

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADATE STUDIES
COLLEGE OF DEVELOPMENT STUDIES
CENTER FOR POPULATION STUDIES

**CHILD MALNUTRITION IN NONNO RESETTLEMENT SITE,
WEST SHEWA, OROMIA NATIONAL REGIONAL STATE**

BY
HAREGEWOIN MIROTAW

JUNE 2012
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HAREGEWOIN MIROTAW

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES
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Research Advisor
Dr. Assefa Hailemariam


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Addis Ababa University
School of Graduate Studies

This is to certify that the thesis prepared by **Haregewoin Mirotaw** entitled: "*Child Malnutrition in Nonno Resettlement Site, West Shoa, Oromia National Regional State*" and Submitted to Partial Fulfillment of the requirements for the Degree of Master of Science (Population Studies) complies with the regulations of the University and meets the accepts standards with respect to originality and quality.

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Abstract

Child Malnutrition in Nonno Resettlement Site, West Shewa, Oromia National Regional State

Haregewoin Mirotaw Shumiye

Center for Population Studies, Addis Ababa University, June 2012

Ethiopia is one of the countries with the highest number of malnourished population in the world. This emanates from lack of adequate and balanced diet, prevalence of infectious diseases, socio-economic drawbacks and sanitary/hygienic problems. Children and women are most affected by the problem. The paper tried to measure the level of child malnutrition in Nonno Resettlement Site and identify the demographic, socio-economic, health and environmental determinant factors associated with the phenomenon among children aged 6-59 months as measured by stunting, wasting and underweight.

This research used a cross-sectional study design and was conducted from December 2011- February 2012 in Nonno resettlement site. The resettlement site was organized under three administrative units/kebeles/. Those all three kebeles were selected purposively for this study. The required sample size (households) was determined using the formula for estimating single population proportion. The calculated sample size was allocated proportionally to three kebeles. Simple random sampling procedure was employed to select the required households from the three kebeles. Lottery method was used to select only one child from one sample household in case of the availability of more than one child for anthropometric measurements. In the event household that does not have under-five child/ren the next neighboring household was considered. Structured and pre-tested questionnaire was used to collect household socio-economic, demographic, health and environmental data. Anthropometric measurements of the selected under-five children were also collected using standard weighing scale and height measuring board.

The results show that the overall prevalence of malnutrition in the community was high with 46.3% of the children stunted, 41.9% underweight, and 11.5% wasted. Parental education, wealth status of household, household size, number of under-five children in the household, age of a child, antenatal care attendance, source of water, availability of latrine and sign of disease in the past two weeks before the survey were found to be the major determinant factors of malnutrition among under-five children in the study area. Therefore, it requires careful attention and systematic actions in the areas of food security, child and maternal healthcare, education and hygienic problems to reduce the existing malnutrition prevalence in the area.

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Table of Contents

	Pages
Table of Contents	iv
List of Figures	vi
List of Tables	vii
List of Annexes	viii
Acronyms and Abbreviations	ix
CHAPTER ONE: INTRODUCTION	1
1.1. Background	1
1.2. Statement of the Problem	3
1.3. Significance of the Study	6
1.4. Objective of the Study	7
1.4.1. General objective of the study	7
1.4.2. Specific objectives of the study	7
1.5. Research Questions	7
1.6. Strength and Limitation of the Study	7
1.7. Definition of Terms	8
CHAPTER TWO: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK	10
2.1. Literature Review	10
2.1.1. Child growth indicators and their interpretation	13
2.1.2. Determinants of malnutrition	16
2.2. Conceptual Framework	17
2.2.1. Analytical framework	19
CHAPTER THREE: METHODS AND MATERIALS	20
3.1. The Study Area	20
3.2. Study Design and Period	23
3.3. Sampling Design	23
3.3.1. Sample size determination	23
3.3.2. Sampling procedure	25
3.3.3. Inclusion and exclusion criteria of the study subjects	26
3.4. Sources and Tools of Data Collection	26
3.5. Data Quality Control Procedures	28
3.6. Methods of Data Analysis	28
3.7. The Study Variables	29
3.8. Ethical Considerations	30
3.9. Dissemination of the Result	30

CHAPTER FOUR: RESULTS AND DISCUSSION	31
4.1. Descriptive Analysis	31
4.1.1. Demographic and socio-economic characteristics of the household	31
4.1.2. Maternal behavior, child demographic and health characteristics	34
4.1.3. Environmental characteristics of the household	36
4.2. Description of Nutritional Status	38
4.3. Bivariate Analysis	44
4.3.1. Chi-square test result showing the association between stunting and the selected variables	44
4.3.2. Chi-square test result showing association between underweight and the selected variables	46
4.3.3. Chi-square test showing the association between wasting and the selected variables	47
4.4. Multivariate Analysis	49
4.4.1. Factors associated with stunting	50
4.4.2. Factors associated with underweight	53
4.4.3. Factors associated with wasting	54
4.5. Discussion	56
CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS	60
5.1. Conclusion	60
5.2. Recommendations	61
References	62
Annexes	66

List of Figures	Pages
Figure 1: Visual representation of causes of malnutrition (conceptual framework)	18
Figure 2: Visual representation of causes of malnutrition (analytical framework)	19
Figure 3: Location map of Nonno Woreda	21
Figure 4: Location map of the resettlement site/kebeles/	23
Figure 5: Schematic presentation of sampling frame	26
Figure 6: Level of stunting among children 6-59 months by age group	40
Figure 7: Level of underweight among children 6-59 months by age group	41
Figure 8: Level of wasting among children 6-59 months by age group	43
Figure 9: Level of stunting, underweight and wasting among children 6-59 months by sex	43

List of Tables	pages
Table 1: Percentage Distribution of Under-five Children Classified as Malnourished	3
Table 2: Resettler Households by their Origin	21
Table 3: List of Dependent and Independent Variables	29
Table 4: Demographic and Socio-economic Characteristics of the Selected Households	33
Table 5: Maternal Behavior and Demographic and Health Characteristics of the Selected Child	35
Table 6: Percentage distribution of the selected households by their environmental characteristics	37
Table 7: Distribution of Age and Sex of Sample Children	38
Table 8: Prevalence of Stunting Based on Height-for-age Z-scores and by Sex	39
Table 9: Prevalence of Stunting by Age Based on Height-for-age Z-scores	39
Table 10: Prevalence of Underweight Based on Weight-for-age Z-scores by sex	40
Table 11: Prevalence of Underweight by Age Based on Weight-for-height Z-scores	41
Table 12: Prevalence of Acute Malnutrition Based on Weight-for-height Z-scores and by Sex	42
Table 13: Prevalence of Acute Malnutrition by Age Based on Weight-for-height Z-Scores	42
Table 14: Chi-square test Result Showing Relation Between Stunting and the Selected Variables	44
Table 15: Chi-square test Result Showing Relationship Between Underweight and the Selected Variables	46
Table 16: Chi-square test Result to Showing Relationship Between Wasting and the Selected Variables	48
Table 17: Multivariate Logistic Regression Analysis Result of Stunting and the Selected Variables	52
Table 18: Multivariate Logistic Regression Analysis Result of Underweight and the Selected Variables	54
Table 19: Multivariate Logistic Regression Analysis Result of Wasting and the Selected Variables	55

List of Annexes	Pages
Annex 1: Household questionnaire	67
Annex 2: Key informant interview guide	73
Annex 3: Focus group discussion guide	74
Annex 4: Multicollinearity test and Hosmer and Lemeshow test results	75
Annex 5: Plausibility check for data quality	77

