-29.9%	>/=30%

Z-scores are particularly useful for population-based surveys, as they have the statistical property of being normally distributed, allowing a meaningful average and SD for a population to be calculated (WHO, 1997). It is also easy to compare Z-scores across ages and indices as a particular score reflects an equivalent deviation from the median for children of any age, in respect of HFA, WFH and WFA (Shann, 1993)..

Percentiles

Percentiles range from zero to 100, with the 50th percentile representing the median of the reference population. Cut-off points for low anthropometric results are generally < 5th percentile or < 3 percentile. In the reference population, 5% of the population falls below the 5th percentile and can be compared to the proportion of the study population that falls below this cut-off point. One of the advantages of using the percentile, is that it is easy to interpret e.g. in the reference population, 3% of the population falls below the 3rd percentile (WHO, 1986). It is thus useful when working with communities and can be easily explained and understood.

Percent of median

The calculation of the percent of median does not take into account the distribution of the reference population around the median. Therefore, interpretation of the percent of median is not consistent across age and height levels nor across the different anthropometric indices (WHO, 1986).

A note on cut-off points

It is important to bear in mind that cut-off points represent a purely statistical separation between the classification of 'malnourished' and 'normal'. In addition, the conventional cut-off of < -2SD or its equivalent, is often unrealistic and of limited use in practice (WHO, 1986). This is often the case in emergency situations, where the vast majority of children may fall below the conventional cut-off points used. In this case, choosing a lower cut-off point will help to identify those children in greatest need of attention (WHO, 1986). This emphasises the flexibility of cut-off points and the need to choose them in relation to the purpose and response to collection of nutritional status data e.g. using cut-off points to help target intervention or using cut-off points for group comparisons.

Although there are a number of ways in which to analyse and present anthropometric data, for the purposes of consistency the WHO has recommended the use of Z-scores for relating measurements to the reference. It has also been suggested that the standard statistical cut-off points of +/-2 SD from the mean should be used (Keller et al, 1983).

Z-scores are recommended by the WHO for monitoring groups of children for public health and research purposes (WHO, 1986).WHO has recommended the use of Z-scores for monitoring nutrition and health progress.

APPENDIX 11: NUTRIENT INTAKES OF CHILDREN 0-71 MONTHS OF AGE

AGEGROUP: 0-11 months (N = 49)

Nutrients	*Mean*	*Std Dev*	*< 67% RDA*
Energy (kJ)	2523,85	951,99	36,7
Protein	12,37	6,7	40,8
Fat	23,63	5,9	
Carbohydrate	88,93	49,13	
Calcium	224,8	85,3	91,8
Iron	2,1	2,4	89,8
Zinc	2,0	1,2	87,8
Vit A	341,1	79,8	6,1
Thiamin	0,2	0,2	55,1
Riboflavin	0,3	0,1	50,0
Niacin	2,3	1,6	85,7
Vit B6	0,2	0,1	83,7
Folate	37,6	15,3	4,1
Vit B12	0,3	0,5	71,4
Vit C	27,9	8,2	30,6

AGEGROUP: 12-23 months (N = 47)

Nutrients	*Mean*	*Std Dev*	*< 67% RDA*
Energy (kJ)	3223,6	1204,6	68,1
Protein	21,6	12,0	14,9
Fat	19,4	8,6	
Carbohydrate	131,4	55,7	
Calcium	241,6	198,1	89,4
Iron	3,7	3,0	87,2
Zinc	2,8	1,4	100,0
Vit A	337,7	532,2	66,0
Thiamin	0,5	0,3	51,0
Riboflavin	0,5	0,3	70,2
Niacin	3,5	2,7	87,2
Vit B6	0,4	0,3	85,1
Folate	49,6	28,2	27,7
Vit B12	0,7	2,2	63,8
Vit C	23,0	43,8	85,1

AGEGROUP: 24-35 months (N = 67)

Nutrients	*Mean*	*Std Dev*	*< 67% RDA*
Energy (kJ)	3917,5	1288,3	50,8
Protein	29,6	13,1	1,5
Fat	18,4	11,9	
Carbohydrate	168,9	53,7	
Calcium	257,8	271,2	91,0
Iron	6,1	5,3	77,6
Zinc	3,8	1,7	91,0
Vit A	391,4	885,1	73,1
Thiamin	0,7	0,3	14,9
Riboflavin	0,6	0,6	61,2
Niacin	5,2	3,7	73,1
Vit B6	0,4	0,3	88,0
Folate	64,3	37,0	17,9
Vit B12	2,4	8,7	49,3
Vit C	11,8	14,0	83,6

AGEGROUP: 36-47 months (N = 90)

