

**ADDIS ABABA UNIVERSITY  
SCHOOL OF GRADUATE STUDIES**

**RISK FACTORS OF MALNUTRITION AMONG CHILDREN  
IN SOUTHERN ETHIOPIA**

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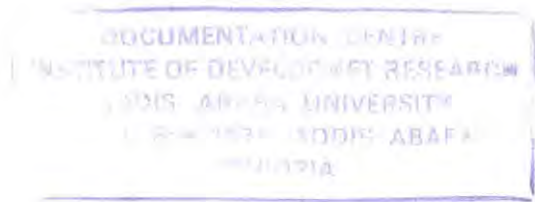
**GUGSA YIMER**

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**RISK FACTORS OF MALNUTRITION AMONG CHILDREN  
IN SOUTHERN ETHIOPIA**

**BY  
GUGSA YIMER**



**A Thesis submitted to the School of Graduate Studies, Addis  
Ababa University, In partial fulfillment of the requirements  
for the Degree of Masters of Sciences in Demography**

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ADDIS ABABA UNIVERSITY  
SCHOOL OF GRADUATE STUDIES

Risk Factors of Malnutrition Among Children in Southern Ethiopia

by

Gugsa Yimer

Institute of Development Research  
Demographic Training and Research Centre

Approved by the Examining Board

Markos Ezra

Chairman, Department Graduate Committee

Markos

Signature

Charles H. Tella

Advisor

Chc

Signature

John R. HERZOG

External Examiner

John R. Herzog

Signature

Gabremarkal Habtomariam

Internal Examiner

Gabremarkal

Signature

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## ABBREVIATIONS

ACC/SCN	Administrative Co-ordinating Committee Sub- Committee on Nutrition of the United Nations.
BCG	Bacilli, Calmett Guerein
CDC	Centre for Diseases Control.
CFS	Community and Family Survey.
CSA	Central Statistics Authority.
DPT	Diphtheria, Perussis, Tetanus.
DHS	Demographic and Health Survey.
DTRC	Demographic Training and Research Centre.
EA	Enumeration Area.
ENI	Ethiopian Nutrition Institute.
FAO	Food and Agricultural Organisation
JNSP	Joint Nutrition Support Programme
KAT	Kembata, Alaba and Timbaro.
NCHS	National Centre for Health Statistics.
PSTC	Population Studies and Training Centre.
PA	Peasant Association.
SD	Standard Deviation.
SNNPR	Southern Nations, Nationalities and Peoples Region.
SPSS	Statistical package for social Science.
UNICEF	United Nation's Children's Fund.
WHO	World Health Organisation.

## **ABSTRACT**

Using data collected in the Community and Family Survey of the Southern Nations Nationalities and Peoples Region, this study estimates the level of child malnutrition and identifies the factors associated with chronic malnutrition among children in the five densely populated zones of the Region. A total of 850 children aged 3 to 36 months were included in the present study. Both bivariate and multivariate techniques were employed in order to identify risk factors of child malnutrition.

The results indicate that child malnutrition is among the most serious problems of the study area where about 45% of the children stunted, 42% underweight and 12% wasted. The search for the factors affecting long term nutritional status point to both socio-economic and demographic factors. The study also identified some child care related variables to be associated with chronic malnutrition. Among the socio-economic factors; household economic status, and women's education were important in explaining the variation in long-term nutritional status of children. From the demographic variables included in the analysis; age and sex of the child; and maternal age at delivery were associated with stunting. Moreover, number of antenatal care visits the mother had during pregnancy of the child and age at weaning are linked to chronic malnutrition. Finally, the study recommended, among other things, the need for programs related to income generating activities for poor households and family life education including appropriate child care for women in reproductive age group.

# I. INTRODUCTION

## 1.1. Background of the Study

Most developing countries have experienced a rapid decline in infant and child mortality since the period following the Second World War. However, the rate of infant and child mortality in these countries is still very high compared with the developed world. Recent estimates indicate that in many developing countries 20 to 25 percent of children die before reaching their fifth birth day, resulting in approximately 15 million deaths annually. By contrast, in the developed countries of the world, over 97 percent of all children survive through the pre-school years (UNICEF, 1984 in Mosely, 1984).

Among the major causes associated with such high infant and child mortality in developing countries, infectious diseases and malnutrition are repeatedly cited (Haword and Herbord, 1982; Alleyne et.al, 1977; Livi-Bacci, 1991; ACC/SCN, 1993; Bakole and Olaieye, 1991). Above all, the combination of malnutrition and infection causes most of the preventable deaths of young children in almost all developing countries (ACC\SCN 1993). When both malnutrition and infection are present, the result is an interaction that is biologically more detrimental than the sum of the separate effects of each (Scrimshaw et. al; 1968 in Rutstein 1996).

Although the magnitude of the estimates differ from study to study and across geographical areas, most studies in developing countries have shown that there is a positive association between malnutrition and infant and child mortality. For instance, Macro International Inc.

(1996), estimates that in Senegal and Zambia, a total of 38 percent of all deaths that occur before age five are related to malnutrition. The contribution of malnutrition to under five mortality in Uganda is 40 percent, while it contributes 28 percent in Zimbabwe and 38 percent in Kenya (Macro International Inc. 1996, 1997).

Malnutrition can also result in a lower level of cognitive development, which results in a lower educational attainment (Brozek and Schurch (1984) in Macro International Inc., 1996). In adulthood, the accumulated effect of long term malnutrition can lead to a reduction a in worker's productivity and increased absenteeism in the work place, both of which may reduce a person's life time earning potential and ability to contribute to the national economy. Malnutrition has also inter-generational effects: infants born to a woman who themselves were malnourished during early childhood are smaller than infants born to a better nourished women (Rutestin, 1996).

Recent studies suggest that malnutrition, specially child malnutrition, is among the most serious problems facing the countries of Sub-Saharan Africa. About 36 million children are stunted, 20 million are underweight and 9 million are wasted (excluding South Africa). In addition, around 16 million women 15 to 49 years of age are malnourished (Rutstein, 1996).

Like many other Sub-Saharan Africa Countries the prevalence of malnutrition in Ethiopia is very high. Studies done in various places and at different times indicated that malnutrition is a serious problem for the majority of the population of Ethiopia. Reports indicate that primary school children as well as adults are affected by serious malnutrition particularly preceding harvest and during peak work times in rural areas (Sukin 1992). The problem has

two distinct aspects: acute malnutrition resulting from drought and epidemics in some years and some geographical areas, and chronic malnutrition resulting from poverty related-factors occurring in all parts of the country (CSA, 1993).

Results of the 1992 National Rural Nutrition Survey indicated that about 64 percent of all children aged 6-59 months in rural Ethiopia were chronically malnourished (CSA, 1993). Such level of stunting is among the highest in the world and almost the worst in Africa (ACC/SCN, 1994). The level of acute malnutrition for under 5 children was 8 percent and 47 percent were underweight. This prevalence of underweight is likely to be (with Mozambique) the highest in Africa (ACC/SCN, 1994).

The nutritional status of children was significantly worse in 1992 than it was in 1983. For example, the prevalence of general malnutrition (underweight) increased from about 37 percent in 1983 to a high of 47 percent in 1992. Stunting also increased from 59.8 percent in 1983 to 64 percent in 1992. With regard to regional variations, the gravity of malnutrition among children in the Northern, North western, North eastern and southern part of the country seems more serious than those in the remaining parts (CSA 1993).

There is a general consensus today that a complex set of causes determines hunger and malnutrition. Inadequate and/or inappropriate dietary intake and infectious diseases are the immediate/direct causes of most forms of malnutrition (FAO, 1996). Both inadequate intakes of food and prevalence of disease reflect underlying social, economic, demographic conditions at the household, community and national levels (Moore and Favin, 1990 in Rutstein 1996; Macro International Inc. 1996).

However, the factors associated with this problem may differ among regions, zones, communities and over time. Identification of the major risk factors associated with malnutrition for each region is, therefore, essential if appropriate policies and programs are to be devised to rectify nutritional deficiencies and imbalances.

Few studies on the determinants of malnutrition are available both at the national and regional levels. However, detailed studies to point out the major risk factors of the problem in different regions of the country are still lacking. This study, therefore, will thoroughly examines the different factors of children's malnutrition in the five densely populated zones of Southern Ethiopia and compare the relative importance of each factor in order to suggest appropriate intervention strategies

## **1.2 The Study Area**

The Southern Nations, Nationalities and Peoples Region (SNNPR) is located in the South Western part of the country bordering with Kenya in the South, the Sudan Republic in the South west and Oromiya region in the north and east. The region has an area of about 117, 506 square kilometres and a population of about 11.1 million distributed over nine administrative zones and five special woredas (DTRC/PSTC, 1998). It is a region of great ethnic diversity in which more than 45 ethnic groups are residing. These ethnic groups are distinguished by their distinct languages, culture, and their psychological make-up.

The Southern region is the most densely populated region in Ethiopia. The regions average density, 95 person per square kilometre, is about twice higher than the national average of 48 persons per square kilometre and vary significantly with zones from 2.3 person per square kilometres in Selemagno, Debube Omo to about 670 in Damot Galle, Semen Omo (DTRC/PSTC, 1998). The population is concentrated mostly in eastern, northern and central part of the region while the western and southern part of the region is sparsely populated.

There are marked socio-economic and demographic differentials in the region. For instance, the region is one of the least urbanised area in the country with only 6.8 percent of its population living in urban areas (DTRC\ PSTC, 1998). Urban unemployment was around 11.5 percent in 1994. In literacy, the urban-rural differential is very significant (67 percent: 22 percent) and the rural male: female differential is 31 percent to 12 percent. According to the 1996 report of the regional Health Bureau, the health service coverage was 35 percent; only 6 percent of women attended supervised delivery and 27 percent women received antenatal care. In addition, high agricultural density and very small land holding are a common feature in most parts of the region.

According to the 1994 population and Housing Census result (CSA, 1996), the reported total fertility rate for the region (in 1994) was estimated at 4.3 children per woman. In addition, infant mortality rate was estimated to be around 128 per thousand live births and life expectancy at birth was 47.6 and 49.7 for males and females, respectively.

According to the 1992 National Rural Nutrition Survey conducted by CSA the prevalence of child malnutrition in rural Southern Ethiopia was vary high, with 61.4 percent of children aged 6-59 months being stunted, and 8.4 percent being wasted. The level of underweight was also high, 47 percent.

### **1.3 Objectives of the study**

#### **General objective**

The magnitude and severity of malnutrition differ from region to region; so do the situations that cause these problems and also their most practical solutions. Hence, studies on the determinants of nutritional status of children in different regions are important for planning and designing programs to alleviate the problem. This study, therefore, examines the influence of some of the socio-economic, demographic child care and environmental variables on one of the anthropometric nutritional indices (Stunting) of children in the five densely populated zones of the Southern Nations, Nationalities and people's Region(SNNPR).

#### **Specific Objectives**

1. To assess the magnitude of child malnutrition in the five densely populated zones of the region
2. To examine the effect of demographic factors on long term nutritional status of young children

3. To examine the effect of socio-economic factors on long term nutritional status of young children
4. To examine the relationship between environmental variables and long term nutritional status of young children.
5. To assess the association between some child care practices and long term nutritional status of young children

## II. LITERATURE REVIEW

### 2. Factors Associated with Malnutrition.

Although the direct causes of malnutrition are inadequate dietary intake and morbidity, these in turn are related to a number of socio-economic, demographic child care and environmental factors. The relationship between these factors and children's nutritional status is discussed here under.

#### 2.1. Socio-economic factors and Malnutrition

The basic causes of malnutrition in developing countries are socio-economic. Poverty is pervasive in much of the developing world, and the capacity of families to purchase and/or produce food is limited. As it is discussed by Alleyne et.al (1977), malnutrition is primarily a problem of poor countries and of the poorest sections of the community within those countries.

Among the socio-economic variables' household income is one of the major factors to be considered very important in determining children's nutritional status. In a study done by Victor et. al (1986) which includes several socio-economic and environmental variables, household income was shown to stand above all other variables in determining children's nutritional status. A study done in developing countries on the relationship between food consumption and nutrition reveals highly significant difference among different economic

groups of a society (Chaudhury, 1986). Similar studies have been reported by Girma and Teshome (1985) and Sommerfelt (1991).

Employment, by providing a source of income, is also an important determinant of household food security. In a study done on the association between socio-economic factors and nutritional status in Zimbabwe, fathers occupation was found to determine the nutritional status of children (Mazur and Sanders in Tagwireyi and Greiner, 1994). Female employment that offers women opportunity for resource control, has been shown to result in increased food availability, improved child care practice and nutritional status (Macro International Inc., 1996).

However, income does not always directly contribute to improving the nutritional well-being of children. Lack of knowledge regarding the nutritional needs of children may lead to the withholding of needed food, even when it is available. This entails the importance of parental education in determining children's nutritional status. Education, especially maternal education is a powerful predictor of children's nutritional status. It is associated with the behavioural factors affecting nutritional status, such as intra-household food distribution, child care practices, feeding behaviours and patterns, and food handling procedures (Macro International Inc., 1996). A study done by Sommerfelt (1991) demonstrates that mothers level of education is strongly related to children's nutritional status in many developing countries. Similar studies in rural Bangladesh by Bairagi 1987 in Zambia, Uganda, Senegal, Zimbabwe, Mali, and Kenya by Macro International Inc. (1996) and in Sidama Awraja (Ethiopia) by ENI (1986) consider maternal education as an important determinant of child nutrition. For instance, malnutrition is two times higher among children of mothers with no

education than among children of mothers with secondary or higher education in Zambia (Macro International Inc., 1996) .