Acronyms and Abbreviations

ANC:	Antenatal care
CARE:	Cooperative for Assistance and Relief Everywhere
CBOs	Community-Based Organizations
CSA:	Central Statistical Agency
DPPC:	Disaster Prevention and Preparedness Commission
EBF:	Exclusive Breast Feeding
EDHS:	Ethiopia Demographic and Health Survey
EHNRI:	Ethiopian Health and Nutrition Research Institute
EMA:	Ethiopian Mapping Agency
ENCU:	Emergency Nutrition Coordination Unit
ESHE:	Essential Services for Health in Ethiopia
FDREFSP	Federal Democratic Republic Ethiopia Food Security Program
FDRGE:	Federal Democratic Republic Government of Ethiopia
GAM:	Global Acute Malnutrition
GTP:	Growth and Transformation Plan
IFPRI:	International Food Policy Research Institute
IFSP:	Integrated Food Security Program
MEDaC:	Ministry of Economic Development and Cooperation
MoFED:	Ministry of Finance and Economic Development
MoHE:	Ministry of Health of Ethiopia
NCHS:	National Center for Health Statistics
NGOs:	Non Governmental Organizations
ORHB:	Oromia Regional Health Bureau
SAM:	Severe Acute Malnutrition
SNNPRS:	Southern Nations, Nationalities and Peoples Region State
TGE:	Transitional Government of Ethiopia
UNDP:	United Nations Development Program
UNFAO:	United Nations Food and Agricultural Organization
UNHCR:	Office of the United Nations High Commissioner for Refugees
UNICEF:	United Nations Children's Fund
UNICEFHAE:	UNICEF Humanitarian Action Ethiopia
UNSCN:	United Nations System Standing Committee on Nutrition
UNWFP:	United Nations World Food Program
USAID:	United States Agency for International Development
USGHAT:	United States Government Humanitarian Assistance Team
WFP:	World Food Program
WHO:	World Health Organization



CHAPTER ONE

INTRODUCTION

1.1. Background

The nutritional status of a population is recognized as a key indicator of the status of poverty, food security, health, education and other related socio-economic conditions. This is because good health, cognitive development and productivity cannot be achieved in the absence of good nutrition. Poorly nourished children cannot grow and develop properly, resist diseases or learn to their full potential. Similarly, malnourished adults cannot be healthy and optimally productive, and are severely disadvantaged in terms of their social and economic security. Hence, the achievement of good nutrition contributes enormously to the fight against poverty. It protects and promotes health and reduces mortality, especially among mothers and children (FAO, 2009).

Nearly one billion people representing almost 16 percent of the population of developing countries are undernourished these days. The recent increase in food prices, if it persists, will create additional obstacles in the fight to further reduce malnourishment in the world. The majority of the world's undernourished people live in developing countries. Two-thirds live in seven countries (Bangladesh, China, the Democratic Republic of the Congo, Ethiopia, India, Indonesia and Pakistan) and over 40% live in China and India alone (FAO and WFP, 2010).

Ethiopia, with a total area of over 1.12 million km² /432,424 mile²/, is a country with about 80 million people of which 84% live in rural areas (CSA, 2010) driving their livelihoods from subsistence agriculture, a sector suffering from lack of essential inputs and erratic rainfall. The country is characterized by persistent per capita food shortfalls that are attributed to drought, rainfall variability, depletion of natural resources associated with land degradation, limited household assets, low levels of farm technologies, lack of off-farm employment opportunities, farmland fragmentation and population pressure. Food shortfall is regarded as a major challenge attributed to malnutrition in most parts of the

country. As noted in various research outputs malnutrition is more severe in rural Ethiopia than urban centers (MoHE, 2003; CSA, 2008; Messay, 2009; CSA, 2010).

Ethiopia is a source of a variety of agricultural products and varied natural resources; yet it is one of the countries with the highest number of malnourished population. The nutritional surveys carried out by between January and September 2006 recorded global acute malnutrition (GAM) levels as high as 23.5 percent and severe acute malnutrition (SAM) levels as high as 3.9 percent, both of which rated critical in any standard (UNICEF, 2007). Up to 130,000 under-five children are estimated to be suffering from severe acute malnutrition at any given time in Ethiopia. Moreover malnutrition remains the underlying cause of more than half of all child deaths in the country.

It is believed that the health problem of the majority of the population of Ethiopia emanates from lack of adequate and balanced diet. Children and women are the most affected group by the problem. In addition, the increasingly growing number of people who are attacked by diseases that occur due to protein and energy deficiency and to lack of disease protecting foods especially low intake of vitamin A, iron and iodine, is an indication of the problem related to malnutrition. Forty-four percent of children aged 6-59 months is anemic. Among the regions, anemia prevalence ranges from a high of 75 percent in Afar to a low of 33 percent in Addis Ababa. Seventeen percent of women age 15-49 are anemic. Regional differences vary greatly; ranging from a high of 44 percent in Somali to a low of 9 percent in Addis Ababa (EDHS, 2011).

According to the study by Woldemariam and Timotiows (2002), about 50 percent of the Ethiopian population are living below the food poverty line and cannot meet their daily minimum nutritional requirement of 2100 calories per day per person.

An assessment of the trends of nutritional status of Ethiopian children from 1983 to 1998 shows that the national rural prevalence of stunting increased from 60 percent in 1983 to 64 percent in 1992. Another national survey undertaken in 1998 with the inclusion of urban areas and children in the age group 3-5 months shows a relative decline in the proportion of stunted children to 52 percent.

Table 1 shows that nutritional status of children has been improving over the last ten years (2000 to 2011) in Ethiopia. About 47 percent of children under five were underweight in 2000 as compared to 38 percent of children in 2005, and 29 percent in 2011. Similarly, 52 percent of children were stunted in 2000 as compared to 47 percent in 2005 and 44 percent in 2011. However, there has been no significant change in weight-for-height (wasting) index over the last ten years. In both 2000 and 2005, 11 percent of the children were found to be wasted; which is reduced only by 1 percent in 2011 (EDHS 2000, 2005, 2011). The overall analysis of these statistics shows the seriousness of the problem in this country. Similarly, a range of researches (Messay, 2009; Alula, 2004/9; Downing, 1996) indicate that planned resettlement programs in Ethiopia have resulted in farther impoverishment and the resultant severe child malnourishment in the country.

Table 1: Percentage distribution of under-five children classified as malnourished¹

Anthropometrics indices	Ethiopia Demographic and Health Survey /EDHS/		
	2005	2010	2011
Stunting /low height-for-age/	52	47	44
Wasting /low weight-for-height/	11	11	10
Underweight /low weight-for-age/	47	38	29

Source: Ethiopia Demographic and Health Survey (EDHS 2000, 2005, 2011)

1.2. Statement of the Problem

Malnutrition is a health problem caused by a prolonged deficiency in diet. It is characterized by a wide range of health problems including underweight, stunted growth, wasting, weakened resistance to infection and impairment of intellect. Severe cases of malnutrition can also lead to death.

Globally, it is estimated that there are nearly 20 million children who are severely acutely malnourished. Most of them live in south Asia and in sub-Saharan Africa (WFP, UN, WHO and UNICEF, 2007).