Nutrients	*Mean*	*Std Dev*	*< 67% RDA*
Energy (kJ)	4394,4	1346,6	34,4
Protein	32,5	12,9	1,1
Fat	17,1	8,1	
Carbohydrate	198,7	61,3	
Calcium	175,1	120,5	98,9
Iron	6,1	3,1	67,8
Zinc	4,5	2,1	82,2
Vit A	252,2	481,5	72,2
Thiamin	0,8	0,3	10,0
Riboflavin	0,4	0,3	73,3
Niacin	6,0	3,7	62,2
Vit B6	0,4	0,3	78,9
Folate	79,6	38,3	11,1
Vit B12	0,8	1,7	58,9
Vit C	18,3	46,5	86,7

AGEGROUP: 48-59 months (N = 69)

Nutrients	*Mean*	Std Dev	< 67% RDA
Energy (kJ)	4260,3	1528,4	82,1
Protein	31,7	13,3	7,3
Fat	17,7	10,8	
Carbohydrate	190,0	69,3	
Calcium	196,4	156,2	95,6
Iron	6,0	3,9	69,6
Zinc	4,4	2,1	85,5
Vit A	284,6	825,6	82,6
Thiamin	0,7	0,3	33,3
Riboflavin	0,5	0,3	88,4
Niacin	6,1	4,1	73,9
Vit B6	0,5	0,3	84,1
Folate	80,5	43,5	26,1
Vit B12	1,7	8,0	60,9
Vit C	13,3	28,7	91,3

AGEGROUP: 60-71 months (N = 44)

Nutrients	*Mean*	Std Dev	< 67% RDA
Energy (kJ)	4766,7	1156,4	81,8
Protein	36,7	12,7	0,0
Fat	21,5	9,4	
Carbohydrate	206,2	51,0	
Calcium	233,7	195,3	90,9
Iron	6,3	3,5	70,5
Zinc	5,2	2,7	75,0
Vit A	244,2	404,9	84,1
Thiamin	0,8	0,3	11,4
Riboflavin	0,5	0,3	79,6
Niacin	6,6	3,4	68,2
Vit B6	0,5	0,2	88,6
Folate	97,4	48,9	6,8
Vit B12	0,9	1,0	54,6
Vit C	12,2	30,5	93,2

APPENDIX 12: TRAINING MANUAL FOR FIELD WORKERS – THE 24-HOUR RECALL.

TRAINING MANUAL FOR FIELD WORKERS

THE 24-HOUR RECALL

Compiled by
DEIDRE SICKLE AND PETRO WOLMARANS

NATIONAL RESEARCH PROGRAMME FOR NUTRITIONAL INTERVENTION

MRC

In collaboration with
ROMY SAITOWITZ AND NAKAA CHIWAYO

CHPI / HHNEC
PARTNERSHIP IN CHILD HEALTH AND NUTRITION

OCTOBER 1997

PART 1

INTRODUCTION

1. What is the overall aim of the study?

The aim of the study is to assess the nutritional status of preschool children. Nutritional status implies how fat/ thin the body is; does the body contain sufficient vitamin and minerals. What we eat determines our nutritional status. A child who eats poorly will get infections more easily and will not grow and develop as well as a child who eats a balanced diet. We then say this child has a poor nutritional status.

2. How do we determine nutritional status?

- Diet
- Anthropometry (weight and height)
- Blood (e.g. to determine whether a child has anaemia).
- Clinical examination (e.g. is the hair/nails/skin healthy?)

3. From whom do we want to collect dietary information?

Our target group is preschool children 0-5 years old. However, these children are ***too young*** to be interviewed, so we will interview their ***mothers*** or ***caretakers***.

4. How will we obtain this dietary information?

There are various methods one can use to collect dietary information. For our study, we will use the ***24-hour recall.*** The dietary information that will be collected will be used for research. That is why it is so important that everyone collects the information in exactly the *same manner*. The purpose of this manual is to train you to collect the dietary information using the 24-hour recall in a ***standardised*** manner (all the field workers collecting the information in the same way).

5. The 24-hour recall

A 24-hour recall involves asking a person to recall *everything* he/she ***ate*** and ***drank*** the day before, from the time he/she awoke, till the time he/she went to bed. When

dealing with young children it is important to ask about things they ate or drank *during the night.*

6. How do we go about doing the 24-hour recall?

First and foremost, it is important to remember the following things:

- ☞ The dietary information will only be used for *research* purposes. It is therefore important that you do *not* discuss with anybody else what children in the study are eating. Confidentiality is very important!
- ☞ Tell the mother/caretaker that she does not have to be embarrassed or shy to recall anything the child ate, because no one in the community will see the information.
- ☞ Tell her that there are no right or wrong answers (she might be nervous that you are going to judge her and in this way give you incorrect information).
- ☞ Never tell the mother that her child is eating the wrong/right foods (even if she asks). In other words, you should **not** give nutritional advice.
- ☞ Try your best to interview the mother/caretaker alone. She might not give you accurate information if someone else is around.
- ☞ Try to conduct the interview in a relaxed manner. You body language may influence whether or not she is going to give you accurate information or not.