According to the 1992 Rural Nutrition Survey (CSA, 1993), malnutrition among older children in Ethiopia has a direct correlation with land size. The study reveals that stunting and wasting are highly observed in landless household as compared to those who have land. Studies done by ENI (1986) in Sidama Awraja of Ethiopia by Victor et.al (1986) in El-Salvador, Hagga et.al (1986) in Kenya and Loe Wenson (in Tigwireyi and Greiner, 1994) in Zimbabwe also confirm the above findings.

Culture is the other socio-economic factor that affects the nutritional status of people. Different cultural groups usually maintain their own cultural identity in food consumption. The custom of ceasing breastfeeding once a new pregnancy has started is predominant in Uganda (Burgess and Dean in Alleyne et.al 1977). In Uganda there is a belief that the infant can poison the unborn child through the breast milk. On the other hand, breast feeding is generally a norm and is considered as a natural phenomena among rural and urban poor mother's of Ethiopia. But in urban areas, especially among elite mothers, breast feeding is declining (Yemane 1991). It has been suggested that prolonged breast feeding may have beneficial effects on child health both by extending the interval between successive births and by supplying significant amounts of nutrients to the nursing child (Jenkins and Heywood, 1985; WHO, 1988; WHO/UNICEF, 1990; Rutstein 1991).

Food taboos in different cultural groups also play their role in affecting children's nutritional status. There are localities where by some highly nutritious food available in the localities are

not consumed due to rigid food taboos. For example, in spite of the abundance of fish in the Rift Valley Lakes (Abay and Chamo) and the River Omo, fish consumption is a taboo because it is considered as a worm and as a result it is believed to be food of low cost societies (Yemane 1991).

## **2.2 Household Demographic Behaviour and Malnutrition.**

Differences in demographic characteristics of the child and the household are related to differences in the nutritional status of children. A number of studies indicated that malnutrition is often associated with certain demographic characteristics of the child and the household (Sommerfelt, 1991, Macro International Inc. 1995 1996, 1997; Ritchie, 1983; Alleyne et.al, 1977 Kajjuka et. al 1989, Rutstein 1996).

There is a well - documented relationship between a child's age and stunting and underweight. A study done by Sommerfelt and Stewart (1994) reveals how nutritional status changes during a child's first three years of life. According to this study, there is a relatively little in the youngest age group, under 6 months, but nutritional status deteriorates rapidly during the remainder of the first year of life and continues to worsen during the second and the third years. Studies done by Macro International Inc. in Kenya (1996) in Benin (1996) in Senegal (1996) in Uganda (1996) and in Zambia (1997) also support the above findings.

The influence of the sex of a child on nutritional status has been the subject of numerous and often contradictory hypothesis or results. Chen et.al (1982) found that the prevalence of malnutrition is higher among female children than among male children. Similar results are

obtained in studies done by Clark in Guatemala, by Levinson (in Melville, 1988) in rural India and by Macro International Inc. (1996) in Benin. On the other hand, a DHS (1996) study in Ugandan children indicate that male children were 1.4 times more likely to be malnourished compared with female children. In a study done by Sommerfelt and Stewart (1994), it was evidenced that in 15 out of 18 countries studied, stunting is less prevalent among girls than boys. Wasting is also somewhat common among boys than girls. However, there was no consistent pattern in the prevalence of underweight by sex. Similar results were found in a study done by Macro International Inc. (1996) in Zimbabwe and in Mali (1996).

A study done on Malian children by Lalou and Mabcke (1993) on the effect of high fertility on malnutrition reveals that high fertility, expressed by short preceding birth interval and/or the presence of more siblings under age five, negatively impacts children's nutritional status through two distinct mechanisms: maternal depletion and siblings competition for food. This is because high fertility tends to exhaust the mother physiologically, so that she no longer has enough energy resources for the intrauterine growth of the child and later for nursing the child. In addition, high fertility sometimes means the presence of many children in the household and thus creates the conditions for "competition" between the brothers and sisters for access to nourishment especially in poor households. Similarly, a study done by Macro International Inc. (1996) on Kenyan children reveals that children who live in families with numerous (i.e., 4 or more) children under five were more likely to be stunted than children who live in families where they are the only children under five, 40 percent compared with 28 percent, respectively.

A large number of young children in a family also suggest short birth intervals. Children born close together create a large biological and child care burdens both pre- and post - nately that can result in reduced nutritional status (the extreme being a multiple birth). Disease transmission may also be increased, young children are often weaned too early because their mother becomes pregnant and, the risk of malnutrition increases. According to a study done by DHS (1997) in Eritrea, children born after a short birth interval (less than 24 months) are more likely to be stunted than children born after longer birth interval (more than 48 months), 46.6 percent compared with 28.4 percent, respectively.

The other demographic factor which affects children's nutritional status is family size. Morley et al in Alleyne et al (1977) stated that in Nigeria a family with greater than seven children results in a higher incidence of malnutrition. Studies in India by Goplan (in Alleyne et al 1977) placed the cut off at three children. This is because high parity and short birth interval give rise to large families which contribute to an increased morbidity and malnutrition due to overcrowding, an increase in disease transmission and shortage of household goods and food. It was postulated that if a family size could be limited to three children, this in itself would reduce the incidence of malnutrition in India by about 60 percent (Alleyne et al 1977).

In a study by Alleyne et al (1977) on pre-school children, it was found that while 32 percent of the children of birth orders of four and above exhibited signs typical of malnutrition, only 17 percent of earlier birth orders showed such evidence.

### **2.3 Child Care, and Environment and Malnutrition**

The ability to avoid exposure to disease or to treat it depends among other things on environmental conditions and health services, including such factors as access to safe water and sanitation. Disease contributes to growth failure in several ways. A sick child usually requires more food because of the needs caused by fever and the higher loss of diarrhoea. Yet, intake is often reduced by loss of appetite. If a child hasn't enough time for rehabilitation, malnutrition will occur gradually and will put the child at even greater risk of contracting new infections, creating a vicious cycle (ACC/SCN, 1989).

Studies done on nutrition and morbidity of children have identified certain infections as particularly important as cause of poor growth. Among these diarrhoea, respiratory infections and malaria are the most cited (Tomkins and Watson, ACC/SCN (1993). The impact of infection on growth may vary according to the previous nutritional status of the child, the availability of food and the time available for feeding, cultural beliefs and access to health facilities. For instance in a relatively underprivileged community in rural Gambia there was a marked negative effect of diarrhoea and malaria on weight gain (Rowland et. al in ACC/SCN, 1993). Repeated diarrhoea also caused a reduction in rates of height increase. In better off children, however, the growth faltering was less impressive though there was some relationship with diarrhoea and lower respiratory tract infections (Rowland et.al in ACC/SCN, 1993).

Unhealthy environment, through infectious disease, especially diarrhoea, affects the nutritional status of children. According to Sommerfelt (1991) there is a significant

relationship between child's nutritional status and the type of toilet facilities in many developing countries. Moreover, in his study in the Horn of Africa Teller (1996) indicated that major illness episodes like malaria, pneumonia, diarrhoea, and other factors like lack of access to quality health care and inadequate child care are the major factors in early life growth faltering in Ethiopia.

Water supplies are also associated with children nutritional status. Improved water supplies and sanitation facilities are positively associated with nutritional status of children in Sri Lanka (Esery 1991). Furthermore the use of large quantities of water had a greater effect on nutritional status than did smaller quantities of water in Ethiopia (Freij and Well in Esery 1991) and Lesotho (Esery et. al in Esery 1991).

Infant and child care, along with household food security, adequate health services and a healthy environment is a necessary precondition for adequate nutrition (Reddy et. al in ACC/SCN 1992). Care refers to "the provision in the household and the community, of time, attention and support to meet the physical, mental and social needs of the growing child" (ACC\SCN, 1992). It involves the optional use of household resources for child feeding, protection from infection, and care for the sick child.

Especially issues of care to child nutrition include breastfeeding and complementary feeding practices. These issues are influenced by household knowledge, attitudes, traditional beliefs and time allocation (especially to women's time allocation).

Exclusive breast feeding, defined as breast milk as the only source of infant food or liquid protects against illness for about six years of life (Macro International Inc., 1996). The practice of exclusive breast feeding for longer than six months, however, will jeopardise the child's nutritional status, since the volume of breast milk doesn't usually satisfy the energy and protein requirements of most infants. Therefore, all infants after the age of 4-6 months should receive complementary foods in addition to breast milk (Macro International Inc., 1996).

The key infant feeding behaviour that poses the greatest threat to child nutritional status and health is the delayed introduction of complementary foods (Macro International Inc., 1996). Delaying the introduction of complementary foods puts infants at risk of malnutrition because, beyond about 6 months, breast milk alone is inadequate to meet energy, protein and micronutrient needs. While other infant feeding behaviours, such as early invitation of breast feeding and exclusive breast feeding, can affect, these are unlikely to be strongly related to malnutrition as delayed introduction of complementary foods (Macro International Inc., 1996).

A study done by Abebe and Yemane (1998) demonstrates the presence of inappropriate weaning practice in Butajira, Southern Ethiopia. This study indicates that only 42 percent of children weaned between 4-6 month of age while the majority were weaned later than 7 months of age. Data on breast feeding and child weaning practices in the 1992 Ethiopian Rural Nutrition Survey indicate that the problem of early stunting in Ethiopia is due in part to delayed introduction of complementary foods in the first year of life (CSA, 1993). Similar studies in Jimma town by Abdulaziz (1987) and in Akaki town by Shimeles (1986) point out

the time of weaning as a contributing factor for malnutrition in the country. While the recommended age for introducing weaning foods is 4-6 months, the national median was about 7.1 months, with some regions such as North Gonder and Tigray with average of 12.1 months. Delayed introduction of supplementary foods also put Senegalian children at greater risk of malnutrition (Macro International Inc., 1996).

Children are particularly vulnerable to malnutrition during the weaning period, defined as the transition from breast milk as the sole source of nourishment to the usual family diet. The foods offered to infants are often contaminated and usually inadequate in calories, protein, and micronutrient which result growth faltering and malnutrition (Macro International Inc., 1996).

### III. SOURCE OF DATA AND METHODS OF THE STUDY

#### 3.1 Conceptual Framework for the Causes of Children's Malnutrition

In figure I, the UNICEF and DHS (ACC/SCN, 1997; DHS, 1996) frameworks have been adopted to show the relationship among variables and mechanisms that lead to childhood malnutrition. Down in the framework from the manifestations, the immediate cause of malnutrition are inadequate food intake and disease (Kavish, 1994). Inadequate food intake is a consequence of insufficient food at the household level and improper feeding practices.

Child feeding behaviour, here meant to convey breastfeeding status of the child and the use of complementary foods. The availability of adequate food combined with child feeding behaviour to affect food intake and protection from disease. The availability of adequate food in turn are affected by household income and household size.

Fertility will affect malnutrition through short birth interval that increases the number of children under five who compete for resource and mother's care and time. Food shortage on the other hand may aggravate the problem by forcing mothers to spend less time with their infants. Fertility in turn, can be affected by child feeding behaviour through breastfeeding. Breastfeeding directly contributes to increased birth intervals by tending to reduce the resumption of fertility in the mother (ACC/SCN, 1992).

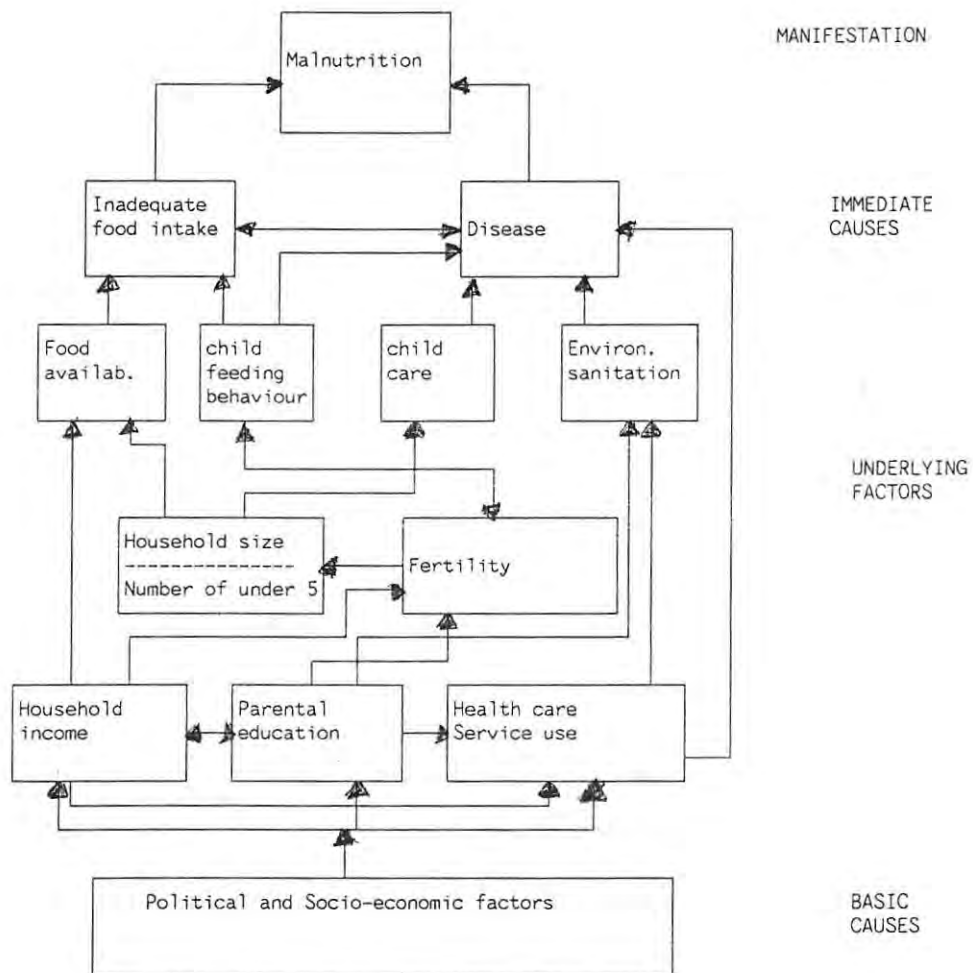
In communities that have little access to health care, children are more vulnerable to malnutrition as a consequence of inadequate treatment of common illnesses, low

immunization rates and poor antenatal care. Poor environmental sanitation including insufficient water supply also puts children at a risk of infection from the ingestion of contaminated food and water which increases susceptibility to malnutrition. In addition, the quality of child care (especially hygiene) will affect the child's exposure to disease.