¹ The three anthropometric indices height-for-age, weight-for-height, and weight-for-age

Number of children under-five years of age dying each year declined globally from more than 12 million in 1990 to 7.6 million in 2010. Sub-Saharan Africa is still the region with the highest number of under-five deaths in the world with 1 in 8 children dying before reaching five. This is more than 17 times the average for developed regions (1 in 143). Southern Asia has the second highest rates with 1 in 15 children dying before age five. These deaths of children are said to be attributed to preventable causes such as pneumonia, diarrhea, measles, malnutrition, HIV/AIDS, malaria and neonatal causes (UNICEF and WHO, 2011).

Similar to the case in most Sub-Saharan Africa, the food security situation has been rapidly deteriorating in Ethiopia owing to a complex set of factors. The high inflation of food prices, failure/low crop production due to inadequate seasonal rains and low resilience capacity of communities from the recurrent crises resulted in food insecurity. The nutrition situation of thousands of Ethiopian children has reached critical levels. UNICEF (2008) indicates that about 75,000 children are directly affected by severe and acute malnutrition in Ethiopia. Other numerous nutrition surveys conducted by NGOs in collaboration with the government offices have found out the worst nutrition situation to exist in Sidama, Wolayta and Hadiya zones of SNNP Region with three of the surveys presenting Global Acute Malnutrition /GAM/ to be higher than 15% and Severe Acute Malnutrition /SAM/ to be around 3%. United States Government Humanitarian Assistance Team/USGHAT/ to SNNP Region in July 2008 reported that a rapid assessment of 33,000 children under-five years of age in Kambata Tambora Zone indicated a 22 percent global acute malnutrition rate (USAID, 2008).

The 2008 quarterly bulletin published by Emergency Nutrition Coordination Unit/ENCU/ of the Federal Disaster Management and Food Security Sector of Ethiopia reported that 9 monitoring surveys conducted in 2008 indicated Global Acute Malnutrition /GAM/ ranging from 13.5 in Mekdela to 15.7 percent in Worebabo *woredas*, of Amhara Region. Severe Acute Malnutrition /SAM/ levels were relatively similar ranging from 1.6 percent in Mekdela to 1.7 percent in Worebabo. The most prevalent child illnesses recorded included Diarrhea, Acute Respiratory Infection /ARI/, malaria and fever (ENCU, 2008).

In Oromia levels of malnutrition are quite high, particularly among children aged 12-23 months. Growth failure is already evident among 6-11 month old children with one-quarter of them moderately or severely stunted and underweight. During the second year of life nearly 2 out of 5 children experience growth failure. Around one of ten children aged 6-23 months suffer from moderate or severe wasting (ESHE and ORHB, 2004). Another survey conducted by Concern Ethiopia in Goro *Woreda*, Bale Zone of the region in 2006 shows that prevalence of Global Acute Malnutrition is estimated at 6.1%, Severe Acute Malnutrition is, estimated at 0.8%, and prevalence of stunting among children 6-59 months is presented as high at 44.5%.

According to 2011 Ethiopian Demographic and Health Survey, percentage of children who are stunted (below -2 SD) is 44% from which 21% are severely stunted. In rural areas, 46% of children are stunted, whereas the figure is 32% in urban areas. In all regions except Addis Ababa (22%) and Gambela (27%) thirty percent or more of children are stunted. The overall percentage of children wasted is 10. A highest percentage of children were found to be wasted in the Somali Region (22%). Concerning the weight-for age index overall, 29% of all children are underweight, and 9% of children are severely underweight. Afar (40%) has the maximum percentage of children who are underweight. A child can be underweight for his/her age because he or she is stunted, wasted, or both. Weight-for-age is an overall indicator of a population's nutritional health.

Malnutrition is a more critical problem to children than to adults. This is because children suffer from the effects of starvation more quickly than adults. They are most exposed to malnutrition due to insufficient household food supply, inadequate childcare, insufficient health services, and unhealthy environment and disease infestations. Particularly, the effects of malnutrition are more prevalent among the poor communities. Child malnutrition and the resultant adverse consequences are linked to many factors such as lack of access to adequate health care services, chronic and transitory food shortfalls, water and sanitation/hygienic problems, prevalence of endemic and epidemic diseases, childhood illnesses, inadequate immunization coverage and population displacement.

Similar to the cases in most rural parts of Ethiopia, the overall livelihood status of residents in Nonno Resettlement site seem to be poor and worsening though it is far better than the cases in their ancestral areas (Messay, 2009). This gives the impression that the nutritional status of the children in resettlement site may be poor as per the anthropometric standards. Therefore, this study tried to explicitly investigate the level and determinants of child malnutrition in Nonno Resettlement Site, West Shewa Zone of Oromia National Regional State.

1.3. Significance of the Study

The prevailing sky-rocketing living cost, severe environmental degradation and erratic agro-climatic problems in rural areas of Ethiopia, in combination with other adverse socio-economic, political and policy factors, have resulted in serious food shortfalls and the resultant malnutrition problems, affecting as much as 45% of the population in the country (FDREFSP, 2004). Raising agricultural productivity, the prime objective of GTP strategy presently, remains the key to improve these spacious and expansive malnutrition problems in the country. Given the present level of emphasis to alleviate malnutrition by the government, it is important to research the level of malnutrition and its determinants in Ethiopia since it helps to come up with more systematic planning, implementation and monitoring issues so that the possible impoverishment risks will be mitigated, if not avoided. Such a study will identify effective strategies to improve the status of malnutrition, and has real benefits for reducing hunger and starvation problems. This study contributes to existing literature on the subject matter and it will act as additional input to policy makers, planners, implementers, monitors, development agents and fund providers in their effort to take the necessary cares in issues related to nutrition in Ethiopia.

1.4. Objective of the Study

1.4.1. General objective of the study

The general objective of this study was to assess the status and causes of child malnutrition in Nonno Resettlement Site.

1.4.2. Specific objectives of the study

The specific objectives of the study are:

- to estimate the level of malnutrition of under-five children
- to identify demographic and socio-economic factors of malnutrition in under-five children and
- to identify health and environmental factors of malnutrition in under-five children in the resettlement site

1.5. Research Questions

The research intends to answer the following basic questions which are the derivatives of the abovementioned research objectives.

- What is the level of malnutrition among under-five children in the study area?
- What are the major demographic, socioeconomic, health and environmental factors that affect the nutritional status of the children?

1.6. Strength and Limitation of the Study

Varied tools and qualified data collectors were used to strengthen the quality of the study. Skilled health and social workers (data collectors), use of standardized weighing machine and height board for anthropometric measurement, use of pre-tested and well structured questionnaire, daily checkup of filled questionnaires and measuring instruments, use of different standard software, statistical package for analysis, use of different statistical methods to control possible confounding factors and finally presence of high response rate among study subjects were the main strengths of this study.

The shortcomings of this study are inherently unavoidable facts of any research. First and foremost, it is expected the informants might not provide the most accurate household socio-economic, demographic health and environmental data. This owes to numerous reasons such as fear of food aid discontinuation, tax raise, cultural apprehension of something bad will happen if one counts her/his belongings and lack of knowledge. Second cross-sectional study design which measures the exposure and out come at the same time, which cannot measure the cause and effect relationship and this is true for this study. Finally, there is no research conducted related to child malnutrition in the area that allows the comparison of the findings of this study.