When conducting the 24-hour recall, there are **4 questions** to remember:

A. *WHAT TIME* DID THE CHILD EAT/DRINK?
B. *WHAT* DID THE CHILD *EAT/DRINK?*
C. *HOW* WAS THE FOOD/DRINK *PREPARED?*
D. *HOW MUCH* OF THE FOOD/DRINK DID THE CHILD *ACTUALLY EAT/DRINK?*

We will now deal with each of these questions in turn.

A. WHEN DID THE CHILD EAT/DRINK?

- ✏ We want to know ***the time*** the child ate or drank something, e.g. 7 am, 8 am, etc.

WHAT TIME DID THE CHILD EAT/DRINK?			

8 am			

B. WHAT DID THE CHILD EAT OR DRINK?

- We want to know ***everything*** the child ate or drank. ***If the child had a meal you must write down all the items that formed part of that meal.*** Each item must be written on a separate line. ***First*** write down all the ***items*** that formed part of that meal ***before*** you go on to write down how it was prepared.
- Remember to ask if the child had anything to eat or drink during the ***night.***
- Write down the ***brand names***, if possible, e.g. Rama brick margarine, Lactogen No.1, or sufficient words to describe the food item, e.g whether it was full cream milk or hard/brick margarine, etc.

WHAT TIME?	**WHAT DID THE CHILD EAT/ DRINK?**		
8 am	**Mielie meal - Iwiza**		
	sugar - white		
	milk - full cream		
	margarine - Rama brick margarine		

C. HOW WAS THE FOOD OR DRINK PREPARED?

- If the food was prepared at home, you must write down all the items that were *added*.
- You must also indicate the cooking method, e.g. fried in sunflower oil.

For example:

WHAT TIME?	WHAT DID THE CHILD EAT OR DRINK?	**HOW WAS THE FOOD OR DRINK PREPARED?**	
8 am	mielie meal - Iwiza	**maize meal, water, brick margarine, full cream milk, salt, sugar - stiff pap.**	
	sugar -white		
	milk - full cream		

D. HOW MUCH OF THE FOOD/DRINK DID THE CHILD ACTUALLY EAT/DRINK?

- You will be provided with a kit containing household measuring aids to help you to determine the quantities or amounts the child ate/drank.
- **You must never guess how much a food item weighs!**

WHAT TIME?	WHAT DID THE CHILD EAT/ DRINK?	HOW WAS THE FOOD/DRINK PREPARED?	**HOW MUCH DID THE CHILD ACTUALLY EAT/DRINK?**
8 am	mielie meal - Iwiza	maize meal, water, brick margarine, full cream milk, salt, sugar - stiff pap.	**250 ml**
	sugar -white		**2 heaped teaspoons (2Λt)**
	milk - full cream		**50 ml**

PART 2

WRITING DOWN THE 24-HOUR RECALL INFORMATION

How do we write down the information as ***accurately*** as possible?
Remember the important questions:

1. WHAT TIME...?

- ✏ Try to determine ***when yesterday***, the child ate or drank something for the first time.
- ✏ "When did the child eat or drink something for the first time?" "When did she eat or drink something next?"

2. WHAT FOODS OR DRINKS...?

- ✏ Determine ***what*** foods or drinks the child ate.
- ✏ "What did the child eat or drink?" "What did she eat or drink next?"

Please note: It is never easy for ***anyone*** to recall what they ate or drank the previous day. It is then important to ***probe***. For example, "What time did she awake yesterday? Half past 6? What did she do then? You bathed her? Did she eat or drink anything afterwards? No? So when was the first time that she ate or drank something? 9 o'clock? What was it that she ate or drank at 9 o'clock? Porridge? Did she have anything to drink? She had tea?" ***Never*** ask what the child had for breakfast or for lunch, etc. If we do ask this, we might give the mother the idea that her child ought to have set meals.

3. HOW WAS THE FOOD OR DRINK PREPARED?

- ✏ Determine ***how*** the food or drink was ***prepared,*** or what was ***added***. If the child had mielie meal, remember that some people add margarine, milk, even fat. So - ***probe!***
- ✏ "How did you make the porridge?" Be sure to find out whether just water and salt was used, or whether milk and margarine was added as well. What type of milk, what type of margarine?

"Did you add anything to the porridge once it was in the child's bowl?" Two teaspoons of sugar. Was that heaped or level teaspoons? Did you add anything else to the porridge? Margarine? Was that brick or tub margarine? How much margarine? "Was the porridge stiff or soft?" Write ***all*** this information down.

Too much descriptive information is better than too little. It is very difficult and tiresome to go back afterwards to fill in incomplete 24-hour recalls.