Household income, health service utilization, fertility and the quality of child care depends on the parents' education. Household income also affects parents' education, fertility and health service utilization.

At higher level, political and socio-economic factors operating at national, regional and community level ultimately affects the nutritional status of children by determining the availability of social services like health, education and employment.

Figure 1. Conceptual Framework for the causes of malnutrition in Children (Adopted from UNICF and DHS; and modified by the author)



### 3.2 Data Source

The data for this study was drawn from the Southern Nations, Nationalities & Peoples Region Community and Family Survey (SNNPR-CFS ) conducted by the Demographic Training and Research Centre (DTRC) of the Addis Ababa University and the Population Studies and Training centre (PSTC) of the Brown University (USA) in May and June, 1997. The survey was an integrated multi-level, survey of communities, households and women in the reproductive ages. Five zones in the Southern Nations, Nationalities and Peoples Region (SNNPR) were covered by the survey. The five most populous administrative zones of the region selected for this survey comprises 78 percent of the region's population (DTRC/PSTC 1998).

Out of the total 9 zones and 5 special *woredas* the five zones were purposively selected based on ethnic, religious, agro-ecological diversity, their very high population density, and their contiguous location in the north-eastern part of the region. The excluded zones and special *woredas* (districts) have low population density comprised of scattered sedentary and nomadic people.

The SNNPR-CFS was designed to provide a representative sample of the five zones overall, and for the rural areas of each of the five zones (Sidama, Semen Omo, K.A.T, Hadiya and Guraghe). The sampling frame made use of the region's administrative structure which is organised first by zones, then by *woredas*, and then by peasant association (PAs) in the rural areas and kebeles in the urban areas.

The selection of rural samples involved four stages: selection of *woredas*, selection of peasant associations, selection of enumeration areas and selection of households. In selecting *woredas*, first, all *woredas* in the five zones were stratified into low and high population density *woredas*. Low and high population density for this survey was defined as less or more than 300 persons per square kilometre. Then, one high and one low density *woreda* were randomly selected from each zone i.e. a total of 10 *woredas*. The selected high density *woredas* average 334 persons per square kilometre while the average for the selected low density *woredas* were 169 persons per square kilometre (DTRC/PSTC, 1998).

From each selected *woredas* 2 PAs were selected using a simple random sampling method. Hence, a total of 20 PAs were selected from the 10 *woredas*. From each selected PA, one enumeration area as defined by the Central Statistics Authority (CSA) was selected following a simple random sampling method (The CSA divided each PA in to enumeration areas (EAs) of roughly 175 households each). Then, fifty percent of non-institutionalised households were selected from each sample EA, using systematic sampling with a random start (DTRC/PSTC, 1998).

On the other hand, the urban sample is representative of the surveyed zones as whole; no attempt was made to produce separate representative urban samples for each zone. The urban residents of the five selected zones were divided into 224 enumeration areas. Ten of these 224 enumeration areas were selected using a simple random sampling method. The resulting sample includes four EAs from a town of Sidama zone, 2 from Semen Omo, 2 from Hadiya and 2 from Guraghe zone. No EA appeared in the random samples from K.A.T zone. From the 10 selected EAs, one third of the households from each EA were selected

for inclusion in the study, by using a systematic sampling procedure with a random start (DTRC/PSTC, 1998).

Accordingly, of the total of 30 EAs (10 from urban and 20 from rural) targeted by the survey, all EAs were actually covered. And from the total of 2500 households (2000 from rural and 500 from urban) targeted by the survey, 2317 households (1819 from rural and 498 from urban) were actually covered and completed. The overall response rate was about 100 percent (DTRC and PSTC, 1998).

The survey used four types of instruments to gather the information: community questionnaire, household questionnaire, individual women questionnaire and anthropometric recording sheet. The community questionnaire collected information on community variables such as access to social services, water situation, community leaders' perception towards population growth, family size, community needs, etc. The household questionnaire was used to list the names and certain characteristics of household members like household composition, age and sex structure, nuptiality, education and health. The women's questionnaire was used to collect information from women aged 15-49 about fertility and reproductive health, immunization, child health and child mortality, knowledge, attitude and practice of family planning etc. The anthropometric recording sheet collected information on: height and weight of young children aged 3 to 36 months, and mid upper left arm circumference of women of reproductive age, to provide scientific data on malnutrition .

Sampling of children for the anthropometric measurement was based on the recorded age in the household questionnaire. All children aged less than three years were recorded on the

Anthropometric Eligibility Sheet and their exact age was probed. Finally, almost all children aged 3 to 36 months were measured. There were almost no refusal for measurement. Data collection was made by trained interviewers from the region (DTRC/PSTC, 1998).

### **3.3 Indicators of Children's Nutritional Status and Definition of Outcome Variables**

Measures of child nutritional status using attained height and weight in relation to age and that of weight in relation to height, taking the sex of the child in to consideration, are commonly used to assess the over all nutritional status of children. The assessment of nutritional status is based on the concept that in a well-nourished population the distribution of children's height and weight, for a given age, will approximate a normal distribution (DHS, 1997). In a normal distribution it is expected that about 2.3 percent of the children will fall below-2 standard deviations of the mean for the age (ACC/SCN, 1993). Prevalence above this figure imply that there is a nutritional problem in the population.

Since children's height and weight changes with age, the anthropometric measurements, taking age and sex in to consideration were converted in to Z scores based on National Centre for Health statistics (NCHS) growth standard. The NCHS standard is based on a reference population made up of children who are assumed to be well nourished and is recommended by WHO as a reference to be used in the evaluation of nutritional status (WHO, 1983 in ACC/SCN 1993). Studies showed that well-nourished children under-five in any country do not differ in growth from this NCHS reference group (Martorell and Habicht in ACC/SCN 1993).

The Centre for Diseases Control (C.D.C) package, ANTHRO, was used to calculate the Height-for-Age, Weight-for-Height, and Weight-for Age Z scores. For a given child the Z-score is the number of standard deviation (SD) units that the child's measurement deviates from the reference population median. Children who fall more than -2 SDs below the reference population median were considered to be undernourished, while those who fall more than -3SDs below the reference population median were be considered to be severely undernourished.

Three anthropometric indicators using measures of height and weight in combination with age are commonly used to determine nutritional status in infants and children (DHS 1996):

#### **Stunting (low height for age) Chronic malnutrition**

"defined as height for-age more than two standard deviations below (-2SD) the median of the NCHS population, is the failure to grow adequately in height in relation to age. It reflects past or chronic malnutrition and results from inadequate food intake over a long period of time and/or repeated episodes of illness, particularly diarrhoea."

#### **Wasting (low weight-for-height) Acute malnutrition**

"defined as weight for height more than two standard deviation below (-2SD) the median of the NCHS reference population, is the failure to gain weight adequately in relation to height and reflects recent or acute malnutrition. Wasting results from a recent shortage of adequate nutrition and/or recent or current acute illness, especially diarrhoea."

#### **Underweight (Low weight for age).**

"defined as weight-for-age more than two standard deviations below (-2SD) the median of the NCHS reference population, is a composite that reflects either chronic or acute malnutrition status or both."

Although it is sometimes useful to use such a summary indicator, its weakness is that it cannot distinguish between long term and more recent experience affecting the child.

All the three anthropometric indicators are used to examine the prevalence of malnutrition in this study. However, in depth analysis was performed on stunting particularly focusing on the factors affecting chronic malnutrition. Because, height for age index measures linear growth retardation among children and is a measure of the long term effects of undernutrition.

### **Independent variables**

Variables included as independent predictors were socio-economic, demographic and those related to child care practices and environmental sanitation. The socio-economic variables which are included in the study are: zone, mother's and father's education, religion, household economic status husband's work status and place of residence.

Variables related to environmental sanitation and child care were source of drinking water, type of sanitation facilities, breastfeeding, weaning practice, immunization, growth monitoring and density.

As part of the demographic variables family size, mother's age, birth order, birth interval, age of the child, sex of the child and number of under 5 children in the household were included. The choice of the above explanatory variables is based on the collected data, and theoretical and empirical studies on the subject under study (Variables are categorised as shown in Annex II).

The variables, sex of the household head, marital status of the mother, and women's work were not included in the analysis. This is because there were few divorced/widowed, working mothers and female headed households in the sampled population. In addition birth type (single Vs multiple) and birth weight were excluded from the analysis because very few children were weighed at birth and there were few twin children. In this study children aged 3 to 36 months are the unit of analysis.

### **3.4 Assessment of Data Quality**

#### **Age Reporting**

The accuracy and completeness of age data are crucial to the analysis of anthropometric data. Only the weight-for-height index is independent of the age of the child. Like many surveys in developing countries, several possible systematic biases in the reporting of children's age may affect the anthropometric results of this survey.

In this study the proportion of children whose parents did not report a month of birth is very small (1.8%). Month of birth was more frequently missing among rural children compared to urban children. These children were excluded from the analysis.

The reported age of the child by the head of the household and the child's mother was compared to test the quality of age reporting. For about 85 percent of children both the head and the mother reported the same month of birth. For the rest, birth reported by the mother

was taken for analysis; assuming that the birth of the child is an important event for the mother compared to the father (DTRC \ PSTC 1998).

On the other hand, the extensive efforts to collect children's month and year of birth and birth history ensure that heaping on multipliers of 12 months, which is often a problem in many surveys if only the age is asked (DHS, 1994), is not observed in this study.

### **Heaping of Height and Weight Measurement**

Like many surveys in developing countries, there is a systematic bias in the reading and recording of anthropometric measurements in this study. If there is no digit preference at all, one would expect to see an even distribution of the readings on height and weight on each of the ten first decimal places, i.e., 10 percent of the measurements should fall on each decimal places (Macro International Inc., 1994). The most common decimal numbers to exhibit heaping are .0 and .5 decimal places.

The degree of heaping in decimal numbers of the height measurements is examined in Table 1. As it shown in the table, there is a tendency towards heaping on those measurements ending in .0 and .5. The final column (height heaping ratio) shows the degree of heaping on both (.0 and .5) combined. The ratio of the proportion of height readings ending in .0 or .5 divided by the expected proportion indicates the extent to which heaping occurs. A value of 1 reflects no heaping.

Table 1. Heaping of height readings: Percentage of recorded height ending with .0 and .5, ratio of the proportion of recorded heights ending with .0 and .5 to the expected proportion, by Residence SNNPR-CFS , 1997.

Residence	Percent of height readings ending on .0	Percent of height readings ending on .5	<sup>1</sup> Height Heaping ratio(HHR)	Number of Height readings
Rural	54.4	13.4	3.4	715
Urban	62.9	15.4	3.9	175
Total	56.1	13.8	3.5	890

$$^1\text{HHR} = \frac{\text{observed height measurements ending in .0 or .5}}{\text{expected height measurements ending in .0 or .5}}$$

The greatest amount of heaping was in urban areas where almost 4 times the expected number of measurements ended with .0 and .5.

Table 2. Heaping of weight readings: Percentage of recorded weights ending with .0 and .5, ratio of the proportion of recorded weights ending with .0 and .5 to the expected proportion, by residence. SNNPR-CFS, 1997

Residence	Percent of weight readings ending on .0	percent of weight readings ending on 0.5	<sup>1</sup> weight heaping ratio(WHR)	number of weight readings.
Rural	31.7	23.8	2.78	715
Urban	42.9	22.9	3.29	175
Total	33.9	23.6	2.88	890

$$^1\text{WHR} = \frac{\text{observed weight measurements ending in .0 or .5}}{\text{expected weight measurements ending in .0 or .5}}$$

The heaping on decimal places for the weight readings is shown in Table 2. Over all heaping was more pronounced on .0 readings than on the .5 readings and was particularly a problem of urban areas. As a result, the weight heaping ratio in urban areas was over 3 times the expected figure. Similar heaping of height and weight measurements on the digit .0 and .5 were observed in surveys done by Macro International Inc.(1994).

In general, these heaping of height measurements on digits .0 and .5 may indicate systematic under measurement, since the design of the board makes it impossible to read the scale beyond the child's height, and it is less likely that the measurer would record a number that could not be seen. Regarding weight measurement, it is difficult to indicate the direction of the bias caused by digit preference. Since number below and above the actual weight can be read on the scale.

### **3. Improbable measurements: Flagging of the Z-scores**

Improbable measurements (flagged Z-scores) were defined as "Z scores for height-for-age and weight-for-age that fall below -6 standard deviation, Z scores for weight for-height below -4 standard deviations, or Z scores for any index above 6 standard deviations" (Macro International Inc., 1996). As can be seen in Table 3, 4.5 percent of the Z scores in height for age, 1.0 percent in weight for height and 3.5 percent in weight for age of the Z scores were flagged. Similar rate of flagged Z scores were observed in studies done in Guatemala and Morocco (Macro International Inc., 1994). There was no bias towards zones. This improbable data were excluded from the analysis. In general, outlier of measurements were not a serious problem in this survey.

Table 3. Percent Flagged Z scores by Residence SNNPR-CFS, 1997.

