ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

RISK FACTORS FOR MATERNAL NUTRITIONAL STATUS : SOUTHERN NATIONS, NATIONALITES AND PEOPLES REGION, ETHIOPIA

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JUNE, 2001

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BY

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILMENT OF THE REQIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN DEMOGRAPHY

JUNE, 2001

ADDIS ABABA UNIVERSITY
School of Graduate Studies

Risk Factors for Maternal Nutritional Status: Southern Nations, Nationalities and Peoples Region, Ethiopia

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ACKNOWLEDGMENT

I would gratefully like to extend my sincere thanks to my advisor Dr. A.P. Deshpande for his valuable comments and suggestions. My special thanks is also extended to Ato Eshetu Gurmu, Coordinator of Demographic Training & Research Centre (DTRC) and other staff members of DTRC for their comments and encouragements.

I would also like to acknowledge DTRC of The Addis Ababa University, and The Population Studies & Training Centre (PSTC), Brown University, USA for allowing me to use their data for this study.

My study could not have been possible without the support of my host institution. I therefore, would like to thank The Ethiopian Health & Nutrition Research Institute (EHNRI) for sponsoring me throughout my study.

Last, but not least a special thanks goes to my wife W/ro Tayitu Assefa; for bearing with me, for the love and care she have given me during my study.

Acronyms :

ACC/SCN	Administrative Committee on Coordination / Sub-Committee on Nutrition
BMI	Body Mass Index
CED	Chronic Energy Deficiency
CFS	Community & Family Survey
DHS	Demographic & Health Survey
DTRC	Demographic Training & Research Centre
EA	Enumeration Area
FAO	Food & Agricultural Organization
KAT	Kembata, Alaba and Timbaro
LBW	Low Birth Weight
MOH	Ministry of Health
MUAC	Mid-Upper Arm Circumference
PA	Peasant Association
PAHO	Pan American Health Organization
PSTC	Population Studies and Training Centre
SD	Standard Deviation
SNNPR	Southern Nations & Nationalities People Region
TFR	Total Fertility Rate
UNICEF	United Nation's Children Fund
WHO	World Health Organization

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Abstract

This study focuses on risk factors for maternal under nutrition and utilized data from the large scale Community and Family Survey (CFS) undertaken in the five densely populated zones (Sidama, Gurage, KAT, North-Omo and Hadiya) of Southern Nations & Nationalities Peoples Region (SNNPR). The survey was cross sectional by design and conducted between early May and early June 1997. This study is based on 935 lactating and pregnant women aged 15-49 years during the survey.

Uni-variate analysis of the data has shown that there exists considerable level of maternal under nutrition. In this study 18.5 % of the women in the region were found out to be moderately and severely under nourished. The problem of under nutrition is higher in rural area (21.0%) than in urban area (6.7%). The level of under nutrition was also higher for women in the age group 15 to 19 years as compared with the remaining age groups. Maternal under nutrition was also found out to be high for women residing in food insecure / inadequate annual income / households, infected by malaria and never used family planning.

Data analysis using the logistic regression model has also shown that a number of variables in the bi-variate model were significantly related to maternal under nutrition; while, few of these variables were significant in the multi-variate mode. As a matter of fact the multi-variate model showed the existence of significant variation in the risk of maternal under nutrition by locational (place of residence and zone) variables. The risk of maternal under nutrition in rural area was 1.64 times higher as compared to the urban area and the risk was higher for Hadiya zone as compared with the remaining zones. It was also identified that women from inadequate food stock / annual income/ households, infected by malaria, in the adolescent age group (15 to 19 years) and those who never used family planning were significantly at higher risk of under nutrition.

The end results of this study indicated that, integrated efforts by various sectors are required to alleviate the overall maternal under nutrition in the study region. Strong involvement of the health sectors to address the health problem and the agricultural sector to increase agricultural productivity could be a long term solution to the problem. Priority attention should be given to the adolescent reproductive age group. Prevention and early treatment of malaria infection as well as promotion of family planning services among the adolescent age group, lactating & pregnant women is also crucial.

CHAPTER ONE

INTRODUCTION

1.1. STUDY BACKGROUND

Nutritional deficits in human being contribute to illness, low weight, and stunted physical and mental development. Maternal nutrition focuses on women as mothers and on their nutritional status as it relates to the bearing and nurturing of children. Women in the reproductive age group in general and those lactating & pregnant in particular are highly vulnerable to malnutrition due to their capacity to meet the vigorous demands of their multiple roles as mothers and productive workers. Many factors influence a mother's nutritional status, ranging from her physiological utilization of food and nutrients during pregnancy and lactation, through the socio-economic influences on food availability and her energy expenditure, to the cultural and educational conditions that affect her ability to utilize available resources.

In many third world countries malnutrition is endemic, fertility rates are high, and women enter the reproductive stage at an early age and subsequently attain high parity. Maternal mortality rates are high, and the incidences of fetal wastage, low birth weight, premature birth, and perinatal death are several times higher than those for industrialized societies (PAHO,1982). Reproductive Risk is one dimension of maternal health and nutrition problem facing Africa. In a reproductive risk assessment based on standard health indicators, 18 of 20 countries in the highest risk category are African

and Ethiopia is one of them. Reproductive risk includes negligible contraceptive use, very high fertility and staggeringly high levels of maternal mortality (Population Action International, 1995).

Mothers living in developing countries are often exhausted by the combination of pregnancy and child birth which can end in the loss of their lives. The proportion of time women spend under total nutritional stress during the 35 year reproductive period varies from country to country and it is high for developing countries. Over their reproductive life span, third world women conceive and bear six to eight children, whom they nourish through their bodies. Because of the high energy and nutrient demands of pregnancy and lactation, women spend a large proportion of their reproductive years under possible nutritional stress . Women in Kenya and North Sudan spend 46.8% and 37.7% of their reproductive life either pregnant or lactating respectively (ACC/SCN, 1990).

In Africa, under nutrition may also be caused or worsened in women by chronic or seasonal household food insecurity; inadequate quality of the diet consumed; poor nutrient utilization due to high rates of morbidity, limited access to health services; and cultural beliefs and customs that restrict women's ability to seek appropriate dietary practice & care that do not promote healthy behaviours. Heavy physical labour; intra-household food distribution that discriminates against women and reproduction (McGuire & Popkin 1989) are also the causes of maternal under nutrition. Women's poor health and under nutrition are also partially the result of cultural factors that limit

women's access to education and other resources, and their decision-making power in community and family relationships and norms regarding their social status.

Sub-Saharan Africa with the highest world fertility and a number of reproductive risk factors is one of the most affected regions with regard to women's nutritional status. In the Sub-Region, the average maternal mortality rate is 590 deaths per 100,000 live births. This rate for Ethiopia is worse than for Sub-Saharan Africa and it is estimated to be between 700 and 1000 per 100,000 live births (MOH, 1996). Sub-Saharan Africa has the highest maternal mortality at 1:20 as compared to industrialized countries, 1:3600 (UNICEF, 1993a). This is due to many risk factors and maternal malnutrition has a significant contribution. Reproductive risk is heightened by frequent childbearing. Ethiopia is among having the highest fertility nations in the world. On an average, Ethiopian women have 6.52 children during their reproductive life and this figure is 6.91 for SNNPR which is the highest next to Oromia (CSA,1994).

Maternal under nutrition was found to be the cause for about 80% of the low birth weight (LBW) babies in developing countries due to intrauterine growth retardation, (Brems and Berg, 1988). LBW babies have a 30 times greater risk of prenatal mortality than infants of normal birth weight (Tinker and Post, 1991). The impact of women's poor nutritional status on reproductive outcomes is striking. Since maternal nutritional status is an important underlying determinant of birth weight, low birth weight infants are more likely to die in the first months of life. From retrospective study of over 10,000 perinatal deaths, (Mehta, 1980) found that 75% were associated with low birth weight.

Ethiopia is one of the Sub-Saharan African country with high infant mortality rate of 105 per 1000 live births (CSA, 1993) and it is estimated that about 13% of the Ethiopian children are born low birth weight (UNICEF, 1989). At the population level, a low birth weight rate greater than 10 percent indicates a high prevalence of under nutrition among women of reproductive age. Low birth weight data for 40 sub-Saharan African countries show that in all but five countries, more than 10 percent of babies are born with low birth weight. This high proportion of LBW infants in many Sub-Saharan African countries is substantially attributable to maternal malnutrition prior to and during pregnancy. After birth, maternal nutrition affects child growth and mental capacity as well as a mother's ability to care for her child. Low birth weight and/or immature and malnourished infants born to such women are vulnerable to life-threatening diseases and nutritional problems (ACC/SCN, 1990).

Maternal malnutrition also affects the amount of breast milk out put. Studies carried out in different population groups seem to indicate that mean breast-milk output in mothers from privileged populations tends to range from 600 to 900 ml/day and volumes of breast milk reported for women in countries with under nutrition and poor living conditions are about 400-700 ml/day in the first six months, 300-600 ml/day in the second six months (R. G. Whitehead, 1983), and 300-500 ml/day in the second year (D. B. Jelliffe ,1978).

In addition to their reproductive roles, women contribute to their nation's economic development by caring for their families and engaging in income-generating activities,

farming, and other productive labour. Under nutrition diminishes women's potential contribution to their family, community, and nation. It reduces productivity, decreases income-earning capacity, and increases health care costs. Moreover, the productivity potential of women is critically hampered by under nutrition (Phillip P., et al.,1994).

Malnutrition plays a key role in maternal mortality, just as in infant and child death. High maternal mortality is a reflection of women's under nutrition, poor health status and high fertility (ACC/SCN, 1990). Next to young children, pregnant & lactating women are nutritionally the most vulnerable group, especially in the developing regions of the world (WHO, 1965). However, recognition about the needs of these mothers have been neglected and much of the international focus has been on interventions related to child health and their nutrition.