1.7. Definition of Terms

The following words are key terms to be used in this research widely:

- a. **Malnutrition**: under nutrition or deficiency in nutrition.
- b. **Stunting/chronic malnutrition**: a low height-for-age in children at < -2 SD of median value of the WHO/NCHS international growth reference. Sever stunting is defined as < -3 SD. It reflects long term cumulative effects of inadequate nutrition, frequent health problem and poverty.
- c. **Wasting/acute malnutrition**: a low weight-for-height in children at < -2 SD of the median value of the (NCHS/WHO) international weight-for-height reference. Sever wasting is defined < -3 SD. It refers a nutritional deficit state of recent onset related to sudden food shortage, poor utilization of nutrients and infections which results in rapid weight loss.
- d. **Underweight**: low weight-for-age in children at < -2 SD of the median value of the WHO/NCHS international reference. Weight for age is influenced by the height and weight of a child and is thus a composite of chronic and acute malnutrition.
- e. **Diarrhea**: the release of loose stools three or more times in a day.
- f. **Measles**: an acute and highly contagious viral disease characterized by fever, runny nose, cough, red eyes, and a spreading skin rash.
- g. **ARI**: severe adenovirus infection of the respiratory tract characterized by fever, sore throat, and cough.

- h. **Fever:** a common medical sign characterized by an elevation of temperature above the normal range of 36.5–37.5 °C (98–100 °F) due to an increase in the body temperature regulatory set-point.
- i. **Resettlement:** the process of moving people from their places of origin to other places with the objective of minimizing risks associated with drought, famine, population pressure, shortage of land, conflict, boarder security, etc.
- j. **Resettlers:** occupants and dwellers of other places than their home of origin.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1. Literature Review

For current and succeeding generations, good nutrition is the cornerstone for survival, health and development. Good nutrition is essential for all children to ensure their normal physical and intellectual development. Under-nutrition, particularly in children, is a vice locked around humanity, preventing individuals and even whole societies from utilizing their full potential to achieve their life goals. Children who are undernourished have lowered resistance to infection and are more likely to die from such common childhood ailments as diarrheal diseases and respiratory infections. Those who survive may be locked into a vicious cycle of recurring sickness and faltering growth, often with irreversible damage to their cognitive and social development (UNICEF, 2006).

Nutritional well-being is not only a basic human right, but also an important input for development through the creation of human capital and sufficient capacities that provide factors such as labor, finance, education and care. Consequently, nutritional status, as an outcome of all these factors, is highly used as an indicator for poverty and sustainable development (IFSP, 2002).

Appropriate and coordinated nutrition actions enable the creation of a healthy and productive labor force, which is vital to ensuring rapid social and economic development. Guarantying food security, proper child and mother care practices, provision of adequate health services as well as maintaining appropriate hygiene and sanitary conditions are essential to optimal nutrition. These wide-ranging activities therefore involve a number of sectors, underlying the importance of coherent and coordinated actions among relevant sectors and institutions to improve the status of nutrition (MoHE, 2008).

All children have the same potential and the right to grow and develop their full potential (Kent, 2000). But a third of all children (or approximately 178 million) under 5 years of age in developing countries continue to suffer from stunting, or low height for age, with all

the short-term and long-term negative consequences that this implies. The unacceptably high rates of under-nutrition could be rapidly eliminated if adequate and universal maternal and child nutrition could be assured (SCN NEWS, 2009).

Malnutrition in children is the consequence of a range of factors that are often related to poor food quality, insufficient food intake, and severe and repeated infectious diseases, or a combination of the three. These conditions, in turn, are closely linked to the overall standard of living and whether a population can meet its basic needs, such as access to food, housing and health care. Growth assessment thus not only serves as a means for evaluating the health and nutritional status of children but also provides an indirect measurement of the quality of life of an entire population (WHO, 1997).

Millions of children in developing countries die each year from common illnesses such as measles, pertussis (whooping cough), diarrhea, pneumonia, and malaria. Newborns die from delivery complications, cold, tetanus, and infections. But malnutrition is the underlying aggravating factor that increases under-five children's vulnerability to the major causes of mortality which were otherwise preventable or treatable (USAID, 2008).

Regarding to the issues of nutrition in Ethiopia, the common diet is mainly composed of cereals (teff, maize, and sorghum), tubers and root crops (*enset*, potatoes, and sweet potatoes), pulses and oil seeds. Despite a large livestock population, the food supply of animal products is very limited, and consumption of these products is especially low in rural areas, except in nomadic areas where milk is a major component of the diet. Environmental and man-made factors cause widespread and severe food insecurity. Besides being quantitatively insufficient, food supplies lack diversity. The dietary energy supply is not sufficient to meet population energy requirements and thus almost half of the population is undernourished (FAO, 2008).

Breastfeeding is a common practice in Ethiopia. However, the duration of exclusive breastfeeding remains very short; bottle-feeding is frequent; and complementary feeding practices are inadequate. These inappropriate practices, combined with poverty, food insecurity and limited access to health services, exacerbate the prevalence of malnutrition

among young children. Although the prevalence of stunting has declined slightly over the last five years, special attention still needs to be given to this silent emergency in order to obtain further reduction in the prevalence.

Malnutrition has been a serious obstacle to economic development in Ethiopia. The continuing human costs for the many malnourished people are enormous. Short life span, illness, reduced physical capability and compromised mental performance are some. Its effect is reflected through the deterioration of welfare of a population and the reduction in human productivity and creativity which are vital for the economic development of a nation.

The adverse effects of micronutrient deficiencies on health include, but are not limited to; impaired resistance to infection, chronic fatigue, poor mental and physical development, blindness, and complications in pregnancy, delivery and low birth weight (FAO, 2008; MoHE, 2008).

Gugsa (2000) carried out a malnutrition study in the five densely populated zones of Southern Nations Nationalities. A total of 850 children aged 3- 36 months were included in the study. Gugsa (2000) applied bivariate and multivariate techniques in order to identify risk factors of child malnutrition. The results indicate that about 45% of children are stunted, 42% underweight, and 12% wasted. Gugsa (2000) identified that household economic status and women's education were important in explaining the variation in long-term nutritional status of children. Moreover, he indicated that age, preceding birth interval and number of under-five children were associated with stunting. Number of antenatal care visits the mother had during the pregnancy of the child and age at weaning are also found to be linked to chronic malnutrition according to Gugsa. Ultimately, the study recommended the need for programs related to income-generating activities for poor households and family life education, including appropriate child care for women of the reproductive ages.

2.1.1. Child growth indicators and their interpretation

Anthropometric values are closely related to nutrition, genetic makeup, environmental characteristics, social and cultural conditions, lifestyle, functional status and health (García et al, 2007). Anthropometry is a widely used, inexpensive and non-invasive measure of the general nutritional status of an individual or a population group. Several studies have demonstrated the applications of anthropometry to include the prediction of who will benefit from interventions, identifying social and economic inequity and evaluating responses to interventions (Cogill, 2001).

Anthropometric indicators for young children provide measures of nutritional status. As recommended by the WHO, evaluation of nutritional status is based on a comparison of height and weight for the children in the survey with data for a reference population of well-nourished children (WHO Multicentre Growth Reference Study Group, 2006). The three indices are expressed as standard deviation units from the median for the reference group. Children who fall below minus two standard deviations (-2 SD) from the median of the reference population are regarded as moderately malnourished, while those who fall below minus three standard deviations (-3 SD) from the median of the reference population are considered severely malnourished.