Residence	Percent of height-for-age Z score flagged	Number of children with height measurement	Percent of weight-for-height Z-scores flagged	Number of children with height measurement	Percent of WAZ scores flagged	Number of children with weight measurements
Rural	4.5	715	1.3	715	3.8	715
Urban	4.6	175	0.0	175	2.3	175
Total	4.5	890	1.0	890	3.5	890

### 3.5 Data Analysis

In analysing the collected data univariate, bivariate and multivariate analysis techniques were employed. The univariate analysis was used to estimate the prevalence of malnutrition in the study area. In the bivariate analysis the relationship between all suspected independent variables and the proportion of stunted children aged 3-36 months are considered. In this part a chi-square test was employed to test the association between the different variables of interest. Many variables provide proxy information or are measured at one point in time but are assumed to act over a span.

In the multivariate analysis, logistic regression technique was used to identify the relative contribution of each selected variable to the total variance in long term nutritional status of children. The logistic model estimates the probability that stunting will occur. This is an appropriate multivariate analysis when the dependent variable is dichotomous. Since the

dependent variable under consideration is whether the child is stunted or not stunted (as a probability function - 1 if stunted and 0 if not stunted), the logistic transformation was employed as indicated in the model.

The logistic model for K independent variables ( $x_1, x_2, x_3, \dots, x_k$ ) is given as:

$$\text{Logit } P(x) = \alpha + \sum \beta_i x_i$$

$$\exp(\beta) = \text{Odds Ratio}$$

$$\beta = \text{Regression coefficient} \quad \alpha = \text{constant}$$

For each variable, there is a reference category against which all other values are compared. The reference category for each variable is the category which is believed to have the lowest rate of stunting. Hence, regression estimates greater than 1 indicate that the risk of stunting is greater than that of the reference category; estimates less than 1 indicated that the risk of stunting is less than that of the reference category.

To identify the net effect of each groups of variables (demographic, socio-economic, and those related to environmental sanitation, child care and health), first three models were run separately. Those variables found to have significant relationship with stunting in the three separate regression analysis were included in developing the final multivariate model. In developing the models both interactive and non-interactive models were considered.

Finally based on the logistic regression, adjusted odds ratio (estimates of the relative risk) were obtained for the different factors. Significant levels of regression coefficients were determined by Wald statistics and P-value. The analysis was performed using the statistical packages for social science (SPSS).

### **3.6 Limitation of the Study**

The factors affecting children nutritional status may be different for different zones and age groups. However, stratified analysis was not performed due to lack of adequate sample for each zone and age group. Moreover, the survey didn't collect information regarding different cultural practices which are expected to affect child care and infant and child feeding. Because of this the study didn't consider cultural practices in its analysis.

Finally, since the survey is a cross sectional in its design, it was difficult to establish a cause-effect relationship.

## IV. Results

### 4.1. Household and Respondent Background Characteristics

A total of 850 children aged 3-36 months were included in the analysis of this study. These constituted 53.6 percent boys and 46.4 percent girls (Table A1, Annex 1). About 80 percent of the children were from rural areas. The mean age of the study children was 17.8 months. The average number of children 6 to 36 months old in the study household was 1.02. The average household size of the study households was about 6 persons. The majority of the households (53.4 percent) had 4-6 family members (Table A3, annex 1)

Almost half of the mothers of the study children were able to read and write while only 12.6 percent mothers have reached post primary level. Substantial variations were observed when mother's education is examined by zone and residence (table A4, annex 1). The highest proportion of illiterate mothers (82.4 percent) was observed in rural Guraghe zone, compared with less than 30 percent in K.A.T zone. While 11.2 percent of mothers from rural KAT zone had completed at least primary level education. Rural women in general had little education compared with their urban counterparts.

The educational attainment of husbands varies widely by both residence and zone. Husbands living in rural areas were almost 3 times less likely to be educated compared with their urban counterparts (Table A5 annex 1). Husbands living in rural Guraghe zone were more likely to have no education (93 percent) compared with husbands living in other zones.

Table A6 (annex 1) shows the percent distribution of children age 3-36 months by age of mothers, according to zone, density and residence. The mothers sampled from rural Sidama zone tend to be younger than those in other zones. The percentage of mothers over 35 ranges from 11.5 percent in rural Semen Omo zone to 23 percent in rural Guraghe zone.

About 8 percent of the fathers of the study children were unemployed at the time of the survey (table A7 annex 1). The highest proportion of unemployed husbands were found in high density rural area (11.6 percent). Over 73 percent of the husbands were farmers while 11.5 percent of husband were professionals. Wider variations in husband's occupation also exist based on urban/rural residence.

Table A8 (Annex 1) presents the percent distribution of rural children aged 3-36 months by the adequacy of household food stocks at the time of the survey. About 69 percent of the rural households said stocks were inadequate. The percent reported ranged from over 87 percent in rural Hadiya and K.A.T zones to 50 percent in rural Guraghe zone. Study households in rural high density area were more food insecure (77.0 percent) than households in rural low density areas (65.0 percent).

Information on the adequacy of household income from the respondents followed by their own self assessment relative to others in the community was collected in the CFS study (Table A9 Annex 1). This assessment indicates that the income of rural households was very low as compared to their urban counterparts.

A household source of drinking water is associated with child nutritional status directly, through its impact on hygiene and the risk of diarrhoeal disease, and indirectly, as measure of wealth and access to water. In the study area the type of drinking water available to households varies by residence (Table A10 Annex1). Urban households were more likely to use piped water (82.3 percent) than any other source of water, while rural households were more likely to use unprotected water (unprotected spring/well lake, pond/rivers) (78.4 percent).

Among the study children 75 percent lived in households without toilette facilities (Table A11 Annex 1). Children in rural Guraghe and Sidama zone were less likely to use toilets compared with children in other rural zones. Urban households had better access to pit latrines than their rural counterparts (85 percent compared to 10 percents).

The health benefit of Breastfeeding for the child is undisputed and it is influenced by the age at which the child receives supplementary food and other liquids. Breastfeeding in the study area was almost universal where 96.7 percent of the children in rural areas and 95.5 percent in urban areas were breast fed (DTRC/PSTC, 1998). In general, the median duration of any breast feeding in the region was 22.6 months (Table A12, annex 1). On the other hand, the median duration of exclusive breastfeeding was 4.1 months. There was very little variation between breast feeding duration for children living in rural high and low density areas. However, the median duration of any brestfeeding was higher for female children (24.5 months) compared to male children (20.5 months) .

Rural children in general breastfed longer (about 23.3 months) than urban children (19.8 months). Moreover, breast feeding duration was longer in rural K.A.T zone (28.6 months) and shorter in rural Sidama zone (20.8 months). On the other hand, the median duration of exclusive breastfeeding was very low for rural Semen Omo (3.3 months) and K.A.T zone (3.6 months). As can be seen in the table there is a decrease in breast feeding duration with increasing level of mother's education.

This study clearly showed that supplementation of food starts very early in the study households. In the third month of life, some liquid and mushy foods were given to about 42.6 percent of the babies, which is too early for optimal infant health. On the other hand 17 percent of children started supplementation after they celebrated their sixth month birth day which is too late for good infant nutrition.

#### **4.2. Overall Levels of Malnutrition**

The 1997 Community and Family Survey found high level of malnutrition in the five densely populated zones of the Southern Nations, Nationalities and Peoples Region. Figure 2 presents the percentage of children classified as undernourished according to height-for age (stunting), weight-for-age (underweight), and weight-for-height (wasting).

Fig 2. Malnutrition among children aged 3 to 36 months

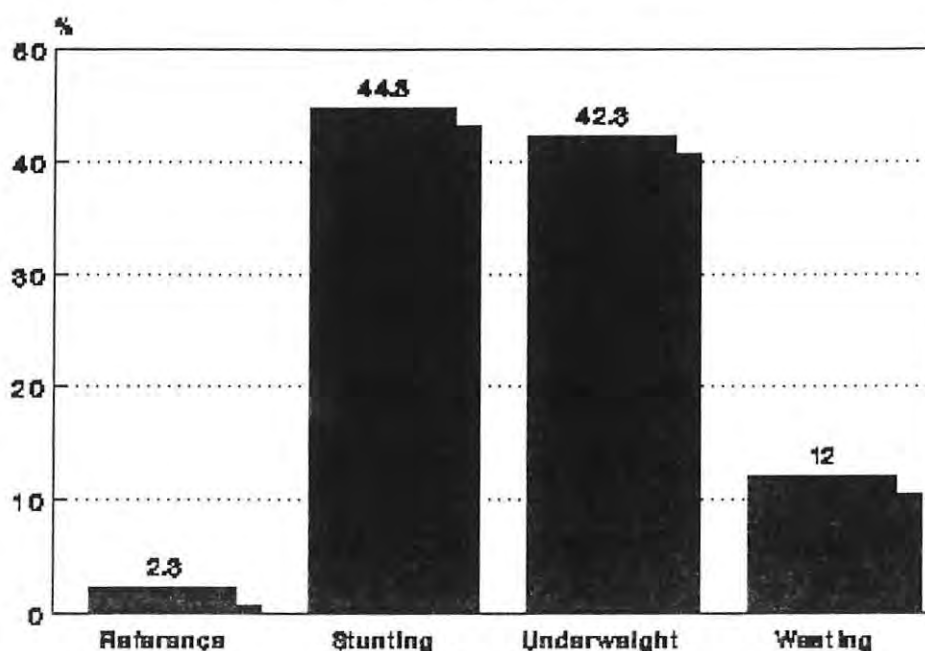
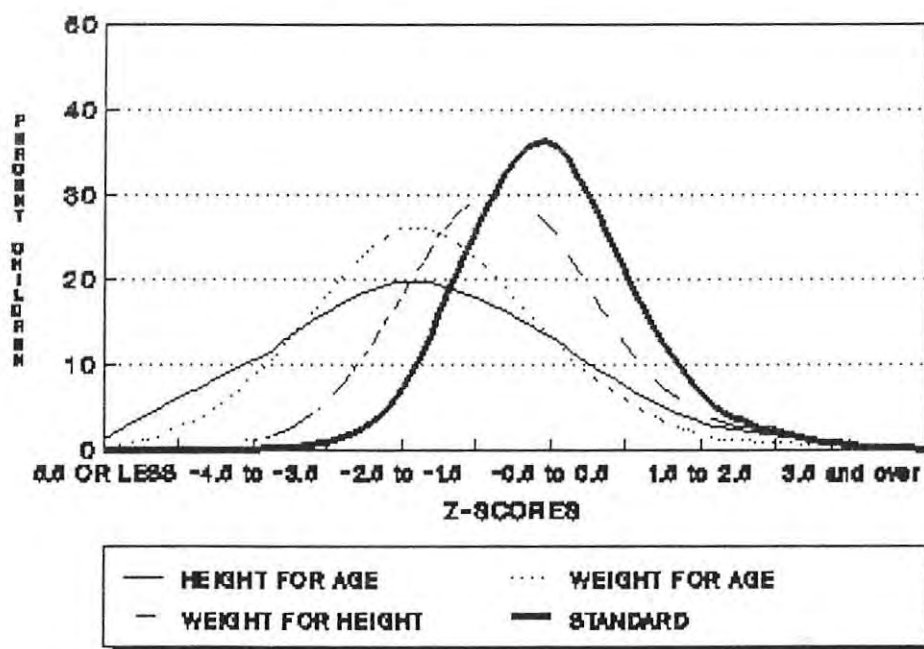


FIGURE 3. CHILDREN'S Z-SCORES



The prevalence of stunting in the region was very high, where 44.8 percent of children aged 3-36 months were short for their age (Table 4). As shown in Figure 3, the distribution of height-for age Z-scores of the region's children is displaced far to the left of the standard, indicating that most children are much shorter for their age than would be the case in a well nourished population.

The proportion of children who were stunted was 19 times the level expected in a healthy, well nourished population. Of the children who were stunted, 55.1 percent were severely stunted (that is, below -3SD from the reference median). In a healthy well nourished population only 1 in 1000 children is expected to be severely malnourished.

The level of wasting, that is, the percentage of children classified as being too thin, was 12.0 percent. The proportion of children who were wasted was 5.2 times the level expected in a healthy, well nourished population. As can be seen in figure 2, the distribution of weight-for-height Z scores are displaced to the left relative to the standard but not as much as for height or weight for age.

Weight-for-age (underweight) measures neither chronic nor acute nutritional status but is rather a combination of the two. About 42 percent of children aged 3-36 months were underweight for their age. In addition the proportion of severely underweight children was 17.8 percent. Figure 3 shows that the distribution of weight-for age Z scores is similar to that of height-for age, and is substantially displaced to the left of the reference standard.

Table 4- Percentage of children age 3-36 months who are classified as malnourished according to the three Anthropometric indices of nutritional status by zone, Density and Residence SNNPR-CFS, 1997.

Zone, Density and Residence	Stunted		Wasted		Underweight	
	1 Severe	2 Moderate & severe	1 Severe	2 Moderate & severe	1 Severe	2 Moderate & severe
Zone(rural)						
Sidamo	19.7	40.6	0.4	15.2	16.1	38.6
S.Omo	32.8	50.8	0.8	5.8	17.3	42.5
K.A.T	33.0	60.6	1.7	7.0	30.5	58.5
Hadiya	24.5	43.9	2.9	15.8	22.4	46.2
Gurghe	22.8	36.7	0.0	8.5	13.4	40.2
		P<0.003		P<0.02		P<0.01
Density (Rural)						
High	29.1	48.4	1.2	12.6	22.0	45.8
Low	22.0	43.4	1.2	10.4	17.3	42.9
		NS		NS		NS
Residence						
Rural	25.5	45.8	1.2	11.5	19.7	44.3
Urban	21.6	40.7	2.9	14.0	10.3	34.3
		NS		NS		P<0.03
Total	24.7	44.8	1.5	12.0	17.8	42.3
Note: Levels of significance determined using chi-square test						
NS= Not significant						
1Below -3 standard deviations from the median of the NCHS/WHO reference pop. 2.Below -2 standard deviations from the median of the NCHS/WHO reference population						

## 1.2 Socio-economic Variables and Stunting

There were noticeable and significant differences in the proportion of children suffering from malnutrition in rural zones (Table 4). The highest prevalence of stunting was observed in rural K.A.T zone (60.6 percent), followed by Semen Omo zone (50.8 percent). Even in the zone with relatively better record on nutritional status of children (rural Guraghe), more than one-third of young children were stunted. The problem of wasting was most evident in rural Hadiya (18.4 percent) and Sidama (14.3 percent) zones while it was less prevalent in rural Semen Omo zone (5.8 percent).