From the point of view of identifying pre-disposition to maternal malnutrition little is known about risk indicators such as characteristics of socio-economic profile, fertility patterns, educational levels, work involved in obtaining water and fuel or health related factors in Ethiopia in general and in Southern Nations & Nationalities Peoples Region (SNNPR) in particular. Therefore, controlled study of these and other characteristics as indicators of predisposition to malnutrition are relevant.

This study focuses on women who are lactating and pregnant at the time of the survey, and this is due to the fact that these women are more vulnerable to under nutrition in developing countries like Ethiopia. Besides the many roles played by

women, pregnancy & lactation adds stress on the women due to the extra energy requirement. The average daily energy requirement of lactation and pregnancy is about 700 & 200 Kilo-Calories respectively (Worthington-Roberts B. S., 1985), and it is difficult to fulfil this requirements for poor women in developing countries .

The SNNPR is heterogeneous in ethnicity, religion, culture and agro-ecology and it is also characterized by high level of fertility and low status of women. It is, therefore justifiable to identify risk factors for maternal malnutrition from large scale survey & heterogeneous population for appropriate intervention.

1.2. SIGNIFICANCE OF THE STUDY

Since maternal under nutrition is a serious problem in developing countries like Ethiopia, actions to improve maternal nutrition should be foreseen at any time in the reproductive life of women. This study will therefore attempt to identify the risk factors of maternal malnutrition and the implications will hopefully help for designing programs by various governmental offices such as Ministry of Agriculture (MOA), Ministry of Health (MOH), Ministry of Education and other Non Governmental Organizations (NGOs). The results also serve as supplement to the existing knowledge with regards to maternal nutrition in Ethiopia.

1993). In general 90% of rural households are food unsecured. The majority of rural households are affected by either chronic or transitory food shortages and urban household are using more than 80% of household income to acquire less than 71 per cent of daily caloric requirements.

Education of mother is inversely related to fertility and infant mortality. This enhanced child survival may be due to better hygiene and improved nutrition and feeding practices and family medical intervention of the mother & children. Illiteracy among women is also a measure of the status of women, which are important variables influencing intra-household allocation of food (UNICEF Ethiopia, 1993).

Women who receive even a minimal basic education are generally more aware than those who are illiterate of the need to utilize available resources for the improvement of the nutritional status for themselves and their families. Schooling may enable women to take independent decision, be accepted by other household members and having greater share of household resources becoming available to women and children . This in turn has an effect on their own nutritional status and that of their children (ACC/SCN, 1990 as cited by D'Souza and Bhuiya, 1982).

Studies in Sub-Saharan Africa showed the higher the level of education, the lower the percentage of mothers who are undernourished (DHS,1997).

1.4.2. BIO-DEMOGRAPHIC FACTORS

Various literatures have shown that, a number of bio-demographic factors were found to affect maternal under nutrition. These include, parity, maternal age, birth interval, age at first marriage and physiological status.

Maternal age, age at first marriage and parity are important reproductive risk factors of maternal depletion that are more likely to occur in countries with high fertility levels like Ethiopia. Studies in some Sub-Saharan African countries showed differentials in the magnitude of Chronic Energy Deficiency (CED) among women at different ages during their reproductive years. Studies in Burkina Faso, Ghana, Malawi, Namibia, Niger, Senegal and Zambia, showed a greater proportion of mothers aged 15 to19 and 40 to 49 exhibit chronic energy deficiency. The percentages are particularly high in Namibia, Niger, and Senegal (DHS, 1997). The high level of CED at younger age (15-19) is likely due to the competing demand for nutrient between the mother and the foetus, while the old age under nutrition may be due to maternal depletion associated with high parity. Though the relationships may not always been consistent, age of the mother have been found as determinants of health care use (Lesile J. and G.R. Gupta, 1989). When fertility is high, pregnancies are often closely spaced, allowing women little time to regain lost or absent fat and nutrient stores (ACC/SCN, 1990). Studies in Burkina Faso, Ghana and Niger showed chronic energy deficiency by mother's parity, with high values at parity 1 and 6+ and low values at parity 4 to 5 (DHS, 1997).

In many developing countries, women spend a significant number of years either pregnant or lactating or doing both at the same time. Between the ages of 18 and 45 years, some women in Sub-Saharan Africa spend as much as 28 percent of the time pregnant and 65 percent lactating (Helen M. Wallace, *et al* 1995). The average woman in Sub- Saharan Africa bears her first child at age 19 and her last child when she is 38 or 39. She spends about 25 years with at least one child under six years of age (UNICEF, 1993b). These reproductive years are periods of nutritional stress, related to frequent, closely spaced pregnancies. During pregnancy and lactation, women's requirements for various nutrients increase. These needs are often not met and may lead to maternal depletion. The number of children ever born and the time intervals between them strongly influences the needs of the mother and the outcome of pregnancy. each pregnancy is a period of physiological stress that drains nutritional resources, and time is required between pregnancies to rebuild these resources (Worthington-Roberts B.S., 1985).

High percentages of chronic energy deficiency are associated with short birth intervals while high percentages of obesity are associated with long birth intervals. The highest prevalence of chronic energy deficiency is observed among mothers with first births (DHS, 1997 ; Worthington-Roberts B.S., 1985; ACC/SCN, 1990).

Women tend to lose weight during lactation which affects their nutritional status. Studies in many countries showed the mean BMI (measure of nutritional status) is lower for lactating mothers (DHS 1997). Mean duration of breastfeeding in Africa is

around 19 months for each child and taking into account the Total Fertility Rate (TFR) of 6.5 for African women, cumulatively are lactating for more than 12 years. Breastfeeding have substantial food cost and it is estimated that the average increase in calorie requirement due to lactation is estimated around 20 % which becomes an additional burden on the limited family budget. Whenever those needs not met, then the women suffer from chronic under nutrition (ACC/SCN, 1990) and the problem will be aggravated with increased duration of breastfeeding .

There are countries where more than half of first pregnancies occur in girls below 18 years of age, before the adolescent has reached her full physical, mental, and social maturity, with harmful effects on the mother and child. Marriage frequently leads to early pregnancy. In a study of selected developing countries, between one-half and three-fourths of all first births among married women occurred within the first two years after they entered a union (Helen M. Wallace, *et al*, 1995). Teenage pregnancy threatens the health and nutritional status of mother and foetus, with both competing to meet their growth needs. There is a higher rate of low birth weight infants born to adolescent mothers due to maternal under nutrition. The risk of maternal death is three times higher for teenage mothers than for women 20-29 years of age (UNICEF, 1995a). Teenage pregnancy has always been the norm where child marriage is prevalent in countries like Ethiopia. In most developing countries (28 of 38 with available data), births to teenage women account for 10% or more of all the births . The mean age at marriage in SNNPR is estimated to be 16.6 years (DTRC and PSTC, 1998) and this is among the lowest in the world.

1.4.3. HEALTH RELATED FACTORS

Health services are a necessary component of any strategy to improve female nutritional status. Access to MCH services ensure a long inter birth interval, providing time for the woman to build up her nutrient stores and care for the child. Prenatal care also offers an opportunity to inform women of their nutritional requirements, distribute iron-foliate tablets, and identify risk factors such as malaria and anaemia (ACC/SCN, 1990). However, the health care systems of most developing countries including Ethiopia, might be characterized by a too far from home, too few trained birth attendants, too poorly equipped to identify or handle complications, and too deficient in quality of care.

Many African women either lack access to health services or do not seek prenatal care. For example, the number of women receiving adequate prenatal care, as indicated by the proportion of pregnant women receiving prenatal care in 1993-94, was less than 20 percent in Angola, Mali, Ethiopia, Madagascar, and Lesotho and a high level of maternal malnutrition was observed in these countries (UNICEF, 1995b).

In Ethiopia, the health infrastructure is very weak. Health coverage, defined as population living within 10 kilo-meters from a health facility, is 46%. This means that the majority of the population has no access to modern health services of any kind (UNICEF, 1993).

Another major factor affecting women's nutrition is morbidity and it is an immediate cause of malnutrition since it affects the dietary intake of the person . The synergistic relationship between health and nutritional status is evident in several ways. Malnutrition increases an individual's vulnerability to disease and heightens the severity of the disease. At the same time, disease often undermines nutritional status (WHO, 1994). Hookworms and other parasites also attach themselves to the mucosa of the small intestine and ingest small amounts of blood each day. Many women in Ethiopia live in areas where malaria is highly endemic or epidemic-prone. Malaria also tends to worsen women's nutritional status especially during their pregnancy, since it destroys red blood cells. In addition to contributing to anaemia, worm infection, malaria has other adverse consequences, including anorexia and decreased food intake and fatigue and this will lead to malnutrition (ACC/SCN,1997).

In many parts of the world uncontrolled fertility and malnutrition co-exists (Echols, J.R.; 1976). Birth control achieves it's greatest impact on nutrition by preventing pregnancies among women at high risk for obstetrical complications and poor pregnancy outcomes. Such a high risk group includes teenage women of high parity and late maternal age (Zackler, J..1969) and chronically malnourished women of any age. Birth control allows parents to space pregnancies at greater interval. Longer intervals improves are the prospect for favorable pregnancy outcome and allow the mother to make a fuller physical and nutritional recovery between births. In conditions of uncontrolled fertility and chronic malnutrition the introduction of birth control can reduce the nutritional stress on the malnourished mother and her family (Worthington-

Roberts B.S., 1985). Women start their reproductive function at an early age, and the sequence of pregnancy followed by about 2 years of lactation until a new pregnancy occurs, will be repeated many times if no effective family planning method is available. A major requirement for safe motherhood is therefore the prevention of high-risk and unplanned pregnancies (WHO 1994d), together with adequate birth spacing. Women in Ethiopia are among the least to use family planning in the world. Only fewer than 8 % of women in the reproductive age group use contraceptive in Ethiopia (MOH, 1999) and this contribute for the high level of Total Fertility Rate (TFR) in the country.