4. *HOW MUCH.....?*

- The information about 'how much' (the amount) is very important and the most difficult. That is why we have to write down this information as carefully and accurately as possible.
- The method we use to determine ***how much*** will depend on the food item. Each field worker will receive a ***complete kit*** which will assist you to determine the amounts.
- ***In this study we never guess how much a food item weighs!!***

The kit consists of:

numbered sponge models
measuring jugs
ruler
popcorn
oats
baby bottles
porridge bowls
spoons
cups
tennis/golf balls
cloths
pencil and sharpener

PART 3

HOW TO DETERMINE *HOW MUCH* THE CHILD ATE OR DRANK

For drinks (liquids), we must remember the following:

- We are determining ***volume.*** The unit of volume is ***millilitre (ml).***
- Children drink from cups or bottles. We must therefore decide on the *appropriate* measuring tool when determining the volume of a particular liquid.
- Some younger children may be drinking breastmilk. We will not be able to determine breastmilk quantity. You will, however, have to write down the time of the feed, and describe, in the appropriate column, how long the feed was. Did the child really feed? Write all this information down.

MILK AND MILK SUBSTITUTES

The important questions you must ask:

a. What type of milk?

- Fresh milk:
  - full cream milk, e.g. Everfresh, Bonnita
  - 2% (low fat) milk
  - skim (fat free) milk
- Powdered milk:
  - Full cream, e.g. Nespray, Numel, Klim, Everyday,
  - Skim, e.g. Protea, Elite, Farmer's Pride
- Breastmilk
- Infant formulas, e.g. Lactogen 1 and 2, Nan, S26, SMA, Isomil, Infagro, Pelargon, etc
- Milk blends, e.g. Make-a-litre, Carnation blend, Molico, Sunblest
- Coffee creamers, e.g. Cremora, Ellis Brown, Coffee Mate, Kreem Me, Weigh-Less
- Condensed milk:
  - Full cream, e.g. Gold Cross, Nestle
  - Fat-free, e.g. Gold medal
- Evaporated milk, e.g. Carnation, Ideal

Fat-free, e.g. Slender

- Yoghurt
  - full cream
  - low fat (e.g. Kid)
  - fat-free
- Yoghurt drinks, e.g. Yogi-sip, Yo-Flo, Yog-Nog
- Buttermilk
- Flavoured milk, e.g. Steri-milk
- Amasi/ingomasi
- Goat's milk

b. How did the mother/caretaker prepare it?

- **Infant formula:** how was the bottle prepared - how much **water** (in ml) and how many **scoops** of infant formula were added? Specify!
- Probe whether the mother add anything else to the milk, e.g. sugar, Nesquick.

c. How much did the child actually drink?

Example 1:

1) Infant formula:

The mother might have prepared a 250 ml bottle containing 10 scoops of formula, but the child might not have drunk all the milk that was prepared. How are we going to determine how much milk was drunk?

☞ *You will use the baby bottle in your kit to help you. Ask the mother to point on the bottle to where the child drunk (how much milk was left). You then subtract the volume that was left from the volume that was prepared, to get the amount the child actually drunk.* ***Show all calculations!***

WHAT TIME DID THE CHILD EAT OR DRINK?	WHAT DID THE CHILD EAT OR DRINK?	HOW WAS IT PREPARED?	HOW MUCH DID THE CHILD EAT OR DRINK?
4:30 PM	Infant formula: Lactogen 2	150 ml water and 7 scoops	150 - 50 ml= 100 ml

2) Example 2: Yoghurt

The mother might have given the child a 175 ml yoghurt. However, the child did not

eat everything. If the mother fed the child, ask how many teaspoons the child ate.

COOLDRINKS AND FRUIT JUICES

a. What type of cooldrinks/juice did the child drink?

* Gas cooldrinks, e.g. Coke, Fanta, home-made (Soda Stream), etc.
* 'Make-on' cooldrinks, e.g. Oros, Kool Aid, Lecol, etc.
* Bunnylicks/suckers (mapopotane)
* Fruit juice:
  - boxes, e.g. Liquifruit, Ceres, Pure Joy, etc.
  - plastic bottles, e.g. Dairybelle, Real, Bonnita, etc.
  - sparkling, e.g. Appletiser, Grapetiser, Monis, etc.
* Dairy blends, e.g. Fiesta, Cabana, Frulati, Tropica.
* Purity fruit juices, e.g. Apple Nectar, Three Fruits.

b. How did the mother/caretaker prepare it?

* Did the mother dilute the cooldrink? Probe.
* Did she add anything else to the cooldrink, e.g. sugar? Probe.

c. How much did the child drink?

* Did the child drink out of a bottle or cup? Use the appropriate tool in your kit.
* If the child drank out of a cup:
  Ask the mother/caretaker to pour some water into a cup (preferably the child's own cup) which was the same amount she gave to the child. Did she/he drink everything? Pour this water into your measuring jug and write down the volume.
* If in a bottle:
  Ask the mother/caretaker to pour water in the bottle which was the same amount she gave to the child. Did she/he drink everything? Pour this water into your measuring jug and write down the volume.