The prevalence of stunting among children of low density rural areas was lower (43.4 percent) as compared to those residing in high density areas (48.4 percent). However, this difference is not statistically significant. In addition, there was no variation between urban and rural areas in the prevalence of both stunting and wasting.

Long term nutritional status of study children by mother's and husband's education is shown in Table 5. In the bivariate analysis, stunting shows no statistical difference as far as both mother's and husband's education are concerned. There was about the same proportion of stunted children of mothers who had never been to school and those with some primary level education. As can be seen in the same table, religion didn't show any significant relationship with chronic malnutrition. The Muslims, however, have relatively lower percentage of stunted children (37.9 percent) compared to the other three groups.

Long term nutritional status of study children by father's occupation and household economic status is shown in Table 6. Stunting and husbands occupation didn't show any significant relationship.

Table 5- Percent of Children age 3-36 Months who are Stunted by selected social Characteristics of the Household SNNPR-CFS 1997.

Social Characteristics	Percent stunted	Number of children
Mother's education		
no education	45.2	383
Primary	45.7	267
Post primary	37.2	94
	NS	
Husband education		
no education	45.2	465
primary	49.4	164
post primary	40.5	185
	NS	
Religion		
Orthodox	48.6	185
Protestant	44.8	384
Muslims	37.9	124
Others	45.8	153
	NS	
Note: Levels of significance determined using chi-square test NS= Not significant		

However, the economic status of the household was found to be strongly associated with chronic malnutrition. The prevalence of stunting ranged from 34.5 percent in households with high economic status to 47.3 in households with below average economic status.

Table 6 Percentage of children age 3-36 months who are stunted by selected economic characteristic of the household, SNNPR-CFS, 1997

Economic characteristics	Percent stunted	Number of children
Husband's occupation		
Professional <sup>1</sup>	36.8	95
Sale\Service	43.1	58
Agricultural	46.5	608
Not working	42.2	64
	NS	
Eco. status of the household		
Above average	34.5	142
Average	45.6	309
Below average	47.3	394
	P<0.03	
Household monthly income		
Inadequate	45.6	496
Barely sufficient	43.5	333
	NS	
Note: Levels of significance determined using chi-square test		
NS= Not significant		
<sup>1</sup> Teachers/others civil servants		

To identify the most important socio-economic factors in explaining stunting, a logistic regression analysis was performed that considers only socio-economic variables. As can be seen in Table 7, from all socio-economic factors included in the model women education and household economic status had a strong positive effect on long term nutritional status of children. Children of women with no education were 1.8 times more likely to be stunted compared to children whose mothers had post primary level education. In addition, children of poor households were 1.6 times more likely to be stunted compared to children in households with above average economic status.

Table 7. Logistic regression Results of the Net Effect of Socio-economic Variables on Chronic Malnutrition.

Explanatory Variables		
	( $\beta$ )	(Exp $\beta$ )
women education (post primary)		
no education	0.5549.	1.7418
primary	0.4634	NS
HH econ status (above average)		
average	0.3446	NS
below average	0.4921.	1.6358
Residence (urban)	0.0040	NS
Constant	-0.2126*	
-2 Log likelihood	970.446---	
Model Chi-square	17.863***	

Reference categories are in parenthesis.

. P<0.05 --- P<0.0001

### 1.3 Demographic Factors and Stunting

Analysing the magnitude of chronic malnutrition at different ages reveals how nutritional status changes during a child's first three years of life. This study shows that long term nutritional status deteriorates markedly after 8 months of the child's age. Figure 4 tracks the mean Z scores for height-for-age index through each month of life. The graph shows that the prevalence of stunting peaks during the end of the second year of life. In addition, as can be seen in Table 8, the proportion classified as stunted is low among infants (30.4 percent) while about half of all children aged 12-36 months are classified as stunted.

Chronic malnutrition is significantly linked with shorter birth interval (see Table 8). The proportion of stunted children among those children with short preceding birth interval (less than 24 months) was 47.7 percent, while it was 45.2 and 32.5 percent for children with a birth interval of 24-48 and above 48 months respectively.

Stunting didn't show any significant relationship with respect to the birth order of the child. There was not consistent pattern of stunting by birth order in the study children, although stunting was a little lower in birth order 2-3 (43.3 percent) (Table 8).

Fig 4. STUNTING BY AGE OF THE CHILD

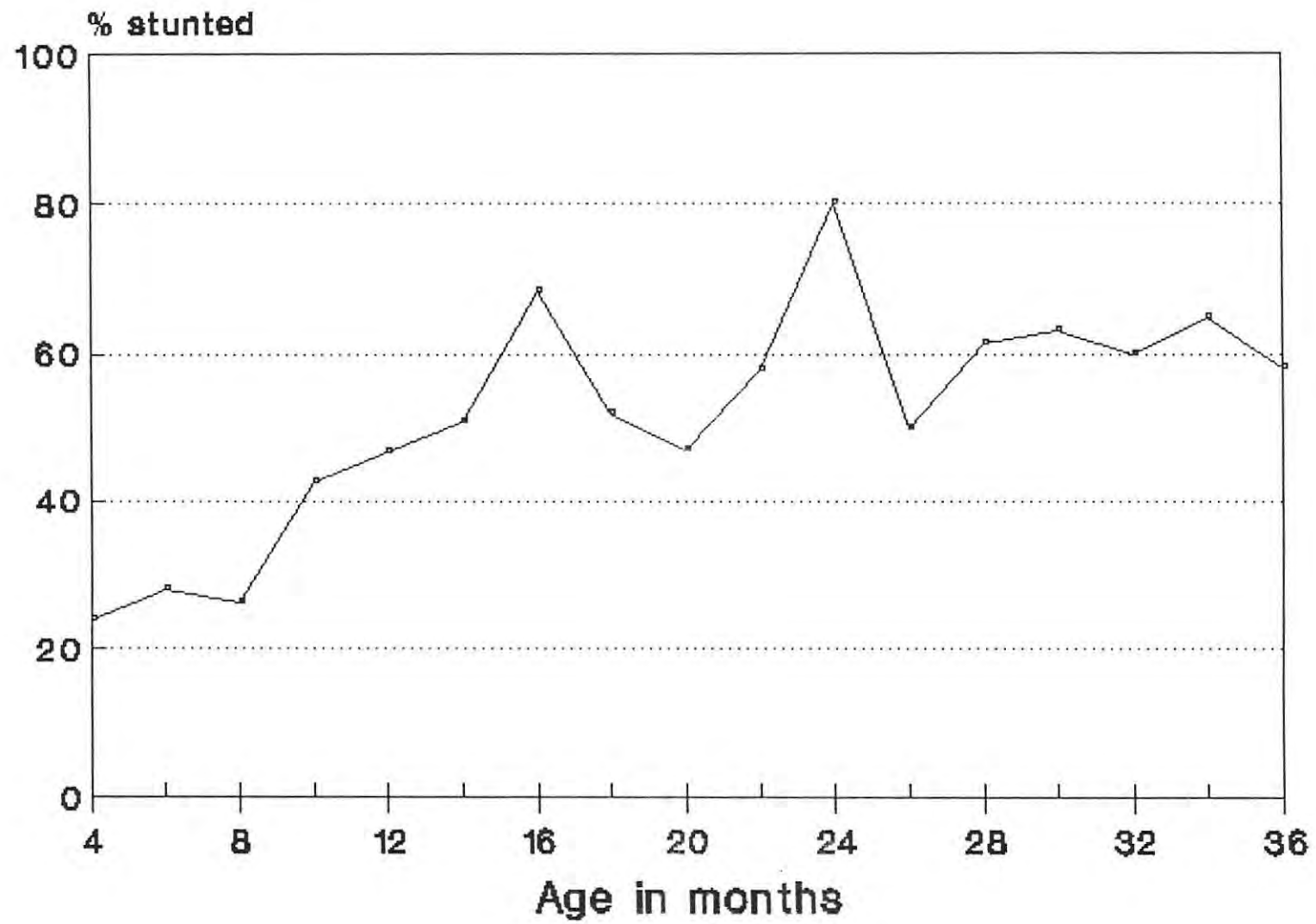


Table 8 -Percentage of Children Age 3-36 Months who are Stunted by Demographic Characteristics of the Child, SNNPR-CFS, 1997.

Characteristics of the child	Percent stunted	Number of children
Sex		
Male	46.7	456
Female	42.6	394
	NS	
Age of the child (months)		
3-11	30.4	184
12-23	46.1	393
24-36	52.7	273
	P<0.00001	
Preceding Birth interval		
<24 months	47.7	109
24-48	45.2	290
>48 months	32.5	83
	P<0.05	
Birth order of the child		
1	45.6	194
2-3	43.3	240
4-6	44.0	216
7+	48.0	100
	NS	
Size of the child at birth		
small	44.5	247
average	45.1	597
	NS	
Note: Level of significance determined using chi-square test		
NS= Not significant		

Table 9 presents the percentage of stunted children by the demographic characteristics of the household. The number of under five children, in addition to the child being measured, was found to be strongly associated with chronic malnutrition. The percentage of stunted children increased with the number of under five children in the household.

Table 9 Percentage of Children age 3-36 Months who are Stunted by Selected Demographic Characteristics of the Household, SNNPR-CFS, 1997.

Demographic characteristics of the Household	Percent stunted	Number of children
Mother's age at the birth of the child		
<20	52.5	61
20-34	43.9	608
>35	42.6	136
	NS	
Number of other under five children in the household		
none	42.0	373
1+	48.8	414
	P<0.05	
Family size		
2-4	48.6	245
5-7	43.1	383
8+	48.8	160
	NS	
Type of marriage (of the father)		
Monogamous	44.2	627
Polygamous	44.0	182
	NS	
Note: Levels of significance determined using chi-square test NS= Note significant		

No statistically significant association is observed between mother's age at the birth of the child and chronic malnutrition (table 9). However, the percentage of nutritionally stunted children decreased as the age of the mother at delivery increased, that is, maternal age at

delivery was negatively associated with stunting. Chronic malnutrition also showed no statistically significant difference with household size.

To identify the most important demographic factors that contribute for chronic malnutrition a separate logistic analysis was performed (Table 10). Accordingly, from the demographic variables included in the model mothers' age at the birth of the child ,sex and age of the child were important predictors of stunting . Children of adolescent women were 6 times more likely to be stunted compared to children whose mothers were aged 20-34 years at the time of their birth. Infants were less likely to be stunted compared to the other age groups. In addition male children were 1.5 times more likely to be stunted compared to female children.

Table 10 Logistic Regression Estimates of the Net Effects of Demographic Variables on Stunting

Explanatory Variables	Demographic	
	$\beta$	exp ( $\beta$ )
Number of under fives (none)		
1+	0.0197	NS
Maternal age at birth(20-34)		
<20	1.7913-	5.9972
>35	0.1502	NS
Birth interval(above 2 years)		
<2yrs	0.1352	NS
child age (months)		
(3-11)		
12-23	1.2368---	5.0777
24-36	1.6249---	3.4446
child's sex (female)		
male	0.4201-	1.5221
size of the child at birth (average+)		
small	0.1879	NS
birth order (2-3)		
1	0.0715	NS
4-6	-0.0359	
7+	-0.2928	
Constant	0.1071-	
N=850		
-2 log likelihood	557.045---	
Model Chi-square	28.81**	

Reference categories are in parenthesis. - P<0.05 P <0.01 P<0.01 ---P<0.0001

#### 1.4. Child care practice and stunting

Optimal infant feeding practice includes the introduction of complementary foods at about 6 months of child's age. Analysis was made to test whether the time of supplementation affects the child's long term nutritional status or not. As can be seen in table 11, age of the child when supplementation started has a significant negative association with long term nutritional status. The percentage of stunted children was higher for children who started supplementation after 6 months of age as compared to the other group.

Table 11- Percentage of Children age 3-36 Months who are Stunted by the age of the Infant/ child when Supplementation started, SNNPR-CFS 1997.

Age of the child(in month) when supplementation started	Percent stunted	Number of children
exclusively breast fed		
0-4	41.1	150
4-6	36.7	91
7+	41.8	347
	49.6	112
	P<0.05	
Note: Level of significance determined using chi-square		

The 1997 CFS didn't collect information about chronic or recurrent illness, which in most cases show higher degree of association with chronic malnutrition than recent illness. Assuming that children who suffer from chronic diarrhoea are likely to be included among children with diarrhoea during the two weeks preceding the survey, bivariate analysis was done to see whether or not relationship exist between diarrhoeal disease and stunting (table 12). Though not significant, the prevalence of stunting was somewhat higher among children

who experienced diarrhoea during the two weeks preceding the survey (45.3 compared with 42.2 percent).

The number of antenatal care visits a mother had during pregnancy is an indicator of some contact with health services and health seeking behaviour. As can be seen in Table 12, the number of antenatal visits a mother had was inversely related with stunting: the prevalence of stunting among children of mothers who had 5 or more visits was low (32.9 percent) compared with 47.3 percent among children of mothers who had no visits (47.3).