1.4.4. WORKLOAD / ACTIVITY FACTORS

It is common for women to maintain a high level of physical activity throughout pregnancy in developing countries like Ethiopia. Women's nutritional status is affected by their physical work and energy expenditure. Poor access to water, fuel, and other basic household necessities encroach on the mother's energy, time, and health. African women are engaged in many activities that are physically demanding and require high levels of energy expenditure. During the farming season, the average rural Zambian woman spends about 14 hours a day on tasks with moderate and heavy energy expenditure (Fishman and Hansch, 1995). Rural and nomadic Ethiopian women work for 15 to 18 hours a day and are said to be responsible for 50.0% of the subsistence agricultural production (Almaz Eshete, 1991). Although inter regional variations exist in gender division of labour that are task specific , generally Ethiopian women participate in weeding , applying manure and grain processing , food storage

and keep sheep & goats. They also engage in trade and take full responsibility for child care. Another workload and time use study in four peasant associations of West Gojam ranked-ordered nine activities of women considered hardest by the women with grinding, water collection, agriculture, fuel collection and food preparation as holding the first five highest positions (Zewdie Abegaz & Barbara Junge, 1990).

Many studies on women's roles in developing countries showed that for poor women pregnancy and lactation do not interrupt the flow of daily activity. In communities where women carry heavy economic responsibilities, often as the sole or primary supporter of their children, neither pregnancy nor lactation can be allowed to disrupt the pattern of work. Under such circumstances, when food availability is also constrained, the physiological burden of pregnancy and lactation is immense.

The main contributors to women's workload vary in different ecologies. They may be year round or seasonal. Fetching water and fuel are two common chores that may take many hours and use much energy. Fetching & carrying fuel long distance may use around 200-300 K cal/day or more (Worthington-Roberts B.S.,1985). Saving this energy could have a marked effect on maternal nutrition.

For the average rural Ethiopian woman, roughly an extra 170 calories per hour will be expended while walking to the water point and 210 calories per hour will be expended returning with a full pot. Distance to the source, rugged terrain, the heavy weight of

water containers and adverse seasons which further distance the source and dictate longer hours for collection are all major problems related to water availability (UNICEF Ethiopia, 1993).

Degree of physical work during pregnancy may also affect the health & nutrition of the mother and the outcome of pregnancy. Several investigations demonstrate that pregnancy weight gain and pregnancy outcome (birth weight) improve if a woman maintains energy balance by reducing physical work to counter-balance reduced dietary energy intake (N. Taferi, et al., 1980, Huffman, 1988).

Heavy physical labour has also a negative impact on pregnancy weight gain. In a study in Ethiopia, the calorie intakes of pregnant women participating in high and low levels of physical activity were compared. Both groups consumed similar diets that contained approximately 1,600 kcal per day. Women who participated in heavy activity gained an average of 6.5 kg during pregnancy, while women engaged in low levels of physical activity gained, on average, 9.2 kg, nearly 3 kg more than the women involved in heavy labour (Taferi, et al. 1980, Huffman, 1988).

Low birth weight is not only an indicator of the child's nutritional status but also of the mothers. Studies on the relationship between women's workload and weight gain in pregnancy or low birth weight in infants indicate that heavy workloads do affect women's health and nutrition. A study in Ethiopia found that women engaged in heavy

labor had weight gain in pregnancy of 3.3 kg, while less active mothers gained 5.9 kg (N. Taferi et al. 1980).

1.5. THE STUDY HYPOTHESIS

1. Mother's education level and household food security are positively related with maternal nutritional status.
2. The lower the age at first marriage the higher will be the maternal under nutrition.
3. Involvement in heavy Physical labor activity such as fuel collection and/ water fetching is negatively related to nutritional status of the mother.
4. Family planning non use have a positive relationship with maternal under nutrition.

CHAPTER TWO

THE STUDY AREA AND METHODOLOGY OF THE STUDY

2.1. THE STUDY AREA & DATA SOURCE

The Southern Nations, Nationalities and Peoples Region (SNNPR) have a land area of 117,506 and it accounts for 10.4% of Ethiopia's total land area. The region delineated in to nine zones and five special woredas and characterized by three main agro-ecological zones i.e., high land, middle land and low land. Fifty six percent of the region is highlands, 37% middle lands, and 7% low lands.

The Region is the home to 11.1 million people which is about 20% of the total Ethiopian population constituting more than 45 language and ethnic groups (DTRC and PSTC,1998) , most of whom live in extremely poor rural communities. The region is one of the least urbanized in the country with only 6.8% of the population living in urban areas. The region has the greatest population density, varying significantly within zones from 2.3 persons per square kilometres in selemago, South Omo to about 670 in Damot-Gale, North Omo

Sidama; South Omo; Hadiya; Guraghe and Kembata Alaba Timbaro (KAT) are the most densely populated Zones of the Region that constitute 78% of the Regions total population (CSA, 1994). These five Zones were purposely selected for the study based on ethnics, religion and agro-ecological diversity, their high population density,

and their contiguous location in the Northern part of the Region. The excluded Zones and special woredas (districts) have a low population density comprised of scattered, sedentary and nomadic people.

The data source for this study is , the Community & Family Survey (CFS), carried out from beginning of May to beginning of June 1997 in the five densely populated zones (Sidama; South Omo; Hadiya; Guraghe and KAT) of SNNPR. One component of the survey was maternal nutrition and the present study utilizes data collected in this survey. The survey was undertaken by the Demographic Training & Research centre (DTRC) of Addis Ababa University (AAU) in Collaboration with the Population Studies and Training Centre (PSTC), Brown University ,USA.

2.2. SAMPLE DESIGN AND SELECTION

The survey was multi purpose and complex. It was targeted community leaders (key informants), households, women aged 15 to 49 with in the households, and children. The sampling design combined stratified random sampling proportional to population size and all urban & rural areas in the five zones were included in the sampling frame.

The sampling frame made use of the regions administrative structure. The administrative structure is organized first by Zones, then Woredas, then by peasant associations (PAs) in the rural areas and kebeles in the urban areas. For the rural sample, ten woredas (two per zone) were selected randomly after stratification into

high (more than 300 person per square kilometer) and low (less than 300 person per square kilometer) population density. The Central Statistical Authority in 1993 divided each PA in to enumeration areas (EAs), areas of roughly 175 households each. The primary sampling units in this survey were these EAs and the secondary sampling units were households.

The target sample size for rural areas was 2000 households, or 400 households per zone. This was the minimum number needed to identify significance difference between zones. The selection involves four stages: i.e. woreda, PAs, Eas and households. In each zone woredas were stratified into low and high density. Then one low and one high density woredas were randomly selected from each zone and resulted in selection of ten woredas. From each woreda using simple random sampling technique two Pas were selected and results in selection of 20 PAs. From each selected PA, one enumeration area was selected using simple random sampling. Then 50% of households were selected from each selected EAs, using systematic sampling.

The target sample size for urban areas was 500 households. The urban sample is representative of the surveyed zones as a whole; no attempt was made to produce separate representative urban samples for each zone. The urban residents of the five selected SNNPR zones were divided into 224 enumeration areas. Ten of the 224 EAs were selected using simple random sampling method. One third of the households in

these EAs were selected for inclusion in the study, by using a systematic sampling procedure .

The 20 rural Peasant associations and the 10 urban EAs selected for sampling formed the sampling frame for the community level interviews. The survey Wereda coordinator was responsible for identifying four to five key informants and knowledgeable, religious leaders, health workers, school teachers, or agricultural extension agents, community leaders in the formal or informal positions. The people had to be permanent residents of the community. They could include PA or Kebele officials.

The total sample size targeted was 2500 households (2000 from rural & 500 from urban). From these targeted households; an overall anthropometric (mid upper left arm circumference) measurement was taken from, 2381 women aged 15 to 49 years . Among these women 935 of them were found to be either lactating or pregnant (753 lactating and 182 pregnant) and hence; this study is based on these 935 pregnant or lactating mothers.

The major survey instrument for the survey (CFS) was interview using various questionnaires. These questionnaires were designed to collect information at the household level, individual women (age 15-49 years) and community level. Besides the interview Mid-Upper Left Arm Circumference (MUAC) measurement for women in of reproductive age of 15-49 years in the selected households were undertaken.

2.3. STUDY VARIABLES

2.3.1. THE DEPENDENT /OUTCOME/ VARIABLE

Mid-Upper Arm Circumference (MUAC) is a measure of nutritional status that reflects both fat and lean tissue stores and highly correlates with weight for height (BMI). MUAC has recently emerged as a potential screening tool for poor nutritional status in Adults (ACC/SCN,2000). The major drawback of MUAC is that , unlike BMI, it may not be useful as a monitoring tool, since it changes little when weight gains are low.

MUAC, measured in centimetres(cm) and which is below 22.5 cm is considered as under nutrition (ACC/SCN, 1993). In this study, we will take MUAC below 22.5 cm as an indication of moderate to severe under nutrition and the rest (22.5 cm & above) as normal maternal nutritional status.

Arm circumference is an indicator , a single measurement , which in its own right has certain properties as well as properties related to other indicators such as weight. It is important to look at it when weighing mothers is not an option. In such situations, arm circumference is used as proxy for weight; in order for it to be valid proxy arm circumference has to be related to weight.