According to World Health Organization /WHO/, child growth standards, the three most commonly used anthropometric indices to assess malnutrition in children are determined by looking into weight-for-height, height-for-age and weight-for-age. These anthropometric indices are most standardized indicators of malnutrition in children and they are determined based on measurements if the body has grown adequately.

Weight-for-age

Weight-for-age is a composite index of weight-for-height and height-for-age, and thus does not distinguish between acute malnutrition (wasting) and chronic malnutrition (stunting) or it is a composite indicator of both chronic and acute malnutrition. A child can be underweight for his/her age because he or she is stunted, wasted, or both. Weight-for-age is

an overall indicator of a population's nutritional health. Weight is influenced both by height and thinness.

Weight-for-age is the most commonly reported anthropometric index and used frequently for monitoring growth, identifying children at risk of growth failure, and assessing the impact of intervention actions in growth promotion programs. It has the advantage of requiring only one relatively simple physical measurement (i.e., weight). The relative change of weight with age is more rapid than that of height and is much more sensitive to changes in the growth pattern of the individual. Significant changes can be observed over periods of few days. Therefore, unlike height for age, weight for age is a very sensitive measure of short duration malnutrition. Among the three most common indices weight-for-age has the highest predictive ability for childhood mortality. Weight-for-age can be used to identify children at risk of becoming malnourished, and guide preventive measures such as nutrition counseling and entry into short-term food supplementation programs.

At the population level, Height-for-age can be used to identify areas of highest need for interventions and to assist in the allocation of resources among communities or regions. Weight-for-age is also used to gauge response to program interventions and to predict the health consequences of anthropometric deficits for populations (based on the predictive relationship between weight-for-age and childhood mortality). Height-for-age is better indicator of nutritional status for young child. To identify underweight, a child's actual weight is compared with that of a reference child of the same sex at exactly the same age (the international reference standard uses data from the WHO).

Height-for-age

Height-for-age is the measure of linear growth. A child who is below minus two standard deviations (below-2 SD) from the reference mean for height-for-age is considered short for his/her age, or stunted, a condition reflecting the cumulative effect of chronic malnutrition. A child exposed to inadequate nutrition for a long period of time will have a reduced growth and therefore a lower height compared to other children of the same age. It is a measure of cumulative linear growth and is often influenced by long-term food shortages, chronic and frequent illnesses, inadequate feeding practices, and poverty.

Therefore, it helps us to know whether the child is growing normally and whether it is in good health or not. But it is also important to note that height changes too slowly to be used by itself to detect changes in growth pattern within a short time interval. In other terms, it is not a very sensitive measure for short duration of malnutrition. Height for age, therefore, is only a measure of long duration malnutrition. This index is used primarily with children under five years of age, as low height-for-age commonly not appearing before 3 months of age. Children who are short for their age relative to a reference standard are classified as stunted. The prevalence of stunting among children generally increases with age up to 24-36 months and then remains relatively constant thereafter.

At the population level the prevalence of stunting is useful for long-term planning and policy development, for targeting a range of interventions to a community, and for monitoring malnutrition at the community, regional, or national level. Height-for-age is frequently used as a reflection of socioeconomic status and equity. Poverty analyses often use stunting as a nutritional indicator since it is cumulative and cannot be compensated by fatness. To identify whether a child is stunted, his/her actual height is compared with that of a reference child of the same sex at exactly the same age.

Weight-for-height

Weight-for-height describes current nutritional status. A child who is below minus two standard deviations (< -2 SD) from the reference mean for weight-for-height is considered too thin for his/her height, or is wasted. Weight-for-height is an indicator of acute malnutrition. It measures body weight relative to height. Because weight can fluctuate rapidly in children due to illness or inadequate food intake, it reflects the current nutritional status of a child, with low weight-for-height indicating current acute malnutrition with failure to gain weight or actual weight loss. However, low weight-for-height can also be a result of a chronic condition in some communities. Weight in individual children and population groups may exhibit marked seasonal patterns associated with changes in food availability or disease prevalence. In non-emergency situations, the highest prevalence of wasting generally occurs in young children of 12-24 months of age.

Weight-for-height is a useful index for assessing nutrition status of individual child under famine conditions and for identifying short-term nutrition problems in non-emergency situations. Wasting is the usual indicator of choice for targeting treatment of diarrheal and other diseases. Weight for height basically is a very good index for short duration malnutrition. This measurement is of value especially in situations where child health services are not available to carry out periodic monitoring and children are seen irregularly. The measure has an added advantage that accurate age assessment is not required. Therefore, it is age-independent and can be easily used in populations where the child's age is not known.

2.1.2. Determinants of malnutrition

Malnutrition is attributable to a range of factors (socioeconomic, demographic, behavioral health and environmental) and closely linked to standards of living and the ability to meet basic needs such as access to food, healthcare services, housing condition and sanitary/hygienic conditions.

The works of Christiaensen and Alderman (2001) identified that over the past decades, child malnutrition in Ethiopia has persisted at alarmingly high rates. They identified household resources, parental education, food prices and maternal nutritional knowledge as key determinants of child growth faltering. They recommend that to reduce child growth faltering in a significant and timely manner targeted child growth monitoring and maternal nutrition education programs must be launched in conjunction with efforts to promote private income growth and formal schooling in the country.

A study conducted in Nigeria by Ajieroh (2009) identified various factors to be influencing maternal and child nutritional status. These include household economic status, having a household head predominantly engaged with agriculture, maternal work to earn income, and maternal education or knowledge, mother's age, decision-making on her income and her health, percent of children under five years in a household, age and sex of a child, dietary diversity and meal frequency, and public health services such as having antenatal care and vaccinations.