* *If the child did not drink everything, you must ask how much was left in the cup/bottle. Subtract this amount from the amount that was given to the child. Write down all calculations.*

TEA, COFFEE

a. ***What type of tea?***

- e.g Rooibos, Five Roses, Joko, Glen, etc?
- What was added? Sugar, milk? What type of milk? Was it creamer? Probe.

b. ***How was it prepared?***

- The mother might have made the child his/her ***own cup*** of tea in a cup or bottle, or else she might have made a ***big pot*** of tea for several children to drink. You must then write down *exactly* how she prepared it.
- This means you have to write down, in the "How was it prepared column", the amount of tea, milk and teaspoons of sugar that was added. Then in the "How much did the child actually eat/drink" column, you write down how much of that tea the child actually drank.
- When making a cup of tea, it is not always possible to determine exactly how much milk was added. So, we have to make certain assumptions. We define quantities of milk according the following criteria: 'little milk', 'medium amount of milk' and 'a lot of milk'.

Example 1: The mother/caretaker made the child his/her own cup of tea.

WHAT TIME?	WHAT DID THE CHILD EAT OR DRINK?	HOW WAS IT PREPARED?	
5 pm	Tea - Five Roses	250 ml tea	
	Milk - fresh full cream	'little milk'	
	Sugar - white	2 ∧ t	

Example 2: She made a big pot of tea for several children.

WHAT TIME?	WHAT DID THE CHILD EAT OR DRINK?	HOW WAS IT PREPARED?	
5 pm	Tea - Five Roses	Made in a large pot: 5 cups water	
	milk - fresh full cream	a lot of milk	
	sugar - white	2 ∧ ssp	

c. How much did the child actually drink?

✣ Even if the mother or caretaker prepared a cup of tea for the child that was 250 ml, we must not just assume that the child drank everything.

Example 1: Made tea for 1 child.
If the child drank out of a bottle:

✣ Ask the mother to pour some water into the bottle (pretending of course that it is the tea/coffee) to indicate how much tea was left in the bottle (not to where the mother initially poured). Subtract the final amount from the initial amount that was made, in order to get how much the child actually drank.

If the child drank out of a cup:

✣ You can even ask the mother to bring you the cup/mug out of which the child drank. The mother pours water into the cup indicating how much tea was left in the cup. Subtract the final amount from the initial amount that was prepared for the child, in order to get how much the child actually drunk. See the example below. All calculations must be written out!

WHAT TIME?	WHAT DID THE CHILD EAT OR DRINK?	HOW WAS IT PREPARED?	HOW MUCH DID THE CHILD ACTUALLY DRINK?

5 pm	Tea - Five Roses	tea, milk, sugar	250 - 100 ml = 150 ml
	Milk - fresh full cream		a lot of milk
	Sugar - white		2Λt

Example 2: Tea made in a large pot for several children.
Use the appropriate tool (bottle or cup):

WHAT TIME	WHAT DID THE CHILD EAT/ DRINK?	HOW WAS IT PREPARED?	HOW MUCH DID THE CHILD EAT/ DRINK?
7 PM	Tea - Five Roses	In a large pot: 750 ml tea	2 X 250 ml bottles (from 7 pm to midnight).
	milk - fresh full cream	a little milk	
	sugar - white	2 Λ ssp	

VEGETABLES AND FRUIT

a. What vegetables/fruit did the child eat?

* Which fruit are eaten in the study area?
  E.g. Oranges, bananas, pears, apples, avocados. Peaches, mangoes, grapes, lemons, guavas, paw paws, watermelon (and the rest of the watermelon family), mulberries, prickly pear, marula, etc. Which fruit are now in season?
* Which vegetables are eaten? Pumpkin, morogo (fresh and dried), lerotse, cabbage, potatoes, tomatoes, onions, sweet potatoes, carrots, beetroot, etc.
* Purity vegetables or fruit. Write down the brand name and description, e.g. Purity sweet potato, Purity peaches, Purity pears and yoghurt, Purity apple and banana, etc.
* Preserves, e.g. peaches, cabbage.
* Dried fruit - specify which types

b. How was it prepared?

* Fruit:
  Preserved, e.g. peaches.
  Mashed, e.g. bananas
  Grated, e.g. grated apple.
* Vegetables:
  Mixed vegetables, e.g. frozen mixed veg, canned mixed veg, etc.
  Boiled vegetables - was fat and/or sugar added? Specify.
  Braised, stewed vegetables - specify what was added and type of fat used.
  Mashed, e.g. mashed potatoes - what was added; what type of margarine, what type of milk.
* Salads, e.g. potato salad, coleslaw, etc. What was added?

c. How much did the child eat?

If the child ate a whole fruit, how are we going to determine the portion size?

* We could, for example, use the tennis ball and golf ball in our kit as measuring aids. If the size of the tennis ball is defined as 'medium', and the golf ball is 'small', then a fruit similar in size to the tennis ball will be 'medium', and a fruit 'golf ball size' will be 'small'.

* We could also use our ruler to determine the dimensions of, for example, a banana (length and diameter), or a slice of tomato (thickness, diameter).
* Fruit with segments, e.g. orange/naartjie: one/two segments.
* Grated carrot/apple or mashed banana: determine the amount the child ate using your oats and spoons as measuring aids.

CAKES, COOKIES, SWEETS, SNACKS, PUDDINGS/DESSERTS

CAKES AND COOKIES

a. What type of cake/cookies did the child eat?