Recent evidences indicate that maternal arm circumference can be used as an indicator of maternal nutritional status in pregnant women because of its high correlation with maternal weight or weight for height (Huffman et al. 1985, Anderson

1989) and as a tool during pregnancy to screen for risk of low birth weight and late fetal and infant mortality (Lechtig 1988, Krasovec 1989, Anderson 1989). The practical advantage of arm circumference compared to other anthropometrical indicators are that it is simple to use ; inexpensive to purchase and maintain; easily portable for home visits or outreach work; and made for or easily adaptable to use in tropical climates. Its use requires minimal levels of training and retraining; the necessary equipment is readily available; and it makes it possible to assess risk in a single visit.

The components involved in the measurement of arm circumference include bones, muscles, nerves, blood vessels, fat and skin. Bone ,nerves, and blood vessels do not show much variation unless there is some pathology in those structures

In developing countries where the weight gain in pregnant women is very low, at most 1-2 kg of weight gain might be deposited as maternal fat, which is found mainly on the abdomen region and negligible part of this is found in the arm. This has been shown in several studies , in developing countries , where there is little weight gain during pregnancy , there is little change in arm circumference. Thus, arm circumference can be used in developing countries as a screening tool to detect the nutritional status of women.

2.3.2. THE INDEPENDENT /PREDICTOR/ VARIABLES :

Maternal age, age at first marriage, children ever born (parity) , ever use family planning, maternal education, maternal morbidity, household assets /wealth/ , maternal access to health service , involvement in fetching water and fuel, household chores, residence (urban, rural) and study zone.

2.4. SAMPLING WEIGHTS

The purpose of sampling weights is:

i. To compensate for unequal probabilities of selection in the survey

ii. To adjust for non-response and not found (vacant) households. The weights are adjusted at the Primary Sampling Unit (enumeration area), level so that the samples in each zone reflect the number of households obtained from the 1994 Census. The weights are proportional to the inverse of the selection probabilities through all stages of the sample selection process.

Adjusted weights are calculated as:

$$W_{ak}=(W_k / \sum_i W_i)/(N_k / n_i)$$

Where;

W_{ak} is the adjusted weight for enumeration area $_k$;

W_k is the preliminary weight based on inverse of cumulative probability of selecting a household at EA $_k$;

$\sum_i W_i$ is the sum of four EA preliminary in a give zone$_i$;

N_k is total number of rural households in zone i, obtained from 1994 Censuses;

n_i is the number of sampled households in EA i with complete information

For urban areas, only one sample weight is needed : the ratio of the number of households in urban areas in 1994 to the number of urban households with complete interviews.

2.5. METHOD OF DATA ANALYSIS

Uni-variate (simple descriptive statistics) analysis of all variables and bi-variate (χ^2-test) association of the dependent variable with each of the independent variable was performed. For the bi-variate analysis statistical significance at $p< 0.05$ was considered based on the chi-square statistics.

Since the interest of this study is to identify lactating or pregnant mothers at risk of under nutrition, the outcome variable was coded as 1 if , the mother was undernourished and it was coded as 0 if she was not undernourished (normal). The logistic regression model is used to see the relationship between a dichotomous dependent variable and any independent variable controlling for the remaining independent variables in the model. This model is applied to see the relative importance of each predictor variable to the outcome variable (nutritional status). The

logistic regression model for K independent (x_1, x_2, ..., x_k) variables is therefore given by:-

$$\text{logit } P(x) = a + \sum \beta_i x_i \; ; \; i = 1,2,...,k$$

where, β_i**'s are regression coefficients**

a= constant

exp(β_i)= odds ratio

The odds ratio is determined from the regression coefficient and it tells us the change in the nutritional status per unit change in the independent variable. Significant levels of regression coefficients were determined by the Wald Statistics and P-values less than 0.05 were considered to be significant. Statistical package for social sciences (SPSS/PC+) was used to analyse the data.

2.6. DATA QUALITY ASSESSMENT

2.6.1. Age Data

Existence of errors in the age data is manifested in clustering of ages ending in some digits and deficiencies at ages ending in others. the tendency of respondents and/ or enumerators to report certain ages at the expense of others is termed the age heaping or age preference or digit preference. Therefore it is necessary to evaluate the quality of age data before analysis.

Whipples Index is a test usually employed to measure age preference for terminal digits "0" and "5" as compared to other digits. If the age data is accurate, value of Whipples index is expected to be 100. The rating of the quality of age data for different values of Whipple's index is as follows.

Quality of data	Values of Whipple's index
Highly accurate data	less than 105
Fairly accurate data	105-109.9
Approximate data	110-124.9
Rough data	125-174.9
Very rough data	175 and above

The information on age of lactating and pregnant mothers was obtained either from direct reporting of the respondent or from age calendar. Among the 935 study subjects 185 reported that their age ending with digit "0" and 140 ending with the digit "5". The Whipples index for age ending with "0" and "5" digits was found out to be 173.8 and this shows that the age data is not a very rough, but it is a rough data. According to the Whipples index, there is a preference for age ending with "0" digit followed by digit "5" and from this data it is observed that there is a tendency to report ages ending in "0" or "5" at the expense of the other digits. Age misreporting is common in developing countries and Ethiopia is not an exception. Age in most cases is imputed either by the respondents and / or enumerators on the basis of linking the probable age with some presumably known events. It may happen that some people even fail to give clues from which their ages can be estimated. In such a situation the estimation of age falls

in the hands of the enumerators and this did not mean that such data is completely irrelevant.

2.6.2. Anthropometric Measurement (MUAC)

The quality of data on the dependent variable (MUAC) can be studied by looking at the distribution of missing values (not present, refused or other) responses. From Table 1, below it can be observed that there are few (2.4%) missing cases which indicate that the quality of the data is good. In rural study sites missing responses are slightly higher than urban areas, however, that could be due to high sample size in the rural areas.

Table 2.1. Percent distribution of women not measured by reason, SNNPR- CFS, 1997.

Variable	Percentage not measured	Percentage for not measurement	
		Not present	Refused/ sick
MUAC-Urban	1.9	75	25
-Rural	2.5	66	34
Total	2.2	68	32

2.7. LIMITATIONS OF THE STUDY

There are a number of methodologies for measuring the response variable (nutritional status) of pregnant and lactating mothers. These include, information on clinical investigations, bio-chemical analysis and dietary intake of the mother; however, information on these measures is lacking. Therefore , this study is limited to MUAC measurement.

Food taboos and cultural factors and intra household food allocation among members of the household are important factors that influence the nutritional status of lactating and pregnant mothers. However, these factors could not be included in the study due to lack of information.

This study is based on data collected at one point of time (cross sectional data), and it suffered from limitations of cross-sectional studies. Hence; it is difficult to establish causal relationship between exposure and outcome variables.

Information on toxic substances like smoking, drinking alcohol and drug abuse is not included in the survey.

CHAPTER THREE

RESULTS OF THE STUDY

3.1. GENERAL CHARACTERISTICS OF THE STUDY POPULATION

Table 3.1. Presents the percentage distribution and number of lactating and pregnant women under study by selected general characteristics.

This study is based on a total of 935 lactating and pregnant women or most of the study subjects (79.8%) were lactating. The majority of these study subjects (82.6%) were taken from the rural area. The proportion of lactating & pregnant women under study was highest (33.2%) for Sidama zone, followed by Hadiya (22.2%), Gurage (21.0%), KAT (12.6%) and North Omo (11.0%). Most of the study subjects (79.0%) were illiterate and the remaining (21.0%) could at least able to read and write. The observed age distribution the women showed that majority of the women (29.2%) were in the age group 25 to 29, followed by age group 20 to 24 (23.5%), age group 30 to 34 (22.4%), age group 35 to 39 (20.4%) and the least number of women were in the age group 15 to 19 (4.5%). About 17.3 % of the women had 0 or 1 live births in their life and 3.2% of these were not experiencing birth; but, only pregnant during the survey. Most of the women (47.0%) had 2 to 4 live births, while some 35.8% had 5 or more live births. With regards to marital status 95.6% of the women were married, while the other 4.4% were single, divorce, widowed or separated. For the majority of the study women (71%) their first marriage was below 19 years of age.

Table 3.1. General characteristics of lactating and pregnant mothers , SNNPR-CFS,1997.

Characteristics	Percent	Number of Women
Residence		
Urban	17.4	163
Rural	82.6	772
Physiological Status		
Lactating	79.8	753
Pregnant	20.2	182
Zone		
Gurage	21.0	196
Hadiya	22.2	208
KAT	12.6	118
North-Omo	11.0	103
Sidama	33.2	310
Literacy of Mother		
Illiterate	79.0	735
Literate	21.0	200
Age group of Mother		
15-19	4.5	42
20-24	23.5	220
25-29	29.2	273
30-34	22.4	209
35-49	20.4	191
Parity		
0	3.2	30
<= 1	17.2	161
2-4	47.0	439
5+	35.8	335
Marital Status		
Married	95.6	896
Others	4.4	41
Age at First Marriage		
<= 18	71.0	666
19+	19.0	269
Total	100.0	935

3.2. DIFFERENTIALS IN MATERNAL NUTRITIONAL STATUS

3.2.1. MATERNAL UNDER NUTRITION BY LOCATIONAL FACTORS

Table 3.2. Presents the percentage (weighted) under nutrition, association with under nutrition and mean MUAC for lactating and pregnant women under study by locational variables.

The overall level of protein energy under nutrition for the region among lactating and pregnant women was found out to be 18.5%. The overall mean Mid-Upper Arum Circumference (MUAC) was 24.18 centimeters. It was also observed that the level of under nutrition was highest (21.0%) for rural area, while it was only 6.7% for urban area. The proportion of under-nourished women was highest for Hadiya zone (27.9%), followed by KAT (23.7%), North–Omo (23.3%), Gurage (13.3%), and the least was for Sidama zone (11.9%). It was also observed that the mean MUAC was higher for Sidama zone (24.74 cm) and the least for KAT (23.36 cm).