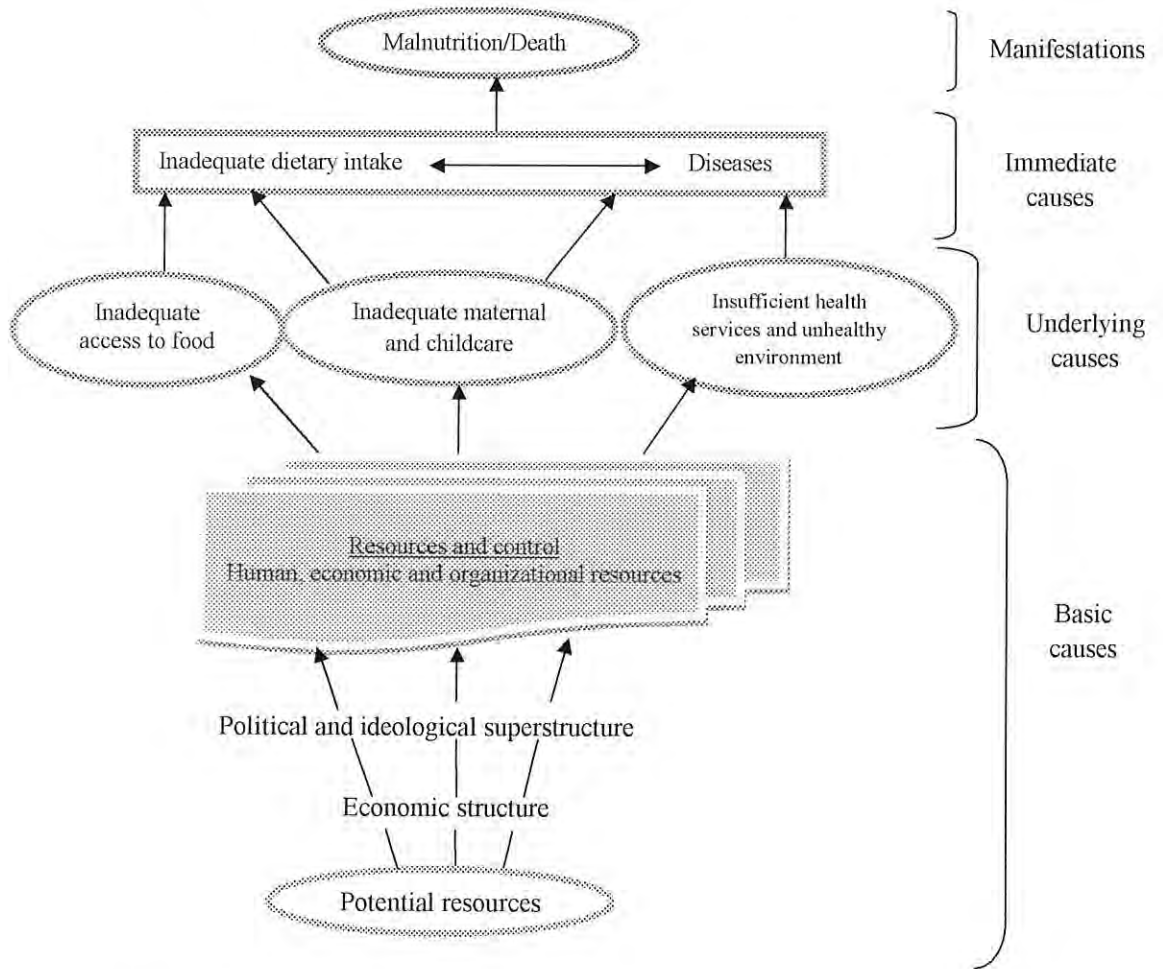
Another study carried out by Miller and Rodgers (2009) in Cambodia indicates that mother's education strongly inversely associated with a child's risk of being stunted. Based on the multivariate results, they found that children born to women with at least secondary education were approximately one-third less likely than those with uneducated mothers to be stunted.

A study by Endeshaw (2009) on the determinants of nutrition security in Shone District of Hadiya Zone, in SNNPRS, indicates that child's age, year difference between the last two births, antenatal care during the selected child, hand washing practice before handling food, child excreta disposal and house type were important predictors of child malnutrition. Similarly, a study by Melkie (2007) on the assessment of nutritional status of preschool children of Gumbrit, North West Ethiopia, shows that among the socio-economic variables household income was significantly associated with malnutrition.

2.2. Conceptual Framework

As depicted in Figure 1, the causes of malnutrition are several and they are interlocked. These causes are closely linked with each other and are hierarchically related. The two immediate causes are inadequate diet and the prevalence of diseases which are themselves caused by a set of underlying factors such as the status of household food security, poor maternal and child caring practices and low access to health services and unhealthy environment. Malnutrition also strongly correlates with the socio-economic status of the community. In developing countries like Ethiopia incidence of extreme poverty, inadequate women and children caring practices, low level of education and poor access to health services are among the major factors causing under-nutrition. Infectious diseases, such as diarrheal diseases and acute respiratory diseases are also significantly responsible for most nutrition-related health problems in developing countries like Ethiopia. Human and environmental resources, economic systems and political and ideological factors contribute to malnutrition at the basic level. Conflicts and natural disasters in many countries have also an aggravated role to the situation (UNICEF, 2003).

Figure 1: Visual representation of causes of malnutrition



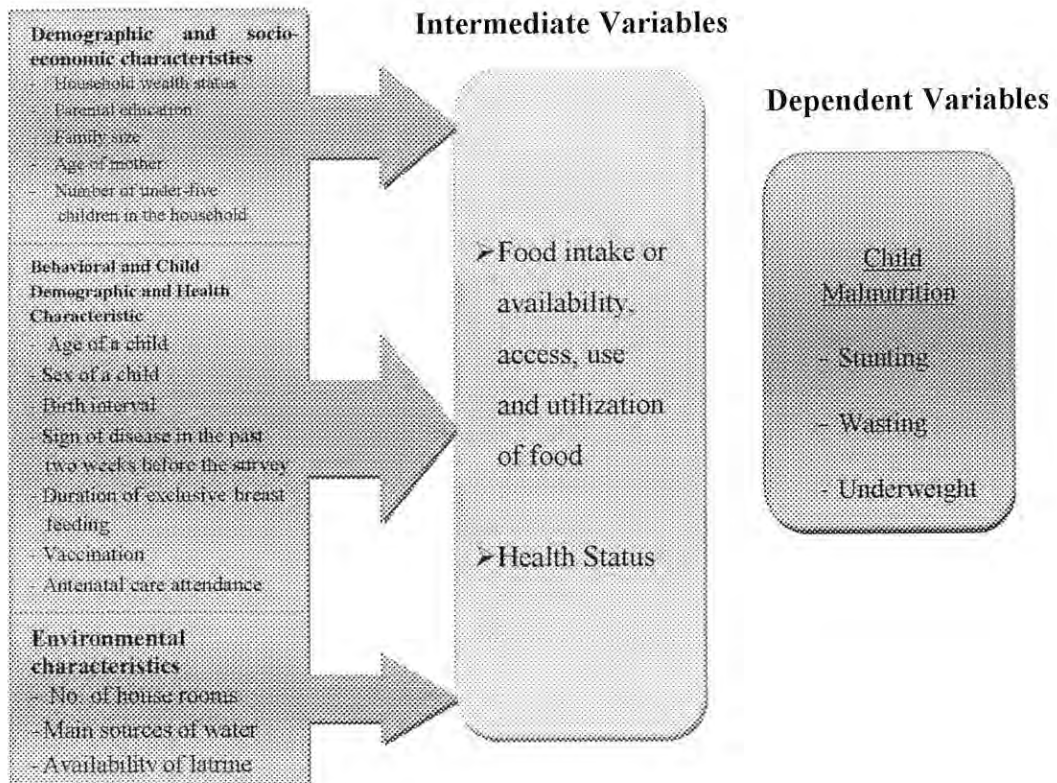
Source: The United Nations Children’s Fund (UNICEF, 2003)

2.2.1. Analytical framework

Based on the literature in the area of child malnutrition, the following analytical framework is developed for the study.