- Sponge cake, chocolate cake, coconut tart, etc. Specify.
- Was the cake home-baked, or bought at the shop? Specify.
- Write down the ***brand name*** of the cookies (if applicable), e.g. Romany Creams, Tennis Biscuits, Marie Biscuits, etc.

b. How was it prepared?

- Cake: with or without icing/cream/caramel; one- or two-layered? Specify.
- Home-baked caked: What type of margarine was used? What type of milk? Specify.

c. How much did the child eat?

- Cake: Use the sponge models and ruler to assist you in determining the portion size. Measure the length, height and width of the slice of cake the child ate. Write down the dimensions in cm.
- Cookies: The size of cookies like Marie biscuits, Romany Creams, Eet Sum More, etc are standard. It is therefore not necessary to measure them - all you need to do is write down the brand name and how many cookies the child ate, e.g. 1 Lemon Cream, ½ Tennis Biscuit, etc.
- Non-standard cookies (e.g. those bought in bulk at the bakery): you have to use your ruler to measure the thickness and diameter of the cookie.

SWEETS

a. ***What type of sweets did the child eat?***

- Hard sweets, e.g. Dimes, Wilsons, Sparkles, lollipops, etc.
- Soft sweets, e.g. jelly babies, marshmallows, toffees, fudge, etc.
- Chocolate, e.g. Tex, Bar One, Smarties, Crunchie, etc.
- Chewing gum, e.g. Chappies, Bubble Yum, etc.

b. ***How many sweets did the child eat?***

- e.g. one/two/five sweets.
- Do not forget to specify what type of sweet.
- Chocolates like Tex, Chomp, Kit Kat, etc: do not forget to fill in whether it was a small or large chocolate. You can determine how much of the chocolate the child ate by measuring the length, height, and width of the piece the child ate.

SNACKS

a. ***What type did the child eat?***

- Salticrax, Tuc, Zap, Cream Crackers, Provita, Mini Cheddars, etc. Specify.
- Potato crisps, e.g. Simba chips, Willard chips, Flings, etc.
- Maize snacks, e.g. Graffiti, Jumping Jack, Smart Pop (popcorn), Nik Naks, Cheese Snacks, Gators, Shooters, Fritos, Cheese Curls (also those chips similar to cheese curls that are made up in packets and bought from the vendors), etc.

b. ***How much did the child eat?***

- Did the child eat the contents of a whole packet? If so, specify whether it was a ***small*** or a ***medium-sized*** packet. *It is very important to write down this information.*
- One/two Flings.

PUDDINGS/DESSERTS

a. ***What type of pudding did the child eat?***

- Was the pudding bought at the shop or was it home-made? Specify.
- 'Shop-bought', e.g. canned peaches, fruit cocktail, Numel custard, Ideal milk, instant pudding, ice cream, etc.

- Home-made, e.g. jelly and custard, sago pudding, etc.

b. How was it prepared?

- e.g. sago pudding: full cream milk, eggs, brick margarine, sugar.
  custard: full cream milk, sugar

c. How much did the child eat?

- Jelly and custard: Use the spoons, oats and bowl in your kit to assist you to determine the amount the child ate. Determine the amount of jelly first, then the amount of custard.
- Baked pudding: Use the sponge models and ruler to assist you in determining the dimensions (height, thickness, width). Do not forget to ask whether custard was served with the pudding.

SOUP

a. ***What type of soup did the child eat?***

- Examples: vegetable and beef soup, split pea and ham, barley, lentil, samp and bean soup, bean, tomato and onion soup, etc.

b. ***How was it prepared?***

- Bean soup: brown beans, tomato, onion, spaghetti
- Was it thick soup or thin soup? Specify.

c. ***How much did the child eat?***

- Use the measuring jug, bowl and water as your measuring aids.

FISH AND FISH DISHES

a. ***What type of fish did the child eat?***

- Fresh/frozen fish, e.g. hake, snoek, mullet, etc. Specify.
- Tinned fish, e.g. pilchards in tomato sauce, tuna in brine, mackerel, etc. Specify.
- Dried fish - what type of fish?

b. ***How was the fish prepared?***

- Fried fish: flour and egg batter, fried in sunflower oil.
- Oven-baked fish, no oil added.
- Braaied fish (over the coals), no oil added.
- Fish stew, fish cakes. Write down the main ingredients, .e.g. fish stew: pilchards, tomato, onion. Were the bones of the pilchards removed? Please specify.

c. ***How much did the child eat?***

- A piece of fried fish: Use the sponge models and your ruler to determine the dimensions (length, thickness, width) of the piece of fish the child ate.
- Fish stew (e.g. pilchards with tomato and onion): Use your spoons, bowl and oats to assist you to determine how much the child ate.
- Fish cakes: Use your ruler to determine the ***diameter*** and thickness.