Table 3.2. Percentage (weighted) undernourished, the association with under nutrition and mean MUAC for pregnant & lactating mothers by locational Factors, SNNPR-CFS, 1997.

Variables	Percent Undernourished MUAC <22.5 cm	χ^2 Value and significance	Mean MUAC(cm) ± S.D.	Percentage of Women
Residence:				
Urban	6.7	18.1***	25.64± 2.35	17.2
Rural	21.0		23.87± 1.85	82.8
Zone:				
Sidama	11.9	28.28***	24.74± 1.94	33.1
Gurage	13.3		24.29± 1.90	21.0
North-Omo	23.3		23.54± 1.81	11.0
KAT	23.7		23.36± 1.49	12.6
Hadiya	27.9		24.02± 2.49	22.3
Total	18.5		24.18± 2.06	100.0

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.2.2.MATERNAL UNDER NUTRITION BY SOCIO-ECONOMIC FACTORS

Table 3.3. Presents the percentage (weighted) under nutrition, the association with under nutrition and mean MUAC for lactating and pregnant women under study by socio-economic variables.

It was hypothesized that food security is a necessary component for improving the nutritional status of household members. In this study adequacy food stock in the household till next harvest in the rural area and adequacy of annual income in the urban were taken as a measure of household food security. According to the results of the study based the majority of the pregnant & lactating women (66.0%) were from inadequate (food stock or income) households and only 34.0% of them were from adequate (food stock or income) households . Generally under nutrition was higher for women living in inadequate food stock or income households. The proportion of under nourished lactating and pregnant women were higher for households with inadequate food stock or income (22.0%) than for adequate (12%) households. Similarly it was also found that the mean MUAC was higher for adequate food stock or income household mothers (24.4 cm) than inadequate (24.03 cm) households.

Generally, the larger proportion of under nutrition in lactating and pregnant women was observed among the illiterate (19.6%) as compared with literate (read and write or

higher) mothers (14.5%). Percent under nutrition further decreases to 10.0% as the level of education of the mother is beyond elementary school (grade 7^{th} and above).

The economic status of the pregnant and lactating women was determined from variables related to household possessions (resources) and dwelling characteristics: possession of radio, television, radio cassette, oxen, cows, plows, bicycle and roof material. Based on these variables three economic status setted were: as very low, low and medium and higher socio-economic status. Accordingly, 50% of the women were from the very low socio-economic status, 39.0% were from low economic status and the remaining 11.0% from middle or higher economic status. The larger proportion of under nourished , lactating & pregnant mothers were found in the very low economic status (21.6%) , followed by low (16.2%) and it is least for medium and above (13.1%) economic status households.

Points were assigned with the following criteria: possession of working radio, cassette recorder, television, kerosene stove, bicycle, plow a woman received 1 point, other wise zero point. Materials of the roof 1 point if corrugated iron sheets zero point otherwise. Ownership of oxen or cows, two points if more than 2, one point if 1 or 2 and zero point they don't have.

Table 3.3. Percentage (weighted) undernourished, the association with under nutrition & mean MUAC among lactating and pregnant women by socio-economic factors, SNNPR-CFS, 1997.

Variables	Percent Undernourished MUAC <22.5 cm	χ^2 Value and significance	Mean MUAC(cm) ± S.D.	Percent of Women
Adequacy of food stock/ Annual Income:				
Adequate	12.0	13.72***	24.47± 1.98	34.0
Inadequate	22.0		24.03± 2.09	66.0
Education level :				
Illiterate	19.6	4.19	24.05± 1.98	78.4
Literate	17.0		24.69± 2.26	21.6
Elementary	19.2		24.29± 2.09	12.2
7th and above	10.0		25.13± 2.36	9.4
Economic status:				
Medium +	13.1	5.25*	24.96± 2.28	11.0
Low	16.2		24.37± 1.95	39.0
Very low	21.6		23.85± 1.88	50.0
Total	18.5		24.18± 2.06	100.00

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.2.3. MATERNAL UNDER NUTRITION BY BIO-DEMOGRAPHIC FACTORS

Table 3.4. Presents the percentage (weighted) under nutrition and mean MUAC for lactating and pregnant women under study by bio-demographic variables.

There are a number of bio-demographic variables that are related with maternal under nutrition. Some of the bio-demographic factors included in this study are physiological status, age, parity and age at marriage of the mother.

The proportion of under nutrition was higher for lactating women (21.8%) than the pregnant (17.9%). The mean MUAC for both pregnant and lactating women were almost the same (24.17cm). There is also variation in the level of under nutrition by age group of the lactating and pregnant women. The larger proportion of under-nourished women were observed in the age group 15 to 19 (26.2%) , followed by age group 30 to 34 (19.6%), age group 25 to 29 (18.3%) and the least was for age group 20 to 24 which is 15.0%. It was also observed that the mean MUAC is the least for age group 15-19 (23.50cm), and highest for both age group 25 to 29 and 35 to 49 (24.27 cm). The proportions undernourished were higher for women with at least 5 live births in their life (20.1%) , followed by those with one or less live births (18.6%). Percentage under nutrition was least for women with 2 to 4 live births (17.3%). Mean MUAC was least for women with one or no live births (23.96cm) and it was high for women with parity 2 to 4 (24.24cm) . It was observed that the age at first marriage for (71.0%) of women was 18 years and below. The percentage of under nutrition was slightly higher for women whose age at first marriage was 18 years and below

(18.6%) as compared with those whose age at first marriage was above 18 years (17.8%). The mean MUAC was also slightly smaller for women whose age at first marriage was 18 years and below.

The chi-square test for the bio-demographic variables showed that none of the variables except age of the women was significantly associated with under nutrition (Table 3.4.). The proportion of undernourished women in the youngest age group 15 to 19 were found out significantly higher than any one of the remaining age groups.

Table 3.4. Percentage (weighted) undernourished, the association with under nutrition & mean MUAC among lactating and pregnant women by bio-demographic factors, SNNPR-CFS, 1997.

Variables	Percent Undernourished MUAC <22.5 cm	χ^2 Value and significance	Mean MUAC(cm) ± S.D.	percent of Women
Physiological Status :				
Lactating	21.8	0.99	24.17±2.06	79.8
Pregnant	17.9		24.28±1.85	20.2
Age group:				
15-19	26.2	7.86*	23.59±1.56	4.5
20-24	15.0		24.07±1.78	23.5
25-29	18.3		24.27±2.03	29.2
30-34	19.6		24.22±2.23	22.4
35-49	19.9		24.27±2.28	20.4
Parity:				
0-1	18.6	1.95	23.96±1.95	17.2
2-4	17.3		24.24±1.91	47.0
5+	20.1		24.19±2.26	35.8
Age at first Marriage :				
Less than 19	18.6	1.78	24.18±2.00	4.5
19+	17.8		24.26±2.17	95.5

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.2.4. MATERNAL UNDER NUTRITION BY HEALTH RELATED FACTORS

Table 3.5. Presents the percentage (weighted) under nutrition and mean MUAC for lactating and pregnant women under study by health related factors.

Access to health service encompasses mainly the physical presence and distance of the health service. This study has found that 47.3% of the pregnant and lactating women were within an hour travel time from the nearest health facility. Urban women were having better access as compared to rural women. More than 95 % the urban and about 36% of the rural mothers resided within an hour travel time from the nearest health facility .

Study results have showed that the proportion of women undernourished was lower (15.2%), if the women resided within hour travel time from the nearest health facility. While the proportion of under nourished women increased to (21.5%) , if the women have to travel more than an hour to reach the nearest health facility. In the rural sites the trend of under nutrition was similar with the regional figure and it was found that 20.1% of the women were under nourished , if the travel time to the nearest health facility was within an hour and the corresponding proportion raised to 21.5% if they had to walk more than an hour. It was also observed that the mean MUAC for women accessible to health service was higher (24.67 cm) as compared with inaccessible .

The large proportion of lactating and pregnant women (88.0%) had never used any contraceptive method. The proportion of under nutrition was much lower among women who ever used any contraceptive method (7.1%) than those who never used any method (20%). In urban areas the proportion under nourished women was found 2.8% for those who ever used and it increased to 9.9% for those who never used any contraceptive methods. In the rural areas percent under nourished women was 14.6% for women who ever used any contraceptive method and this raised to 21.2% , if she never used any method. The mean MUAC for ever used any contraceptive method was more (24.07 cm) than those who never used any contraceptive method.

In this study 29.0% of the total study subjects were found sick within the last two weeks of the survey. Cough, fever and malaria were the common illnesses. A difference in the proportion of maternal under nutrition was observed between those who were sick during the last two weeks from the survey date and those who did not. The percentage of maternal under nutrition for those sick within two weeks prior to the survey was 23.3%, while it reduced to 16.6% for the non sick women. The mean MUAC for women sick in the last two weeks prior to the survey was smaller (23.87) than the non sick. Ever used any contraceptive method was above (24.07 cm) than never used any contraceptive method.

Among the common morbidities of the study subjects, malaria infestation was highly related with maternal under nutrition, while the others had no much variation. Four percent of the women reported sick due to malaria. The proportion of undernourished

women among the malaria infected women was found 42.9%, while the proportion reduced to 17.6% for those whom did not suffer from malaria. The mean MUAC was also higher among non malaria infected women (24.22 cm) than among malaria infected women (23.28 cm).

The bi-variate chi-square test showed that all of the health related variables (health service accessibility, ever use of family planning, morbidity and malaria infection) were significant (Table 3.5.). The proportion of under nutrition for women inaccessible to health service (more than an hour to reach the health service) was significantly higher when compared to those accessible to health service. The proportion of under nutrition was significantly lower for those women who ever used family planning as compared to those never used family planning. Proportion of under nutrition was also significantly higher for women who were ill during the two weeks prior to the survey and those infected by malaria.