Figure 2: Visual representation of causes of malnutrition

Independent Variables



Source: developed by the researcher based on different literatures

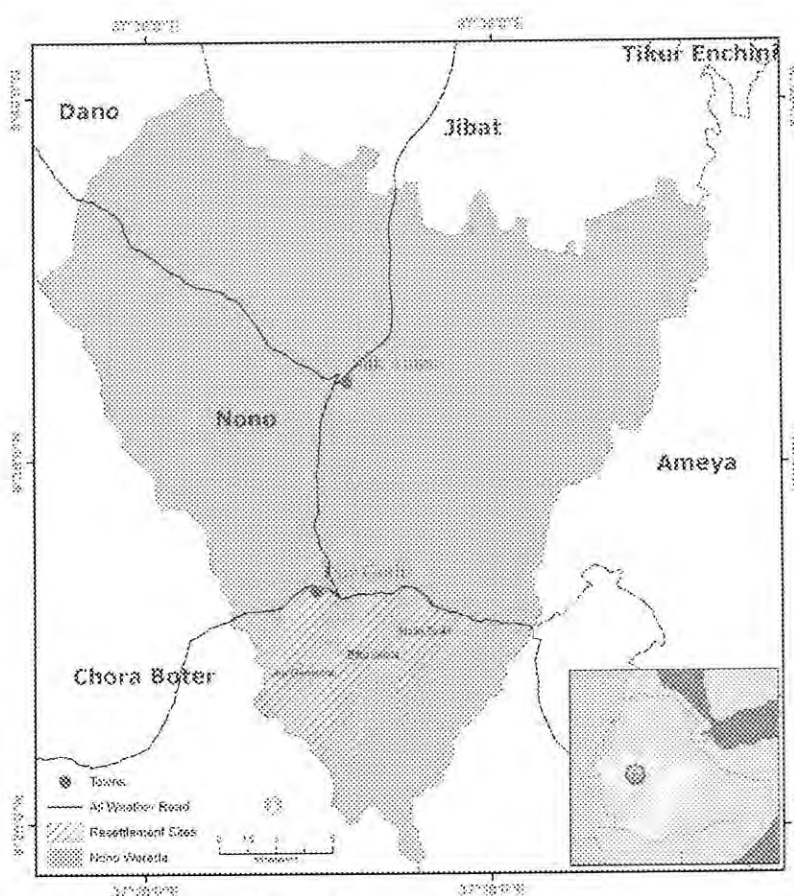
CHAPTER THREE

METHODS AND MATERIALS

3.1. The Study Area

Nonno Woreda, the locus of this study and where the resettlement site is placed, lies within 8015'N-8040' N and 37020' E-37035'E. In administrative terms, Nonno is located in West Shewa Zone, Oromia National Regional State, Central Ethiopia. The surface area of Nonno district is about 693.7 km² of which the rural area accounts for 99.07 percent. Topographically, Nonno is found within the central Ethiopian tableland commonly known as Shewan Plateau in the upper catchment of Gibe River. Nonno is a flat terrain milieu with altitude ranging from about 1126m amsl (in Gibe Valley) to about 2192m amsl. The area comprises of small mountains (hills) named Qondala (1646m), Tullu Setana /Satan's Hill/ (1640m) and Silk-Amba (1820m). It is drained by numerous perennial and seasonal rivers known as Ghibe, Ejersa, Guda, Warabessa, Nonno, Wenni and Silmi (Mesay, 2009).

Figure 3: Location map of Nonno Woreda



Source: Messay (2012)

The research site for this study is Nonno resettlement scheme. The resettlement site was organized under three administrative units /kebeles/. The kebeles in the resettlement site are Biftu Jalala, Hallo Dinki and Jiru Gamachu and it is located in a flat terrain milieu /gradient slope <8%/ with altitude ranging from about 1200m to about 1600m above sea level. The site covers an area of about 62 km² (Messay and Bekure, 2011).

Table 2: Resettler households by their origin

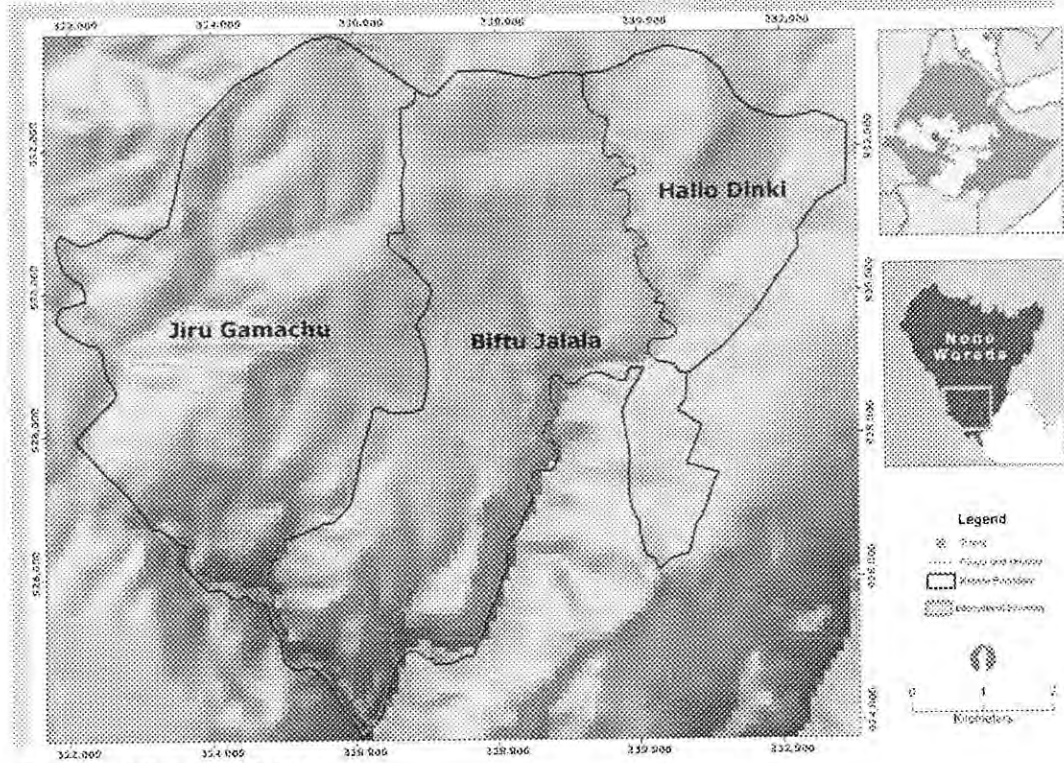
Resettlement Sites	Resettlers			
	Origin	Year of arrival	Total Hhlds	Female-headed Hhlds
Biftu Jalala	E/Hararge	2004	881	30
Halo Dinqi	Arsi	2003	232	9
Jiru Gamachu	E/Hararge	2004	632	18
Total	--	--	1745	57

Source: Official data from Nonno Woreda Administration

As can be seen in Table 2, the resettlers have been organized under three administrative units called Kebeles, namely, Biftu Jalala, Halo Dinki and Jiru Gamachu. Both Biftu Jalala and Jiru Gamachu resettlers came from East Hararge Zone whereas Halo Dinki resettlers are those from Arsi. The total household heads in the three administrative units (kebeles) is 1745 of which 3.27 percent were female. Messay (2011) noted that the total resettler population was estimated to be about 8479 with the average family size of 4.86.

Nonno Resettlement site was selected for this study mainly for two reasons. First and foremost, it is found to be spatially the most accessible resettlement site in Ethiopia for a researcher whose home-base is Addis Ababa. Hence, it was selected purposively for this study. Secondly, it has been found in the literature and other empirical research works that Nonno Resettlement Site houses resettlers who came from various woredas in Oromia National Regional State. It was then thought that this would enable the researcher to deal with communities from somewhat varied socio-economic, demographic, geographic and cultural backgrounds which may also affect the nutritional status of children.

Figure 4: Location map of the resettlement site /kebeles/ (Jiru Gamachu, Biftu Jalala and Halo Dinki)



Source: Messay (2011)

3.2. Study Design and Period

This research used a cross-sectional study design and was conducted from December 2011-February 2012 to assess the level of malnutrition and its determinants among the under-five children in Nonno resettlement site, Oromia National Regional State.