MEAT AND MEAT DISHES

a. ***What type of meat did the child eat?***

- Red meat: Was it beef, pork, lamb, goat? Was the fat left on, or was the fat removed? Specify.
- Mince, sausage (beef, pork), chops (what type?), ribs, organs (liver, heart, lungs, brain, kidneys), etc. Specify.
- Chicken: thigh, drumstick, wing, breast, giblets. Was it a small, medium, or large chicken? Was it chicken pieces or did the mother make it 'fine' for the child to eat? Was the skin left on, or was the skin removed? Specify.
- Stew: beef stew, cabbage stew, chicken curry, sausage stew, etc. Specify.
- Cold meats: french polony, viennas, garlic polony, etc. Specify.
- Others: mopani worms, kgakgaripane, ntlwa-makhura.

b. ***How was it prepared?***

- e.g. chops/sausage/chicken, fried in oil. Was the chicken battered? What type of fat was used (sunflower oil, beef fat, etc)? Specify.
- Oven-grilled/braaied chops, sausage, chicken, no added fat.
- Stews: What was added? e.g. mince curry: beef mince, peas, potato, tomato, spices.
- Mopani worms, etc: how was it prepared?

c. ***How much did the child eat?***

- Use your sponge models and ruler to determine the dimensions (length, thickness, width) of the piece of meat the child ate.
- Stew: Use your oats, spoons and measuring jug to determine the amount of stew the child ate. ***Determine the dimensions of the piece of <u>meat</u> the child had that was in the stew.***
- Did the child eat the bones? Specify.

PORRIDGE

a. ***What type of porridge?***

- ✿ Cooked porridge, e.g. maize porridge, mabella, oats, Tastyweet, etc. Specify.
- ✿ Instant breakfast cereals, e.g. Weetbix, All Bran, cornflakes, Rice Crispies, etc.
- ✿ Infant cereals, e.g. Nestum No. 1 Rice and Maize, Nestum No. 1 First Cereal, Nestum No. 2 Mixed Cereal, Nestum No. 2 Honey, Nestum No. 3 Five Cereals, Nestum No. 3 Chocolate Malt, Cerelac Regular, Cerelac Honey, Cerelac Banana, Cerelac Guava and Custard, Cerelac with Milo, Nestle Infant Cereal with Soya.

  So many different types, so specify!!

b. ***How was the porridge prepared?***

- ✿ Cooked porridge: did the mother/caretaker add margarine (what type?), any other type of fat (e.g. beef fat), milk, (what type? breastmilk?) And sugar? Specify.
- ✿ Was it stiff porridge or soft porridge?
- ✿ ***What else was added to the porridge?*** E.g. kgodu (what were the main ingredients?), sempheriane (specify the type of seeds), bean soup (what was added?), sour milk (was it home-made or shop-bought?), mango atchar, etc. Please specify.

c. ***How much porridge did the child eat?***

- ✿ Stiff porridge: you must decide what models (e.g. sponge models) you are going to use. How much milk? How much sugar?
- ✿ Soft porridge: Use the oats, spoons, bowl and measuring jug to assist you. Tell the mother she must imagine the *oats* is the *cooked* porridge that the child ate. She must now pour an amount of oats into the bowl which was the same as that which the child was served. ***Did the child eat up everything?*** Now determine the volume by pouring this back into the measuring jug. Determine the volume. ***Did the child ask for more porridge?*** How much milk, sugar?
- ✿ ***You must not forget to determine the amount of bean soup, etc that was added to the porridge.***
- ✿ For babies eating infant cereal: Ask the mother to use the teaspoon and ask

her to add some oats into the bowl which was the same amount as the ***dry*** (before she added water or milk) infant cereal which she gave to the baby. Did the baby want more porridge? How much milk did she add to the porridge? How much sugar?

BREAD

a. ***What type of bread did the child eat?***

- ✿ Was it white, brown, or wholewheat? Specify.
- ✿ Was it home-baked bread or bread that was bought at the shop? Specify.

b. ***How was it prepared?***

- ✿ Was there ***margarine*** or butter on the bread? What type of margarine (brick or tub)? Write down the ***brand name*** if possible.
- ✿ Was there a ***spread*** on the bread (e.g. jam, peanut butter, Melrose cheese, fishpaste, marmite, etc)? Specify.

c. ***How much did the child eat?***

- ✿ We must determine:
  a) how much ***bread*** the child ate
  b) the amount of ***spread*** that was on the bread.
- ✿ 'Sliced shop bread':
  The size of 'shop bread' is standard. Write down if the child had one, two, or three slices. Write down whether the child ate a half or a quarter of one slice, etc.
- ✿ Ask whether the mother/caretaker cut the crust off or left it on.
- ✿ 'Unsliced shop bread':
  Use your ruler to determine the length, thickness and width of the slice the child ate.
- ✿ Home-baked bread: same as for 'unsliced shop bread'.