Table 3.5. Percentage (weighted) undernourished, the association with under nutrition & mean MUAC among lactating and pregnant women by health related factors, SNNPR-CFS, 1997.

Variables	Percent Undernourished MUAC <22.5 cm	χ^2 Value and significance	Mean MUAC(cm) ± S.D.	Percent of Women
Health Service Accessibility :				
<= one hour	15.2	7.03**	24.67± 2.24	47.3
More than an hour	21.5		23.74± 2.00	52.7
Ever Use Family Planning:				
Yes	7.1	10.79***	25.07± 2.28	12.0
No	20.0		24.06± 1.99	88.0
Any infection (last two weeks) :				
No	16.6	5.64*	24.29± 2.07	29.0
Yes	23.3		23.87± 2.04	71.0
Type of infection:				
Malaria-No	17.6	14.30***	24.22± 2.03	96.0
Yes	42.9		23.28± 2.52	4.0
Cough/cold-No	18.4	0.03	24.19± 2.07	89.9
Yes	19.1		24.08± 1.96	10.1
Fever/ Flu-No	18.5	0.01	24.18± 2.07	88.9
Yes	18.3		24.16± 2.01	11.1

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.2.5. MATERNAL UNDER NUTRITION BY WORKLOAD / ACTIVITY FACTORS

Table 3.6. Presents the percentage (weighted) under nutrition and mean MUAC for lactating and pregnant women under study by health related factors.

Fire wood collection & water fetching are the two common chores of women in many developing countries like Ethiopia. In this study, It was found that 46.7% of the lactating or pregnant women were usually responsible for collecting both fire wood and fetching water. It was also found that 36.2% of the women involved either in fetching water or collecting fire wood . Only 17.2 % did not involve in these activities. Analysis of the data has showed that, mothers responsibility for collecting fire wood or fetching water would increase the level of under nutrition. Percent under nutrition is highest (20.7%) for women involved in both the activities (fire wood and water fetching), followed by those involved in either of the two activities (fire wood or water fetching) (17.0%). The percentage of under nourished women further decreased to 15.8%, if they were not involved in either of the two activities . Household chores were common even after delivery for the study women. Hundred percent of the women were involved in household chores with varying degree. For about 6.1% of the lactating and pregnant women household chores was the burden of these women alone after their last delivery; and remaining was assisted by some body else. Comparison on the burden of household chores showed that women not assisted by some body else were more under nourished (22.8%) than assisted after their last delivery (18.2%). The mean MUAC for those assisted was also higher (24.2 cm) than the none assisted (23.8 cm) group. About 20% of the women stayed away from duties for more than a

month and half after their last delivery; while, the remaining majority (79.8%) for a month and half or less. The proportion under nourished was higher for women who stayed away from duties for relatively shorter time (19.5%) than for longer duration (14.5%).

The bi-variate chi-square test on work load or activity factors showed that only water fetching and fire wood collection was found out to be significant (Table 3.6.). Women who were usually responsible for collecting fire wood and fetching water were significantly associated with under nutrition.

Table 3.6. Percentages (weighted) undernourished, the association with under nutrition & mean MUAC among lactating and pregnant women by workload / activity factors, SNNPR-CFS, 1997.

Variables	Percent Undernourished MUAC <22.5 cm	χ^2 Value and significance	Mean MUAC(cm) ± S.D.	Percentage of Women
Water & Fuel Collection :				
No	15.8	3.51*	24.63± 2.48	17.3
Either water or fuel	17.0		24.41± 2.08	36.2
Both water & Fuel	20.7		23.87± 1.85	46.5
Household Chores:				
Mother alone	22.8	0.58	23.80± 1.71	6.1
Assisted by others	18.2		24.20± 2.08	93.9
Duration Stay secluded from Duties: (after last delivery)				
<= 1.5 months	19.5	2.01	24.08± 2.01	79.8
> 1.5 months	14.9		24.57± 2.23	20.2

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.3. RISK FACTORS FOR MATERNAL NUTRITION STATUS

3.3.1. LOCATIONAL RISK FACTORS FOR MATERNAL NUTRITIONAL STATUS

Multivariate analysis was performed using logistic regression technique to see the relationship and significance between the independent variables and the dependent variable. The multivariate model for the locational independent variables (residence and zone) on the dependent variable showed a difference which is statistically significant (Table 3.7.). Rural lactating or pregnant were at higher risk to under nutrition than the urban residents. Controlling the effect of place of residence , women in Hadiya and North-Omo zone were significantly at higher risk and those in Gurage were at lower risk to under nutrition as compared with women in Sidama zone.

Table 3.7. Relative risk of under nutrition among pregnant and lactating mothers aged 15-49 by locational factors, SNNPR-CFS, 1997

Variables	Multi-variate	
	β	Exp(β)
Residence:		
Urban (Reference)		
Rural	0.6212	1.8612***
Zone:		
Sidama (Reference)		
Gurage	-0.5865	0.5563**
North-Omo	0.5952	1.8134**
KAT	0.0998	1.1049
Hadiya	0.4708	1.6013**

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.3.2. SOCIO-ECONOMIC RISK FACTORS FOR MATERNAL NUTRITIONAL STATUS

The bi-vatiate model for socio-economic variables showed that adequacy of food stock or annual income and economic status of the household have a significant effect on nutritional status of pregnant and lactating women (Table 3.8.). Women from inadequate food stock (annual income) were significantly at higher risk of under nutrition as compared to those women from adequate food stock (annual income). Illiterate women and those in very low economic status households were also at a risk

of under nutrition as compared with literate women; However, the risk was not statistically significant. After controlling for literacy of the women and household economic status, adequacy of food stock or annual income was found to be significant predictor of the nutritional status of the women. The risk of under nutrition for inadequate food stock (annual income) household women were 1.41 times higher as compared to adequate food stock (annual income) households.

Table 3.8. Relative risk of under nutrition among pregnant and lactating mothers aged 15-49 by socio-economic factors, SNNPR-CFS, 1997

Variable	Multi-variate	
	β	Exp(β)
Adequacy of food stock (until next harvest)/**Annual Income :**		
Adequate (Reference)		
Insufficient	0.3429	1.4091***
Literacy :		
Literate (Reference)		
Illiterate	0.1707	1.1861
Economic Status:		
Medium + (Reference)		
Low	-0.0015	0.9985
Very low	0.1736	1.1896

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.3.3. BIO-DEMOGRAPHIC RISK FACTORS FOR MATERNAL NUTRITIONAL STATUS

The multivariate model for bio-demographic variables showed that, only age of the women was found to be significant (Table 3.9.). After controlling physiological status, parity and age at first marriage, age of the women was found to be statistically significant. Women in the youngest age group 15 to 19 were 1.42 time at higher risk of under nutrition as compared to age group 25 to 29. Women in the age group 20 to 24 were at lower risk of under nutrition, even though it was not significant.

Table 3.9. Relative Risk of under nutrition among pregnant and lactating mothers aged 15-49 by bio-demographic factors, SNNPR-CFS, 1997

Variable	Multi-variate	
	β	Exp(β)
Physiological Status :		
Pregnant (Reference)		
Lactating	0.0824	1.0858
Age group:		
15-19	0.3490	1.4177*
20-24	-0.3225	0.7243
25-29 (Reference)		
30-34	0.0082	1.0082
35-49	-0.0085	0.9915
Parity:		
0-1	0.0696	1.0721
2-4 (Reference)		
5+	0.0132	1.0133
Age at first Marriage :		
19+ (Reference)		
Less than 19	0.0119	1.0120

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.3.4. HEALTH RELATED RISK FACTORS FOR MATERNAL NUTRITIONAL STATUS

On the other hand the multivariate model for health related variables showed that only two variables were found to be significant (Table 3.10.). After controlling for health related variables (health service accessibility, ever use of family planning, morbidity and malaria infection) ever use of family planning and malaria infection were found to be significant predictors of nutritional status of the women. Women who never used family planning were 1.68 time at high risk of under nutrition when compared to women who ever used family planning. The risk of under nutrition in malaria infected women was 1.66 times higher as compared to none infected women.

Table 3.10. Relative Risk of under nutrition among pregnant and lactating mothers aged 15-49 by health related factors, SNNPR-CFS, 1997

Variable	Multi-variate	
	β	Exp(β)
Health Service Accessibility :		
<= one hour (Reference)		
> one hour	0.1432	1.1540*
Ever Use Family Planning:		
Yes (Reference)		
No	0.5193	1.6808**
Any sickness (last two weeks**)** :		
No (Reference)		
Yes	0.1382	1.1482
Malaria Infection:		
No (Reference)		
Yes	0.5047	1.6565**

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.3.5. WORKLOAD OR ACTIVITY RISK FACTORS FOR MATERNAL NUTRITIONAL STATUS

After controlling for the work load factors (water & fuel collection, household chores and stay secluded from duties after delivery) the multivariate model showed that none of the variables were found to be significant. However, the direction of the risk in these variables was found towards the hypothesis.