Vaccination status of a child is the other indicator of contact with health services during infancy and childhood. Since it is expected that contact with health services would help correct incipient nutritional problems, vaccination status was expected to be positively related with long term nutritional status. However, as can be seen in table 12, fully vaccinated children were more likely to be stunted (47.1 percent) than children who had at least one vaccination (34.1 percent).

Table 12. Percentage of children age 3-36 months who are stunted by selected Child care and health status indicators SNNPR-CFS, 1997.

Selected health status indicators	Percent stunted	Number of children
Diarrhoea (2 weeks)		
Yes	45.3	325
No	42.2	479
No of Antenatal Care Visits		
None	47.3	467
1-4	44.9	225
5+	32.9	121
	P<0.05	
Vaccination status of the child		
No vaccination	46.7	430
1-3 vaccinated <sup>1</sup>	34.1	138
Fully vaccinated <sup>2</sup>	47.1	261
	P<0.03	
Measles immunization <sup>3</sup>		
Yes	47.6	311
No	42.9	531
	NS	
<p>Note: Levels of significance determined using chi-square test NS= Not significant  1.If the child received from 1-3 vaccine from the following vaccination: BCG, 3 doses of DPT and Polio, Measles  2. If the child received all of the above vaccinations  3. For children 9 months and older only</p>		

## 5 Environmental Sanitation and Chronic Malnutrition

Long term nutritional status by source of drinking water source is shown in Table 13. As can be seen in this table there was no statistically significant difference in the prevalence of stunting by source of drinking water.

Table 13 Percentage of Children age 3-36 Months who are Stunted by Related Environmental variables.

Environmental characteristics	Percent stunted	Number of children
Drinking water source		
piped	43.7	186
pumped/protected well	48.3	116
unprotected/ surface	45.7	547
	NS	
Type of toilet		
None	45.0	640
Pit latrine	44.4	207
	NS	
Note:- Levels of significance determined using (Chi-square test)		NS= Not significant

In addition, there was no significant difference in the prevalence of stunting by the type of toilet facility . The proportion of children classified as stunted are similar for both groups (table 13).

Table 14. Percentage of Children age 3-36 Months who are stunted by Community Level Variables

Community variables	Percent stunted	Number of children
Out reach growth monitoring		
yes	46.7	167
no	44.4	683
	NS	
Growth monitoring at the community level		
yes	48.9	221
no	43.4	629
	NS	
Vitamin supplementation		
yes	49.0	192
no	43.6	658
	NS	
Total	44.8	850
Note: Level of significant determined using chi-square		
NS= Not significant		

The 1997 CFS also collect information regarding nutrition intervention programs from key informants of community members. Based on the responses of the key informants, bivariate analysis was performed. Though not significant, the prevalence of stunting in communities that have growth monitoring services at the community level, out-reach growth monitoring and vitamin supplementation was higher compared to communities without these services (table 14).

The logistic regression analysis which was performed separately on environmental sanitation, child care and health related variables identifies the most important factors associated with chronic malnutrition (Table 15).

Table 15 Logistic Regression Estimates of the net Effect of Environmental, Child care and Health related Variables on Stunting, SNNPR-CFS, 1997.

Explanatory variables	B	exp B
	Vaccination status (fully vaccinated)	
1-3	-0.3679	NS
none	-0.2250	
No of antenatal visits (5+)	**	
1-4	0.9982**	2.7134
none	1.1242**	3.0778
Age when supp. Started (4-6)	*	
0-4	-0.2670	0.7656
6+	0.2724	1.3131
exclusively bf/d	0.0069	1.0069
Water source (piped)		
protected/pump	0.0524	NS
unprotec/surfa	-0.2288	
measles immunization (yes)		
no	0.2157	NS
Toilet type (pit latrine)		
no latrine	0.0165	NS
Constant	-0.6554**	
N= 850		
-2loglikelihood	903.379***	
Model chi-square	22.84**	

Reference categories are in parenthesis

\* P<0.05 \*\*P<0.01 \*\*\*P<0.0001

Children of women who didn't receive antenatal care during the pregnancy of the child were 3.1 times more likely to be stunted compared to children of women who had made at least five visits. Over all, age of the child when supplementation started was also important in predicting chronic malnutrition.

From the variables included in the study, those variables which were important in the bivariate and in the separate multivariate analysis were considered in developing the final model. In the final model (Table 16), women education, household economic status and age of the child retain their explanatory power. The risk of stunting for children of illiterate women was 2.3 times of that of children of women with post primary level education. In addition, children of mother with some primary education were 2.1 times more likely to be stunted compared to children whose mothers had a post primary level education.

Household economic status was also inversely related to stunting. Children of poor households were 1.9 times more likely to be stunted compared to children of households with above average economic status. The findings also indicate that the net risk of stunting for children in the age group 12-23 months was higher(4.7 times compared to infants) than those of children aged 24-36 months indicating that the second year of life was the most disastrous for nutritional status of children. In general infants were less likely to be stunted as compared to the other age groups.

Table 16. Logistic Regression Estimates of the Net effect of the Explanatory Variables on Stunting  
 (Only variables which appeared to be significant are shown in the table), SNNPR-CFS, 1997.

Explanatory Variables	$\beta$	(Exp $\beta$ )
HH economic Status (above average)		
low	0.6237-	1.8658
average	0.4784	1.6136
Women education (post primary)		
no education	0.8229--	2.2772
Primary	0.7313-	2.0777
Age of the child (3-11)		
12-23	1.5416---	4.6720
24-36	1.5177---	4.5619
constant	-0.5181---	
N=850		
-2loglikelihood	691.816---	
Model chi-square	79.232---	

Reference categories are in parenthesis

- P<0.05 -- P<0.01 --- P<0.0001

## V. Discussion

According to this study, 44.8 percent of children aged 3-36 months in the five densely populated zones of southern Ethiopia were found to suffer from chronic malnutrition. In addition the level of wasting and underweight were very high, with 12 percent of children aged 3-36 months being wasted and 42 percent being underweight.

When we compare the prevalence of malnutrition in the region with the countries of the Horn, the prevalence is very high. According to UNICEF (1998) the percentage of under five children who are stunted in the Horn of Africa ranges from 22 percent in Djibouti to 64 percent in Ethiopia. Except Ethiopia, in other countries of the Horn the percentage of stunted children falls between 22 and 38 percent. In terms of wasting, the percentage of children who are wasted ranges from 5 percent in Uganda to 16 percent in Eritrea. In general, the prevalence of malnutrition in the study area is among the highest, indicating that malnutrition is a major health and welfare problem affecting thousands of children in the study area.

Moreover, the prevalence of chronic malnutrition in this study is lower than what had previously been reported as 61.4 percent in 1992 for rural Southern Region (CSA 1993, Melaku and Yohannes, 1996). The prevalence of underweight also decreased from 46.7 percent in 1992 to 42 percent in this study. However, the prevalence of wasting increased from 8.4 percent in 1992 to 12 percent in this study. This must be seen in light of two essential considerations. First this study is based on children in the age group 3-36 months, while the 1992 nutrition survey was based on children aged 6-59 months. Since stunting is a

cumulative effect of repeated illness and / or inadequate food intake, lowering the upper limits of children's age from 59 months to 36 months and including those infants aged 3-5 months may lower the prevalence of stunting in this study. Because prevalence estimates may be higher if older children are included than if they are not, and may be lower if infants from birth 3-5 months are included than if they are not (ACC/SCN, 1997).

Secondly, the increase in the prevalence of wasting may be due to seasonal factors. The 1992 rural nutrition survey was conducted in March, immediately after harvest time whereas the 1997 CFS was conducted at the end of May and the beginning of June when nearly the food stock was depleted.

Among the socioeconomic factors only economic status of the household and zone are important in explaining stunting in the bivariate analysis of this study. Household economic status is also important in the final model.

The administrative zones of the SNNPR is classified based on ethnic composition, which might indicate the difference in cultural practice among zones. Hence, the difference in the prevalence of stunting among zones may be due to the difference in cultural practices, access to health services, and in economic conditions of households. For instance, in rural K.A.T zone where the prevalence of stunting was extremely high (60.6 percent), those households who reported the inadequacy of their monthly/yearly income were very high (82.0 percent) as compared to other zones (table 8 annex A1). In addition, the average duration of breastfeeding was very high (28.6 months) compared with other zones. In their study in

Southern Ethiopia, Melaku and Yohannes (1996) also found a very high prevalence of stunting in K.A.T zone.

Contrary to what was found in many studies (for example, Macro International Inc, 1996, 1997; Sommerfelt and Stewart, 1994) there was no significant difference in the prevalence of chronic malnutrition between rural and urban children . A recent study done by CSA (1997) confirmed that the average per capita daily calorie intake of the rural population of Ethiopia is higher (2,256) than that of the urban population (1,223). As one of the immediate causes of stunting is calorie intake, the observed higher prevalence of stunting in urban area is justifiable. On the other hand, though the calorie intake seems better in rural areas, other factors such as health facilities, access to better source of drinking water and latrine are relatively low which may off set the prevalence of stunting in the area.

Occupation of the husband was not a good predictor of stunting in this study. It should be noted that the majority of the study population were farmers (73.4 percent). The non-significance of this variables may be the result of the small sample size from different occupation categories rather than the true reflection of lack of association between occupation of the father and stunting. Most of the time occupation is highly correlated with income and education which have a positive effect on children's nutritional status (Macro International Inc 1996).

Education of the father was not found to be of benefit in terms of long term nutritional status of the child in this study. A study done in Senegal demonstrated the increment effect of husband's education, which highlights the fact that even some primary school education of a

husbands is highly protective of child nutrition (Macro, 1996). According to Rutstein (1996) husbands education in improving the health and nutrition of children is important especially if the mother is not educated.

Model 1, which considers only the net effect of socioeconomic variables, indicate that women education and household economic status have significant effect on stunting. Like many studies this model clearly shows that women education and household economic status are inversely related with stunting. Both of these variables are also important in the final model.

Among the demographic variables used in the bivariate analysis; length of preceding birth interval, age of the child and number of under five children in the household were significantly associated with long term nutritional status of children.

Children born less than 24 months after the last sibling are more likely to be stunted than those born after 48 months. Similar results were observed in Zimbabwe (DHS, 1996) and in Mali (Lalou and Mbacke, 1993 in Tagwireyi and Greiner, 1994). Children born in a short birth interval may create a large biological and child care burdens both pre- and post - natally that can result in reduced nutritional status. Similarly a number of studies have associated short preceding birth interval with low birth weight and higher infant mortality. However, short birth interval is not always disastrous to new borns unless they are born to mothers whose financial resources cannot simultaneously meet both her nutritional needs and those of the fetus (Lalou & Mbacke, 1993). There is also no reason for competition between the

children for access to care and nourishment unless the household's resources are incapable of completely satisfying the basic needs of the children being cared for.

Unlike family size, the number of under five children in the household is significantly associated with long-term nutritional status of children-the greater the number of under fives in the household, the higher the chance of being stunted. This is not surprising, as the number of children under five years of age increases, so may the strains on intra household availability of resources and child care. On the other hand, larger family size may indicate larger number of working older children and adults, which may increase income and thus food availability. However, the effect of the increase in the number of under five children on nutritional status depend on the economic status of the household .

There is no consistent pattern of stunting by birth order, although stunting seems lower in birth order 2-3. In a study done by Sommerfelt and Stewart (1994) on 27 developing countries, birth order was not associated with chronic malnutrition. However, Rutstein (1996) found a positive association between birth order and chronic malnutrition. Since higher birth order mostly indicate the existence of many children in the household, poverty may be entertained as a possible explanation for the findings of Rutstein. In addition, research on birth order and infant mortality suggests that higher parity women experience greater pregnancy and birth related complications than women at second or third parity, and their children may experience poorer intrauterine growth and low birth weight (Hagga in Lalou and Mbacke (1993).

In model 2 where only the net effects of the demographic variables were considered, age and sex of the child and mothers' age at the birth of the child were important in explaining stunting. The effect of age can easily be understood, since stunting is, by definition, a phenomenon which becomes intensified with time. Age of the child is also important in the final model.

With regard to the sex of the child, the overall result revealed that girls suffer less than boys from chronic malnutrition. In a study by Melaku and Yohannes (1996) in Southern Ethiopia stunting was observed to be higher in male compared to female children. Similarly, in Kenya, Senegal (Macro International Inc, 1996) and Malawi (Madise and Mpoma, 1997) females have shown a better long term nutritional status than males. This might be due to biological reasons or some cultural and traditional practices revolving around variation in child care practice between different sex of the child which should be investigated in detail. However, Negussie (1994) Ayana, 1995) and Tekele (1988) didn't find any relationship between sex and malnutrition.

Stunting is most common among children of young mothers (under 20 years of age). Children born to young mothers were 6 times more likely to be stunted compared to children born to mothers aged 20-34 years. Young maternal age can increase the health risks of children for both physiological and behavioral reasons. Young mothers may be physically less mature and less able to handle the demands of pregnancy, child birth and subsequent child care. Many studies have found that the birth weight of children to young mothers are generally lower than those of other children (Le Grand and Mbacke' 1993). Adolescent mothers also lack experience and tend to be less psychologically mature and emotionally

stable, leading to poorer child health care and infant feeding behaviors (Senderowitz and Paxman in Legrand and Mbacke; 1993).

A surprising finding is that fully vaccinated children were more malnourished than who were partially vaccinated. Similar results were found by Rutestin (1996) and Tekele (1988). On the other hand studies done by Macro International Inc. in Senegal (1996) and Uganda(1996) show a negative association between chronic malnutrition and vaccination states of children. Since stunting appear at early ages in Ethiopian children (CSA 1993) many of the children of this study may be stunted before they receive all the recommended vaccinations. Probably, children that are frequently brought to immunization sessions may be those children who were perceived by their mothers as too short or too thin for their age, which should be investigated.