BREAD SPREADS

- **Margarine**: margarine or real butter? Tub or brick margarine? Specify brand name, if possible. Spread thin, medium, or thick (can you see tooth marks?) Specify. If the child ate a sandwich (two slices) was the bread spread on both slices, or just on one slice? Specify.
- **Peanut butter/jam/fishpaste/marmite, etc**

  Was it smooth, or crunchy peanut butter? Was it home-made or shop-bought? Were the spreads ***'thin', 'medium' or 'thick'*** ? Was it spread on ***both slices*** or just one? Specify.

  Was the jam smooth or pieces? Was it home-made or shop-bought?
- Egg:

  Was the egg fried/scrambled/boiled? Specify.

  Fried egg: fried in what (e.g. sunflower oil)? Specify.

  How many fried eggs did the child eat?

  Scrambled egg: what was added (e.g. milk)? Scrambled in sunflower oil, margarine or fat?

  Use your spoons and oats to determine how much scrambled egg the child ate.
- Cheese

  What type of cheese (e.g. cheddar, Gouda (red skin))? Specify.

  Was the cheese sliced or grated? Specify.

  Grated cheese: define the amount that was on the bread as 'thin', 'medium' or 'thick'.

  Sliced cheese: use your ruler to determine the dimensions of the piece the child ate.

RICE

- Specify whether it was rice, or **maize rice.**
- Use your spoons, oats and measuring jug to determine the amount of cooked rice the child ate. Specify the type of spoons, and whether it was ***heaped or level.***

SAMP

- ✿ Use the **popcorn** as an aid to determine the amount of samp eaten.
- ✿ If the child ate samp and beans, determine the ratio of samp to beans, and write this information down, e.g. samp and beans, 2:1. What type of beans?

BEANS AND SEEDS

a. What type of beans/seeds did the child eat?

- ❖ Beans: brown beans, butter beans, white small beans (phinsane), dithlodi, etc.
- ❖ Seeds: pumpkin seeds, watermelon seeds, etc.

b. How were the beans/seeds prepared?

- ❖ E.g. bean soup: brown beans, tomato, onion.
- ❖ Seeds: watermelon seeds, fried in sunflower oil.

c. How much did the child eat?

- ❖ Use your spoons and oats to determine how much the child ate.

APPENDIX 14: METHODS OF COLLECTING DIETARY DATA

There are several methods available for the collection of dietary intake data. In choosing which method to select, consideration needs to be given to the purpose of the study, qualities of the study population (e.g. literacy level), and availability of resources (Katzenellenbogen et al, 1991). The advantages and disadvantages of each method should be weighed against the priorities of the study when making a final choice.

The methods for assessing dietary intake can be divided into two basic categories: methods that record data at the time of eating (food records) and methods that recall food eaten in the past (24-hour recalls, food frequency questionnaires and dietary histories).

FOOD RECORDS

Weighed food records require the respondent to weigh and record all foods and drinks consumed during the study period, on special diet-record sheets. This method of dietary data collection places the greatest burden on the respondent. Only literate, dedicated people qualify as suitable respondents. The researcher needs to instruct the respondents on the correct methods of weighing and recording of consumables. Each respondent needs to be supplied with a reliable scale, making this an expensive technique (Katzenellenbogen et al, 1991).

A variation on this technique is an estimated food record, in which the respondent records all foods and drinks on diet-record sheets in terms of household measures (e.g. spoons, cups). This method places less burden on the respondent and does not require the use of scales (Katzenellenbogen et al, 1991).

24-HOUR RECALLS

In this method, the respondent is interviewed regarding all foods and beverages consumed the previous day, that is over the past 24-hours. The strength of this method lies in the fact that if properly performed, it can provide information detailed enough to permit precise coding of foods and nutrients consumed. The 24-hour recall method requires an experienced interviewer. The interviewer can use food models to assist the respondent in reporting accurate portion sizes of food consumed.

The main drawback of this method is that it is not representative of an individual's usual intake, due to the day-to-day variability in eating patterns. Thus the 24-hour recall is primarily used to describe the mean intakes of groups. Dietary study research methodology indicates that data of at least 50 respondents are needed to describe the "usual" intakes for a homogenous group. Thus subgroups, for example age/sex groups, have to have at least 50 participants. The researcher must also bear in mind that as this method relies on the memory of the respondent, forgetting may result in an underestimation of food intake.

FOOD FREQUENCY QUESTIONNAIRES

In this method, the respondent is asked to recall the frequency of consumption of a list of foods over a specified period of time. The interviewer uses a structured questionnaire to guide the respondent, and hence the food frequency questionnaire can be administered by a non-nutritionist interviewer.

The food frequency questionnaire can be used with or without a quantity component. Quantified food frequency questionnaires require food models to assist in quantifying intake as this method tends to overestimate food intake.

The advantage of this method above the regular food frequency questionnaire is that the latter method cannot be used to calculate intake of nutrients.

DIETARY HISTORIES

This term has been applied to a wide variety of approaches. A dietary history consists of a 24-hour recall, a meal pattern (that is how many food intake periods per day, and what foods are usually consumed at each of these periods) over an extended period of time with food quantities specified in household measures, as well as a checklist of foods usually consumed.