Table 3.11. Relative risk of under nutrition among pregnant and lactating mothers aged 15-49 by workload or activity factors, SNNPR-CFS, 1997

Variable	Muli-variate	
	β	Exp(β)
Water & Fuel Collection :		
None (Reference)		
Either water or fuel	-0.0398	0.9609
Both water & Fuel	0.1616	1.1754
Household Chores:		
Assisted by others (Reference)		
Mother alone	0.0685	1.0709
Duration Stay Secluded from Duties (after last delivery)		
> 1.5 months (Reference)		
<= 1.5 months	0.1281	1.1366

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

3.3.6. SELECTED RISK FACTORS FOR MATERNAL NUTRITIONAL STATUS

Multivariate analysis using logistic regression model was performed for important independent variables in the bi-variate chi-square analysis. After controlling a number of variables, the fitted multivariate model showed that residence, study zone, adequacy of food stock (annual income), age group, ever use of family planning and malaria infection were found to be significant predictors of nutritional status of the women (Table 3.12.) . The risk of under nutrition in rural areas was 1.64 times higher as compared to the urban area & the risk of under nutrition in Hadyia zone was 1.60 times higher as compared with Sidama zone. In Gurage, North- Omo and KAT zones the risk of under nutrition was not significantly different from Sidama Zone. Women from inadequate food stock (annual income) households were about 1.35 times at higher risk of under nutrition as compared to adequate food stock (annual income) households. Women in the age group 15 to 19 were 1.75 times at high risk of under nutrition as compared to age group 25 to 29 (reference). The remaining age groups were not significantly different from the reference age group. Women who never used family planning were about 1.59 times at high risk of under nutrition as compared to those who ever used family planning. The risk of under nutrition for malaria infected women was 1.48 times higher than those none infected women

Table 3.12. Relative risk of under nutrition among pregnant and lactating mothers aged 15-49 by selected variables, SNNPR-CFS, 1997

Variable	Multi-variate (Final Model)	
	β	Exp(β)
Residence: Urban (Reference)		
Rural	0.4977	1.6449**
Zone: Sidama (Reference)		
Gurage	-0.2243	0.7991
North-Omo	0.2744	1.3158
KAT	0.1702	1.1855
Hadiya	0.4700	1.6001*
Adequacy of food stock (until next harvest) /**annual income :**		
Adequate (Reference)		
Insufficient	0.2483	1.3533*
Economic Status:		
Medium + (Reference)		
Low	-0.0220	0.9783
very low	0.0157	1.0100
Age group : 15-19	0.5612	1.7528*
20-24	-0.2515	0.7777
25-29 (Reference)		
30-34	-0.1681	0.8452
35-49	-0.1573	0.8545
Water & Fuel Collection :		
No (Reference)		
Either water or fuel	-0.2591	0.9717
Both water & Fuel	0.1406	1.1510
Health Service Accessibility :		
<= one hour (Reference)		
> one hour	0.1761	1.1925
Ever Use Family Planning:		
Yes (Reference)		
No	0.4662	1.5939*
Any sickness (last two weeks) :		
No (Reference)	0.0432	1.0441
Yes		
Malaria Infection:		
No (Reference)		
Yes	0.3324	1.4806*

Note : *** (significant at 0.001)

** (significant at 0.01)

* (significant at 0.05) and unmarked are not significant

CHAPTER FOUR

DISCUSSION

This study has demonstrated that there is a considerable level of under nutrition (18.5%) in the region which is higher as compared to the Sub-Saharan African countries with an average of 13.3% (ACC/SCN, 1992). The mean MUAC for lactating & pregnant women in the study region (24.2 cm) was also smaller than the Namibian non pregnant women of 26.5 cm (Namibian DHS, 1992) and that of the Philippines lactating and pregnant women of 24.6 cm (ACC/SCN, 1990). The finding of this study is consistent with other studies undertaken on non pregnant women (James W.P.T.,1994; Samson, 1999) in Ethiopia. This indicates that the nutritional status of lactating and pregnant women in SNNPR were worse than the lactating & pregnant women in Sub-Saharan African countries and the Philippines. The nutritional status of the study women was even worse than the non pregnant women in Namibia and not better than those in Ethiopia indicating the nutritional demand for pregnancy and lactation is not considered. This shows that under nutrition is a serious problem in pregnant & lactating women's of the region.

The results of the study also showed that substantial rural-urban differential exist in maternal nutritional status. Twenty one percent of the rural and 6.7% of the urban women were found out to be undernourished. The mean MUAC for rural women (23.87 cm) was also lower than the urban (25.64 cm). A number of DHS studies (DHS, 1997) have shown that similar trend in the differences of maternal under nutrition in

the urban and rural residences of Sub-Saharan Region. The lower level of under nutrition in the urban area could be explained by the better access and utilization of health services and their exposure to the modern world .

Multi-variate analysis of the data has indicated that there was a significant variation in the levels of maternal under nutrition among the five densely populated zones of the SNNPR. Holding other factors constant , the final multi-vatriate model showed that women in Hadiya zone were significantly at higher risk of under nutrition as compared to Sidama zone (low level of maternal under nutrition). A variation in the risk of maternal under nutrition was also observed between each of the other zones and Sidama zone; however, the difference was not statistically significant. It is obvious that zones were formed mainly based on ethnic composition and there will be a single dominant ethnic group in each zone. The zonal variation in the level of under nutrition may be due to ethnic based cultural factors such intra household food allocation, food aversions during lactation & pregnancy and various food taboos with in the population. Besides this there may exist other factors (not in the model) such as utilization for the available health services that could explain the zonal variation.

Household food security issues differ in urban and rural settings. In the rural area adequacy of food stock in the household till next harvest is a proxy indicator of household food production for consumption. On the other hand adequacy of annual household income in the urban area shows the purchasing power of food in developing countries like Ethiopia. Therefore , Adequacy of food stock /annual income/

is a major component of food security, which is the necessary condition for improving nutritional status of household members. In this study about 34.0% of the households with lactating and pregnant women have adequate food stock till next harvest (adequate annual income). The percentage of undernourished women in these households was significantly lower (14.4%) than those in the inadequate food stock or inadequate annual income households (23.2%). The bi-variate analysis and multi-variate socio economic model showed that women who are illiterate and from very low socio economic status household were at higher risk of under nutrition, but this risk was not statistically significant. The reason for usefulness of women's literacy in improving maternal under nutrition could be that more educated women have better health practices, and protecting themselves from diseases. Literate women would also delay marriage and this delays child bearing which is one of the burden on maternal nutrition status. It was also observed that women from very low economic status households were more affected by under nutrition. This could be due to the fact that economic status of the household may affect the labour burden of the women. Hence; greater household resources could afford to pay for fuel wood and water collected by other women . On the other hand , the multi-variate model for socio economic variables Table 2.8.) and the final model for selected variables (Table 2.12.) showed that, adequacy of food stock (annual income) was significantly related to improved maternal nutritional status. The increased risk of maternal under nutrition in households with inadequate food (annual income) is most likely due to food insecurity at the household level that could be reflected on members of the household.

In the bio-demographic model (Table 2.9.) none of the variables was significant except maternal age. Bi-variate and multi-varaiate analysis of these bio-demographic factors showed that the adolescent reproductive age group (15 to 19 years) was significantly associated and at higher risk of under nutrition as compared to the remaining age groups. This finding is consistent with a number of studies of pregnancy in adolescence carried out in developed and developing countries, that indicate rates of low birth weight and maternal under nutrition are higher in the young, physiologically immature adolescent than in matured women (Worthington-Roberts B.S. et al., 1985). This shows that age group 15 to 19 is a special case of maternal nutrition and growth related to reproductive efficiency (pregnancy and lactation during adolescence), because two components of growth (maternal and child) take place simultaneously. Therefore the higher risk of under nutrition in this age group could be due to nutritional demand of pregnancy, lactation and adolescent growth itself . Women in this age group may also have lower confidence and experience to use available health services. On the other hand this study has shown that maternal nutritional status was not significantly affected by the age at first marriage . This could be due to either marriage may not always be followed by pregnancy or the duration between consecutive pregnancies may not be very narrow. Thus age the at first marriage per se may not always be a risk factor . It was also observed that the risk of under nutrition in lactating women were higher than the pregnant women and this may show the higher nutritional demand of lactation over pregnancy.

In general Illness is important factor in determining nutritional status and effects of morbidity can reverse the benefits of adequate food consumption. Wide spread availability of health care is another factor associated to superior nutrition and health outcomes (regardless of the quality of service). The significance of these variables showed that increasing food consumption alone will not be enough to improve nutrition when poor health and the condition which cause it to persist. Thus the nutritional status of women may be affected , if the risk of infection is high and possibility for treatment is marginal. Analysis of the health related factors showed that all the factors in bi-variate analysis (Table 2.5.) and three variables in the multi-variate model (Table 2.10) were significant. However , ever use of family planning and malaria infection were significantly related to maternal nutritional status in the final model (Table 2.12.) for selected variables. Health service accessibility will play a significant role to improve maternal knowledge and utilization of contraceptive methods. Contraceptive knowledge and utilization plays a pivotal role in deciding the number of children couples would like to have and the time interval between each birth. This ensures a long inter birth interval and providing time for the woman to build up their nutrient stores, since frequent and closely spaced pregnancies imposes a heavy nutritional and health burden on the mother. Malaria has been found to be by far the most common causes of severe anaemia among mothers; particularly in Africa. The impact of malaria on nutrition varies according to the intensity of infection and in the severe case, malaria affects maternal nutrition by destroying red blood cells and decreasing appetite. The problem is worse in rural area where early treatment may not be possible.

workload /Activity level/ is another factor that could affect nutritional status of women. Women in Kenya with significant higher earning and higher calorie consumption had showed lower nutritional status because of heavy physical burden of the work they were doing (FAO, 1992). In this study bi-variate chi square analysis for workload showed that fuel and water collection burden was found out to be significantly related with maternal nutritional status; However , this variable was insignificant in the final model for selected variables. This finding indicates that such labour intensive activities might increase the energy expenditure of women and as a result contributes to maternal under nutrition especially when there is no adequate food for consumption. Though not significant, the remaining variables (household chores and duration stay secluded from duties) in the workload model also showed similar effect on maternal under nutrition. This indicates that maternal under nutrition may be worsened by the level of activity burden.

In general, besides the locational variables this study showed that food stock (annual income) inadequacy at the household level, the adolescent age group, never use of family planning and malaria infection as an important risk factors for maternal under nutrition. However, there may be other factors (not in the model) that could affect mother's nutritional status. This could include factors such as the physiological utilization of food and nutrients during pregnancy and lactation and intra-household food distribution. In some cultures women in general received inequitable share of

family food and the additional nutrient requirements for lactating and pregnant women are not recognised and most women eat last and least .