Moreover, the environmental sanitation variables included in the study (water source, presence of growth of monitoring service and toilet type) were not associated with long term nutritional status of children. The possible explanation for this may be that most household in the study area were using the same type of service e.g. surface water or with out toilet facility. In addition, the presence of nutrition intervention program in a community seems not important in reducing stunting in the study area. However, since this study didn't see whether or not the study children benefited from the intervention program, it is impossible to say that these programs were not of benefit for the community. This study hasn't information on the quality of service provided by these programs. Probably, these programs were implemented in communities where the prevalence of the problem was very high.

Results of model 3 indicates that the number of antenatal care visits a women had during the pregnancy of the child and age of the child when supplementation started had a significant effect on chronic malnutrition. Antenatal care can help prevent low birth weight and birth complications while, at the same time, providing mothers with valuable information about child care, health and nutrition. In addition a women who has antenatal care is more likely to bring her child for a post-natal check-up during which visit the child would be nutritionally assessed and the mother given nutritional advice. Similar results were reported in Kenya, Zimbabwe and Uganda (Macro International Inc, 1996)

Over all, age of the child when supplementation started had a significant effect on stunting. Though not significant children who started supplementation after 6 months of age where more likely to be stunted compared to the other group. Children need nutritious food at the appropriate age to grow normally. As it is recommended by WHO, breastfeeding beyond 4 to 6 months of age should be complemented with energy and other nutrient dense weaning foods. Since the nutritional requirement of the child increases with age, it is an established fact that breast milk alone is not satisfying the energy and protein requirements of most children. This may be one possible factor that contributed to stunting for children who were supplemented after 6 months of their age.

Results of the final model indicate that age of the child, women education and household economic status have a significant effect on chronic malnutrition. Since stunting is a cumulative process that occurs over the course of many individual insults of nutritional deprivation and/or illness, the increase in the risk of stunting with age is not surprising. The better nutritional status of infants is probably due to their being able to satisfy their nutritional needs through breast milk and some complementary foods. However, after the six months of

life, when breastfeeding no longer meets their nutritional needs and complementary food is inadequate, there is likely to be an increase in the prevalence of stunting.

Higher maternal education was found to be protective of chronic malnutrition. The importance of mother's education in relation to the health and nutrition of the child has been stressed by many studies (Sommerfelt, and Stewart 1994, Negussie, 1988; Macro International Inc 1996, 1997). Several studies indicate that better educated women tend to commit more time and effort to child care than less educated women. They are also more likely to use available health care and community services than women with no education (Engle et al 1997; Alderman and Garcia, 1993). In general, women education affects the knowledge and attitude of parents which in turn affect, *inter alia*, their fertility behavior, their use of health services, and their access to information and other forms of behaviour. However, in this study, women need a post primary level education before an effect on long term nutritional status is found. Probably, for a mother to change the culture and tradition in which she has been brought up and lived in, few years of primary schooling is not enough. In addition what is taught in primary schools might have been of little or no help in changing one's life style. Similar result was found in Senegal (Macro International Inc, 1996) and Malawi (Madise and Mpoma, 1997).

The economic status of the household which also directly indicate the level of household food security is positive associated with long term nutritional status of children. Household food availability/security is clearly a pre-requisite for adequate dietary intake for all household members. Household economic status can affect children's nutritional status through its association with reduced illness including diarrhea and increased likelihood of

antenatal and delivery cares( Alderman et al, 1993). Economic status of the household is also a proxy for access to and use of health services, improved water source and sanitation facilities. Similar results were reported in Zimbabwe, Kenya, Uganda, Senegal (Macro International Inc, 1996) Brazil (Victor et al, 1986) Addis Ababa (Girma and Teshome, 1985) and other Sub Saharan African countries (Rutstein, 1996).

## VI. CONCLUSIONS AND RECOMMENDATIONS

### 6.1. Conclusions

This study examines the prevalence of malnutrition in the five densely populated zones of Southern Ethiopia and the effects of some socioeconomic, demographic, child care and environmental factors on long term nutritional status of children. In general, the prevalence of malnutrition in the study area is very high: 44.8 percent of young children age 3-36 months are stunted, and 12 percent are wasted. The level of underweight is 42 percent. These shows that child malnutrition is among the most serious health and welfare problems facing the population of the five densely populated zones of Southern Ethiopia.

The findings of this study indicate that there was a significant variation in the prevalence of malnutrition in rural zones. The prevalence of stunting ranges from a low of 36.7 percent in rural Guraghe to a high of 60.6 percent in rural K.A.T zone . However, wasting was very high in Hadiya and Sidama zone and low in Semen Omo zone. This difference might be related with differences in cultural practices like child care practice (such as duration of breast feeding, weaning foods etc.) or food taboos and economic conditions of the zones.

Urban versus rural and high versus low density area of residence are not significantly associated with both wasting and stunting. This suggest that food shortage child care and/or bad environmental conditions may be affecting all geographical segments of the population.

The study clearly shows that three demographic factors were associated with long term nutritional status of children. The child's sex and age and the mother's age at the birth of the child were the major demographic factors in explaining long term nutritional status.

In addition, from the variables related to environmental sanitation, child care and health, number of antenatal care visits a women had during the pregnancy of the child, and age of the child when supplementation started were highly associated with chronic malnutrition. Antenatal care visits which are indicators of health care utilization was associated with improved stature and decreased likelihood of stunting. Children who were introduced to complementary foods lately (after 6 months of age) were more stunted than those who were introduced to complementary foods according to internationally recommended time table.

As per the findings of the final multivariate model, two socioeconomic variables i.e. women education and household economic status and one demographic factor (child's age) were very important predictors of long term nutritional status of children.

Improved economic conditions can lead to better child nutrition. This is seen through the positive association of household economic status for stature. Access to proper nourishment can come about only when households have the necessary financial resources to meet the food needs of the members of the family. While better economic status allow great food security, it can also promote better feeding behaviour, health care use and better sanitation facilities.

Maternal education is significantly related to the net relative risk of stunting. Although maternal educational level is highly correlated with household economic status, which also positively affect child nutritional status, this study shows that even after controlling for household economic status, maternal education has a positive effect on long term nutritional status. Thus, as a long term health nutritional investment, emphasis on maternal education is likely to have important and lasting positive effects.

The findings of this study indicate the pronounced deterioration in long term nutritional status before the end of the first year of life. This may be caused by factors affecting mothers during pregnancy (like poor maternal nutrition during pregnancy) and/or factors operating during infancy such as illness, inappropriate child care, duration of exclusive breast feeding, and weaning complication. In addition, the dramatic rise of stunting with age up to the end of the second year of life reflects the cumulative effect of repeated illness, inadequate nutrient intake and most importantly their negative synergistic effect during this critical period of child development. This pattern highlights the first 2 years of life as the most nutritionally vulnerable for children in the study area.

## 6.2 RECOMMENDATIONS

The study demonstrated the importance of socioeconomic and demographic factors and child care practices for the high prevalence of chronic malnutrition in the five densely populated zones of southern Ethiopia. In particular, the study confirmed that children of low economic status families are at a higher risk of stunting. Hence, there is an urgent need to ensure household food security. In this regard the following are recommended.

- (I) Directing planned agricultural and employment strategies to economically disadvantageous rural households in food deficit areas to increase household productive assets, including access to credit, tools, work animals, and seeds and provide off farm employment opportunities.
- (II) Support the development of income generating activities for urban poor households through access to credit as a means of improving children's nutritional status.

The findings of this study highlights that children of young mothers' (under 20) were at a higher risk of stunting indicating a program priority for children of adolescent mothers. This also show the special needs of young mother's both in terms of family life education (including contraceptive methods) and easy access to family planing and prenatal health care services for both the child and the mother.

The study revealed that many mothers were not following the recommended feeding practice of infants and young children, so this is one area where efforts should be

concentrated. Thus communicating the importance of exclusively breastfeeding in the early months of life (4-6 months), increasing the energy density of complementary foods (e.g., through the use of germinated flour and other local foods), decreasing contamination and maintaining frequent feeding is crucial through adult/literacy education and health and nutrition education.

Moreover, considering the importance of women education in children's nutritional as crucial, more deliberate effort by local governments administrators and educational personnel are needed to improve educational opportunities for female children as a long term strategy. In addition, availability and accessibility of antenatal care services to pregnant women should be increased as a means to improve long term nutritional and survival status of children.

The study revealed that there is a pronounced deterioration in the nutritional status of children in early infancy. In addition, the risk of stunting remains high throughout the second year of life, suggesting that the first two years of life are a critical periods for public health intervention.

In general, the nutritional status of children is affected by both socioeconomic and demographic factors as documented by this study. This suggest that, like many other studies, nutrition is multi-sectoral by nature. In this regard integrating family planning and nutrition programs with development projects and education in both governmental & non governmental organizations is very important.

Moreover the following general policy implications are recommended for all concerned regional officers in order to alleviate child malnutrition .

1. Improvements in access to clean water and appropriate fecal and sewage disposal systems
2. Expand diarrhea prevention and control activities
3. Expand immunization and vaccination coverage.
4. In addition to out reach and community based growth monitoring, creating a mechanism to develop community based nutrition development intervention (like JNSP) particularly in food deficit areas and most deprived woredas.
5. Longitudinal studies to establish sound basis for long term intervention programs.
6. Similar studies for each zone in the region and for each age group should be done to design appropriate strategies separately.

Finally, results of this and other studies should be communicated to both government and non-governmental organizations in the region who are working in fields related to nutrition.

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## ANNEX 1

### BACKGROUND CHARACTERISTICS OF RESPONDENTS

Table A1. Percent Distribution of Male and Female Children age 3-36 months used in the analysis of the study by zone, Density and Residence SNNPR-CFS, 1997

Zone, Density and Residence	Children		Number of Children
	Male	Female	
Zone (Rural)			
Sidama	53.0	47.0	234
S. Omo	50.0	50.0	122
K.A.T	58.7	41.3	109
Hadiya	56.1	43.9	139
Guraghe	57.0	43.0	79
Density (Rural)			
High	53.4	46.6	337
Low	55.5	44.5	346
Residence			
Rural	54.5	45.5	683
Urban	50.3	49.7	167
Total	53.6	46.4	850

Table A2. Percent Distribution of Children age 3-36 months by Age, according to zone, Density and Residence SNNPR-CFS, 1997.

Zone Density and Residence	Child's Age (Months)			Number of children
	3-11	12-23	24-36	
Zone (Rural)				
Sidama	32.2	32.2	35.6	234
S.Omo	32.8	39.1	28.1	122
K.A.T	27.7	35.3	37.0	109
Hadiya	30.6	38.1	31.3	139
Guraghe	39.0	32.9	28.1	79
Density (Rural)				
High	34.0	33.4	32.6	337
Low	30.1	37.0	32.9	346
Residence				
Rural	32.0	35.2	32.8	683
Urban	29.7	37.7	32.6	167
Total	31.6	35.7	32.7	850

Table A3 Percentage Distribution of Children age 3-36 months by their Household family size, according to zone, Density and Residence SNNPR-CFS, 1997.

Zone, Density and Residence	Family Size				Number of Children
	2-3	4-6	7-8	9+	
Zone (Rural)					
Sidama	12.2	50.9	23.8	13.1	232
S.Omo	19.1	59.1	15.7	6.1	125
K.A.T	8.9	51.8	24.1	15.2	112
Hadiya	13.0	52.2	20.3	14.5	146
Guraghe	15.2	46.8	32.9	5.1	71
Density (Rural)					
High	14.0	52.5	21.2	12.3	340
Low	12.7	52.0	24.5	10.8	346
Residence				11.5	
Rural	13.4	52.3	22.8	11.2	686
Urban	9.4	58.1	21.3		160
Total	12.6	53.4	22.5	11.5	846

Table A4 Percent Distribution of children Age 3-36 months by Level of Mother's Education, according to Zone, Density and Residence SNNPR-CFS, 1997

Zone, Density and Residence	Mother's Education			Number of Children
	No education	Primary	7+	
Zone (Rural)				
Sidama	68.8	30.4	0.8	224
S.Omo	53.1	39.1	7.8	64
K.A.T	28.1	60.7	11.2	89
Hadiya	64.2	34.3	1.5	134
Guraghe	82.4	17.6	0.0	74
Density (Rural)				
High	61.0	37.8	1.2	251
Low	62.0	33.2	4.8	334
Residence				
Rural	61.5	35.3	3.2	585
Urban	14.5	38.3	47.2	159
Total	51.5	35.9	12.6	744

Table A5 Percent Distribution of Children age 3-36 months by mother's husband education, according to Zone, Density and Residence SNNPR-CFS, 1997

Zone, Density and Residence	Husband's Education			Number of Children
	No education	Primary	7+	
Zone (Rural)				231
Sidama	68.8	24.3	6.9	121
S.Omo	70.2	13.3	16.5	104
K.A.T	36.5	30.8	32.7	136
Hadiya	66.1	22.1	11.8	70
Guraghe	92.9	7.1	0.0	331
Density (Rural)				331
High	66.2	24.1	9.7	662
Low	65.9	17.8	16.3	152
Residence				814
Rural	66.0	21.0	13.0	
Urban	18.4	16.5	65.1	
Total	57.1	20.2	22.7	

Table A6 Percent Distribution of children age 3-36 months by mother's Age, according to zone, Density and Residence SNNPR-CFS, 1997.