CHAPTER FIVE

CONCLUSIONS AND POLICY IMPLICATIONS

Multisectoral efforts are required to alleviate overall nutritional problems in the Region. Nutritional security could only be attained with the involvement of the health, and agricultural sectors as well as others. Production should be increased to cover for the annual requirements of households and health service accessibility should be expanded to promote family planning utilization as well as prevention and treatment of infectious diseases.

Women who receive even a minimal basic education are generally more aware than those who are illiterate. It is therefore imperative that young girls be enrolled into compulsory primary school education and adult women to take part in non-formal education

Poor food intake and nutrient utilization due to morbidity from malaria infections and limited access to health services affects maternal nutritional status. Therefore, preventing and early treatment of malaria could improve the nutritional status of the mother.

Integrated programs involving birth control service and nutritional maintenance should be developed with special attention to the protection of adolescent, pregnant and lactating women. There should be access to services for child-spacing.

Poor access to water, fuel, and other basic household necessities encroach on the mother's energy, time, and health. Employment of traditional and modern appropriate technology should

be implemented to reduce women's energy expenditure and release time for self-improvement. The provision of safe water supply at short distances and low cost cooking stoves could reduce the energy cost of mothers .

Further research on socio-cultural practices such as food taboos, intra-household food distribution and environmental factors is also recommended.

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Annex I : Percentage under-nourished pregnant & lactating mothers by locational factors for selected variables, SNNPR-CFS, 1997

Variable	Residence		Zone				
	Urban	Rural	Gurage	Hadiya	KAT	North Omo	Sidama
Adequacy of food stock/ Annual Income:							
Adequate	6.1	12.6	12.9	27.0	17.4	21.4	2.7
Inadequate	8.3	25.5	13.5	27.9	25.3	24.0	17.2
Literacy :							
Illiterate	6.3	21.0	14.0	31.3	25.7	26.1	13.3
Literate	8.7	20.6	0.0	19.0	22.9	17.6	4.9
Economic status:							
Medium +	3.5	17.8	9.1	25.0	0.0	0.0	0.0
Low	8.7	18.7	10.6	24.1	29.2	16.1	10.9
Very low	7.1	22.4	16.9	27.9	22.8	27.9	13.3
Age group:							
15-19	20.0	27.0	16.7	40.0	100.	*	23.3
20-24	4.4	17.7	15.2	22.4	0	11.1	11.1
25-29	5.6	21.5	15.5	28.3	17.6	25.0	11.8
30-34	6.1	22.2	9.1	32.0	21.9	26.9	8.2
35-49	11.5	21.2	11.9	27.5	25.0	33.3	10.4
					25.0		
Ever Use Family Planning:							
Yes	2.9	14.6	0.0	16.7	6.3	7.4	4.8
No	9.8	21.3	13.8	29.1	26.5	28.9	13.1
Any infection (last two weeks) :							
No	4.1	19.4	13.3	21.4	26.4	20.5	11.9
Yes	15.0	24.8	11.2	35.3	14.8	30.0	12.3
Malaria Infection:							
No	0.0	19.9	12.6	25.0	23.5	*	0.0
Yes	6.9	46.9	33.3	50.0	33.3	23.3	12.0

* shows there are no case in the category

Annex II : Variable Coding and categories :

Dependent variable :

Measure of Mid Upper Arm Circumference (MUAC) in centimetre

0= ³22.5 cm 1= <22.5 cm

Independent variable :

Locational factors

Place of residence

0= Urban 1=Rural

Study Zone

0=Sidama 1=Gurage 3=North-Omo

4=KAT 5=Hadiya

Socio-economic factors

Adequacy of food stock (until next harvest) / adequacy of annual income :

0=Adequate 1=Inadequate

Literacy status

0=Literate 1=Illiterate

Economic status

0=Medium or above 2=Low 3=Very low

Bio-demographic factors

Physiological status

0=Pregnant 1=lactating

Age group of the mother

1=15 to 19 2=20 to 24 0=25 to 29

3=30 to 34 4=35 to 49

Parity (previous number of children)

1= <=1 0=2 to 4 2= >=5

Age at first marriage

0= 19+ 1= Below 19

Health related factors

Health service accessibility

0= <= one hour 1= > one hour

Ever use of family planning

0= Yes 1=No

Any sickness in the last two weeks

0= No 1=Yes

Were you sick malaria in the last two weeks

0= No 1=Yes

Workload or activity factors

Mother collects water & fuel for the household :

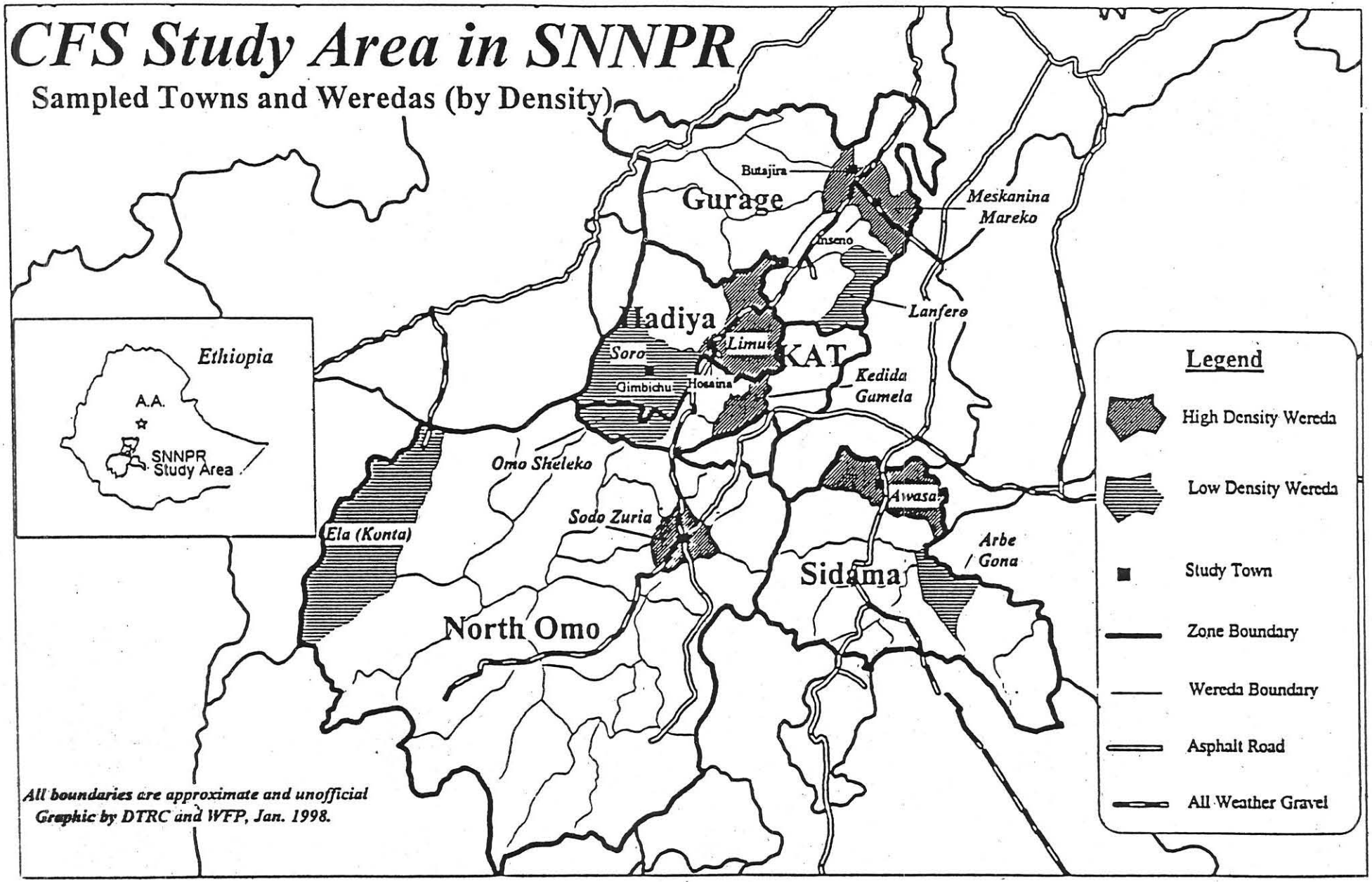
0=No 1=Yes, either water or fuel 2=Yes, both water & fuel

Household chores after your last delivery

0=Assisted by others 1=Mother alone

Duration stay secluded from duties after last delivery

0= > 1.5 month 1= <= 1.5 month


CFS Study Area in SNNPR
Sampled Towns and Weredas (by Density)
Butajira
Gurage
Meskanina
Mareko
Inseno
Lanfero
Hadiya
Limu
KAT
Soro
Qimbichu
Hosaina
Kedida
Gumela
Ethiopia
A.A.
SNNPR
Study Area
Omo Sheleko
Awasa
Sodo Zuria
Ela (Konta)
Arbe
/ Gona
Sidama
North Omo
Legend
High Density Wereda
Low Density Wereda
Study Town
Zone Boundary
Wereda Boundary
Asphalt Road
All Weather Gravel
All boundaries are approximate and unofficial
Graphic by DTRC and WFP, Jan. 1998.

Declaration

I, the undersigned declare this Thesis is my original work, has not been presented for a degree in any other University and that all sources of material used for the thesis has been duly acknowledged.

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Signature : 

Place :Addis Ababa University (AAU)

Date : 4 July 2001

A. P. Deshpande (Dr.)	Deshpande AP	July 6, 2001
Advisor	**Signature**	**Date**