Zone, Density & Residence	Mother's Age (Years)			Number of children
	15-19	20-34	35-49	
Zone (Rural)				234
Sidama	12.8	71.8	15.4	122
S. Omo	6.5	82.0	11.5	109
K.A.T	4.6	78.9	16.5	139
Hadyia	8.6	69.8	21.6	79
Guraghe	3.8	73.4	22.8	337
Density (Rural)				346
High	8.6	74.5	16.9	683
Low	8.3	74.6	17.1	167
Residence				850
Rural	8.5	74.5	17.0	
Urban	6.6	82.0	11.4	
Total	8.1	76.0	15.9	

Table A7 Percent Distribution of children age 3-36 months by mother's Husband Occupation, according to Zone, Density and Residence SNNPR-CFS, 1997.

Zone, Density & Residence	husband's Occupation				Number of children
	Professional	Agricultural	Sale.service	Unemployed	
Zone (Rural)					232
Sidama	0.9	91.1	0.4	7.6	122
S. Omo	2.5	83.6	0.8	13.1	109
K.A.T	2.8	89.9	0.0	7.3	139
Hadyia	1.4	92.8	0.0	5.8	79
Guraghe	0.0	73.4	6.3	20.3	335
Density (Rural)					
High	1.5	86.9	0.0	11.6	346
Low	1.4	88.4	2.0	8.1	681
Residence					
Rural	1.5	87.5	1.0	9.8	147
Urban	57.8	7.5	34.7	0.0	
	11.5	73.4	9.0	8.1	828

Table A8 Percent Distribution of Rural Children age 3-36 months by the Adequacy of Household Food Stock, according to Zone, Density and Residence SNNPR-CFS, 1997

Zone, Density & Residence	Have adequate stock till next harvest		Number of children
	Adequate	Inadequate	
Zone (Rural)			
Sidama	32.6	67.4	228
S.Omo	43.3	56.7	117
K.A.T	12.8	87.2	105
Hadiya	12.2	87.8	133
Guraghe	50.0	50.	79
Density			
High	22.9	77.1	325
Low	35.0	65.0	337
Total	31.7	68.3	829

Table A9 Percent Distribution of children age 3-36 months sufficiency of Household monthly/yearly income, according to Zone, Density and Residence SNNPR-CFS,1997.

Zone, Density & Residence	Household monthly/yearly income			Number of children
	Inadequate	Barley sufficient	sufficient	
Zone (Rural)				
Sidama	645	28.6	6.8	228
S. Omo	41.0	37.7	21.3	117
K.A.T	81.5	14.8	3.7	105
Hadyia	85.6	9.4	5.0	133
Guraghe	32.9	48.1	19.0	79
Density (Rural)				
High	74.4	13.4	12.0	325
Low	53.2	39.0	7.8	337
Residence				
Rural	63.6	26.4	10.0	682
Urban	42.2	42.9	15.0	147
Total	59.8	29.3	10.9	829

Table A10 Percent Distribution of Children age 3-36 months by Household Drinking Water Source SNNPR-CFS,1997.

Zone, Density & Residence	Source of drinking water			Number of children
	Piped	pump/prote	surface/unpro	
Zone (Rural)				
Sidama	0.4	6.7	92.9	231
S. Omo	0.8	13.3	85.9	121
K.A.T	28.0	45.8	26.2	104
Hadyia				
Guraghe	12.2	9.0	78.2	136
Density (Rural)				
High	0.0	0.0	100.0	70
Low	12.1	9.0	78.9	332
Residence				
Rural	2.8	19.2	78.0	320
Urban				
Rural	7.4	14.1	78.4	654
Urban	82.3	13.1	4.6	148
Total	22.2	13.9	63.9	802

Table A11. Percent Distribution of Children Age 3-36 months by type of Toilet Facilities, according to Zone, Density and Residence SNNPR-CFS, 1997

Zone, Density and Residence	Type of Latrin used by the Household		Number of children
	Pit Latrin	no latrin	
<b>Zone (Rural)</b>			
Sidama	2.1	97.9	232
S. Omo	16.4	83.6	120
K.A.T.	29.1	70.9	103
Hadiya	5.4	94.6	137
Guraghe	1.2	98.8	72
<b>Density (Rural)</b>			
High	3.7	96.3	333
Low	15.6	84.4	321
<b>Residence</b>			
Rural	9.7	90.3	654
Urban	84.6	15.4	152
<b>Total</b>	<b>24.5</b>	<b>75.5</b>	<b>806</b>

Table A12 Median Duration of Breast feeding by selected Background characteristics SNNPR-CFS, 1997.

Background Characteristics	Median Duration of Breastfeeding	
	Exclusively breastfeeding	Any breastfeeding
<b>sex of the child</b>		
male	4.0	20.5
female	4.1	23.5
<b>Zone (rural)</b>		
Sidama	5.0	20.8
S.Omo	3.3	23.2
K.A.T.	3.6	28.6
Hadiya	3.9	21.4
Guraghe	4.3	23.5
<b>Density</b>		
high	4.2	23.1
low	3.9	22.4
<b>Residence</b>		
Urban	4.3	19.8
Rural	4.1	23.3
<b>Women Education</b>		
No Education	4.2	24
primary	4.1	24
Post Primary	3.8	18
<b>Total</b>	<b>4.1</b>	<b>22.6</b>

## ANNEX 2

### Defination of the variables used in the Study

Variables used in the study are defined below. The dependent variable in this study is Z score on the NCHS/CDC/WHO reference standard for height for age. This indicates the child's chronic nutritional status. In addition to measure acute prevalence of and overall nutritional status of children weight for height and weight for age respectively, were used. Cut off points of two standard deviations below the mean (-2SD) are used to indicate malnourished children, termed as stunted (low height for age), wasted (low weight for height) and undermweight (Low weight-for-age)

The following variables were used as wxplanatory variables for analysis.

#### **SOCIOECONOMIC VARIABLES**

Zone - the Child's zone of residence (1) Sidama (2) S. Omo (3) KAT (4) Hadiya (5) Guraghe.

Density ( population density per square killometer)

- (1) high if it is above 300 people per s.k ms.
- (2) low if it is below 300 people per S.K.Ms.

Residence (1) Urban

- (2) Rural

mother's Education (1) No education

- (2) With some primary education (1-6)
- (3) With post primary education (7+)

Economic status of the HH - above average

- average
- below average

Adequacy of household monthly/yearly income

- (1) Not sufficient
- (2) bearly sufficient and bearly sufficient

Husband Occupation

- (1) Professional (teachers & other civil servants.
- (2) Sales/Service - traders and service providers/ tailor.
- (3) Agricultural farmers
- (4) Unemployed

Religion

- (1) Orthodoxes
- (2) Protestants
- (3) Muslims
- (4) Others

#### **DEMOGRAPHIC FACTORS**

Age of the child during the survey in months

- (1) 3-11
- (2) 12-23
- (3) 24-36

Sex of the child

- (1) Male
- (2) Female

Preceeding Birth Interval: Number of months between the birth of the child and that of the pceding child

(1) Less than months - If the interval between the birth of the index child and the previous live birth to the mother is less than 24 months.

- (2) If the interval in greater than 24 month.

Birth order (1) 1 - If mother didn't have previous live birth.

- (2) 2-3
- (3) 4-6
- (4) 7+

Number of other living sibilings aged 5 years and under

- (1) none
- (2) 1 or more

Mother's age at the birth of the child

- (1) Under 20 years of age (young mothers)
- (2) 20-34
- (3) 35+ old mothers

Family size (Household size)

- (1) 2-4
- (2) 5-7
- (3) 8+

Birth Size -

- (1) Small
- (2) Average and above average.

Type of marriage (1) polygam - if the mother is currently married and her husband has other wife  
(2) Monogam - If the husbands have only one wife

### **CHILD CARE /HEALTH AND ENVIRONMENTAL FACTORS**

Diarrhea - If the child had diarrhea in the preceding two weeks the survey.

No of antenatal care visits

- (1) none
- (2) 1-4
- (3) 5+

Weaning age:- Age of the child (in months) when supplimentation started

- (1) 0-4
- (2) 4-6
- (3) 6+
- (4) Not started yet

Vaccination status - If the child recived any or all of the following vaccinations: BCG, DPT Polio, measles

- (1) fully vaccinated- (if s\he took all)
- (2) Partally vaccinated - dif he/shetook from 1 to 3 from the above
- (3) None

Water - Households source of drinking water

- (1) Piped water
- (2) Pumped or protected well and spring
- (3) Surface - which include - river, Lacks ponds etc

Toilet - Toilet type used by the household

- (1) Pit latrin
- (2) none

Groth monitoring - The presence of growth monitering program in the community

- (1) Yes
- (2) No

Out reach groth monitering - The presence of out rich growth service in the community

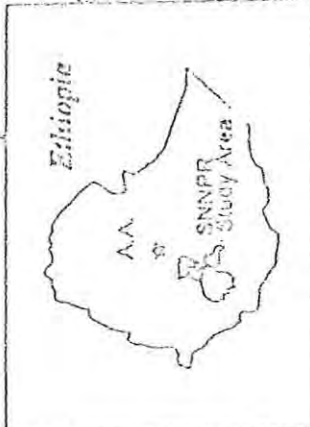
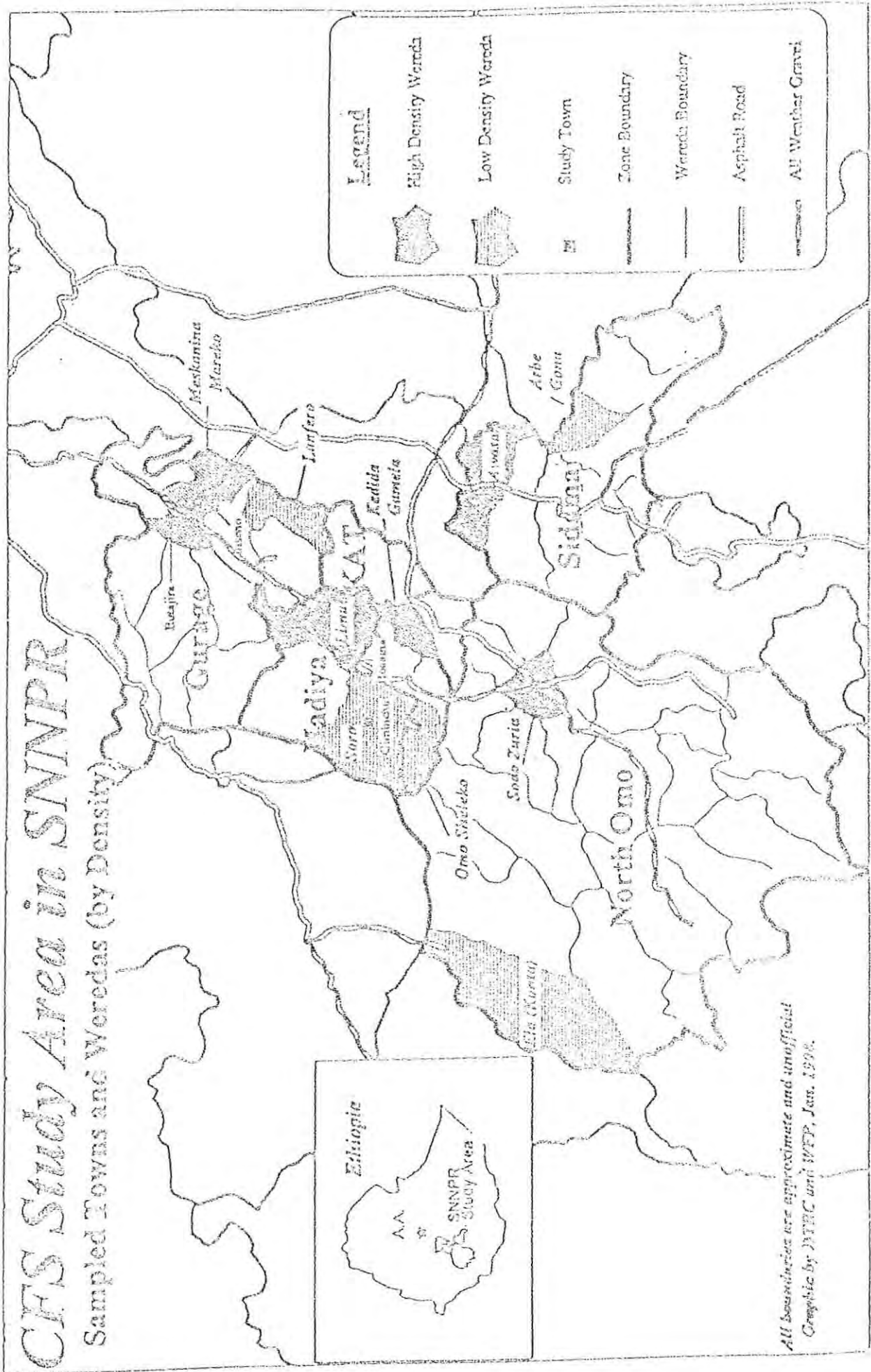
- (1) Yes
- (2) No

Vitamin A supplimentation - The presence of vitamin A supplimmentation service in the community.

- (1) Yes
- (2) No

# CFS Study Area in SNNPR

Sampled Towns and Weredas (by Density)

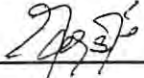


All boundaries are approximate and unofficial  
Graphics by MTRC and WFP, Jan. 1998.

## DECLARATION

I, the undersigned declare this Thesis is my origin work and has not been presented for a degree in this or any other university and that all sources of materials used for the Thesis has been dully acknowledged.

Name Guusa Yimer

Signature 

Place Addis Ababa University

Date June 18 / 1998.

**ADDIS ABABA UNIVERSITY  
SCHOOL OF GRADUATE STUDIES**

**RISK FACTORS OF MALNUTRITION AMONG CHILDREN  
IN SOUTHERN ETHIOPIA**

**GUGSA YIMER**

**JUNE 1998**