3.3. Sampling Design

3.3.1. Sample size determination

Determining an appropriate sample size is a very important issue in research because sample that is too large waste resources, while too small sample may hardly represent the population and lead to inaccurate findings. Of course sample size is the function of several factors such as homogeneity/heterogeneity of the population, the sampling error (level of precision) that can be tolerated, and confidence (risk) level. After considering all these

variables, the required sample size (households) for this study was determined using the formula for estimating single population proportion. The proportion of children who are stunted (below -2 SD) in Oromia region was used for computing this size. The Ethiopian Demographic and Health Survey 2011 (Preliminary Report) estimated the proportion of children who are stunted (below -2 SD) in Oromia region at 41.4 percent. The error to be tolerated in this study was decided to be 0.05 and the level of confidence interval 95%; the sample size (n) was determined by the following formula

$$n = pq \left(\frac{Z_{\alpha/2}}{e} \right)^2$$

Where,

n = minimum sample size

e = 0.05 (margin of error/level of precision)

$Z_{\alpha/2}$ = 1.96 (95% confidence level)

P = 0.414 (prevalence of stunting in Oromia region, 41.4%)

q = 1-p = 0.586

$$n = pq \left(\frac{Z_{\alpha/2}}{e} \right)^2$$

$$n = (0.414)(0.586) \left(\frac{1.96}{0.05} \right)^2$$

$$n = 372.79 \cong 373$$

For non-response errors, 10%, of contingency i.e 37 was added to the sample. Then, the total sample size = 410.

After determining the total household units to be involved in the study, the number of sample households was proportionally distributed across the three *kebeles* using the formula:

$$n_h = N_h \frac{n}{N}$$

Where,

n_h is sample size (households) for *kebele* h,

N_h is total households in *kebele* h,

h = 1, 2, 3 (Halo Dinki, Biftu Jalala, and Jiru Gamachu respectively)

n is total sample size, ($n = n_1 + n_2 + n_3$)

N is total households in all *kebeles*: ($N = N_1 + N_2 + N_3$)

Therefore $n_h = N_h \frac{n}{N}$

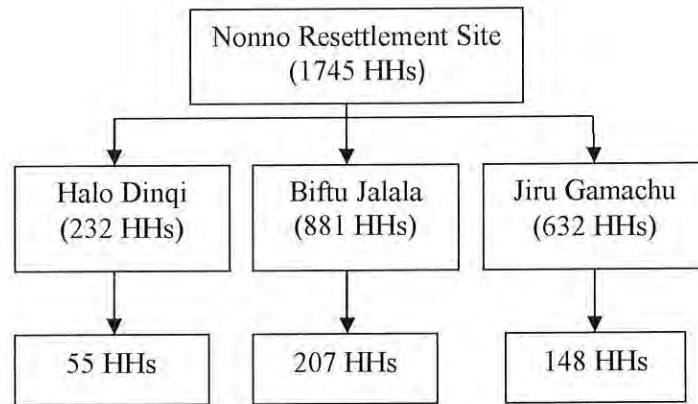
$$n_1 = N_1 \frac{n}{N} = 232 \frac{410}{1745} = 55$$

Consequently, n_1 , n_2 and n_3 are 55, 207 and 148, respectively.

3.3.2. Sampling procedure

Various sampling techniques were employed to select sample households from the resettler community. Firstly, the fact that the resettlers have been grouped into three *kebeles* (resettlement sites) was taken as an opportunity to group the resettler households into three strata. At the second stage, simple random sampling technique was employed to select sample households from each stratum or *kebele*. To do this a list of households was prepared based on the data obtained from each *kebele* offices. The selected households were used as sources of first hand socio-economic, demographic, health, environmental and anthropometric data for (for under-five children). Thirdly, lottery method was employed to select only one child from one sample household in case of the presence of more than one child (6 to 59 months) within a household for anthropometric measurements. In case there was no under five (6 to 59 months) child in the selected household, the next neighboring household was considered.

Figure 5: Schematic presentation of the sampling frame



Non-probabilistic purposive sampling technique was used to obtain focus group discussants and key informants.

3.3.3. Inclusion and exclusion criteria of the study subjects

Severely ill child/children was/were excluded and only households having under-five children were included in this study.

3.4. Sources and Tools of Data Collection

Both primary and secondary data sources were utilized for this study. Almost all the necessary household-level primary data for this study were collected from the sample households. The primary data for this study was generated through four major tools: household survey, anthropometric measurements, key informant interview and focus group discussion. These major tools were preceded by intensive training of the data collectors.

A team of one supervisor and four enumerators, were involved in collecting under-five children's anthropometric measurements /height and weight/ and other demographic, environmental, health and socio-economic data. The data collection team members include rural health extension workers and nurses with experience in community services especially in health and social areas. They were trained for two days on issues related to household survey, interviewing, taking anthropometric measurement, data recording and safety measures so as to enhance their capability to perform the data collection activities

properly. They were also given detailed instructions on how to approach and convince the respondents. They were enlightened on the entire questionnaire painstakingly and were made to practice the processes of data collection techniques prior to its actual implementation. The procedures of each primary data collection techniques in this study are briefed hereunder.

The vital data acquisition tool employed in this study is household questionnaire survey. The questionnaire was adapted from DHS and related works after reviewing relevant literature and it was pretested before it was administered. This enabled the researcher to capture multiple attributes like demographics, socio-economic, health and environmental conditions of the area. Each sample household was interviewed using the household questionnaire by the trained interviewer or under a close supervision of the researcher and/or the supervisor.

The other crucial data collection technique for this study was anthropometric measurement. This involves the measurement of weight and height of the under-five children. This anthropometric data was collected by using the procedure recommended by the WHO. Weight was measured in kilogram to the nearest 0.1 kg by using personal Scale Beam (Model QE 2003B) /weighing scale/. Height/length was measured by using wooden board to the nearest 0.1 centimeter. For children of age 6-24 months, length was measured horizontally /in a laying position/. While Children whose age was over 24 months, height was measured vertically /in a standing position/. Two readings were taken and the average was recorded for accuracy.

Finally, key informant interview (KII) and focus group discussion (FGD) data acquisition tools were applied for this study to obtain qualitative data from key informants and discussants. KII and FGD guides were designed in order to triangulate responses obtained by the structured questionnaire on the knowledge of health, nutrition, child and maternal healthcare and hygiene. Accordingly, two FGDs of seven members each (as recommended by the WHO) were carried out. The groups were composed of community elders, religious leaders and women. Key informant interviews were conducted with health professionals, rural health extension workers and development agents.

3.5. Data Quality Controlling Procedures

The data collectors were trained on issues related to data collection procedures. Data collection instruments were pretested to estimate the time needed to complete and implement them to assure whether they were capable enough to conduct the actual study. Anthropometric measurement /weight and height of under-five children/ was also pre-tested; the data collection team members measured weight and height of the same children before the actual time of data collection. Measurement was taken using standard instruments of weighing scale and height board and was regularly checked and adjusted to maintain data accuracy. The completed questionnaires were reviewed every night by the supervisor and investigator and erroneous notes were returned to the data collectors so that they can revisit the households for correction. Computer data cleaning was under taken to check for the completeness, consistency and accuracy of data and to identify errors that might have occurred during data collection or coding process.

3.6. Methods of Data Analysis

Investigation of the status of nutrition is very complex and needs to be treated using different techniques depending on the context and objectives of the research. It is characterized by multifaceted and intertwined issues such as health, socio-economic, demographic and environmental attributes for instance education and income level, birth order and interval, household size, age and sex of a child and housing conditions.

The collected data were coded and entered in to the computer using EPI info software. According to World Health Organization /WHO/ child growth standards, actual height/length and weight is compared with that of a reference child of the same sex and the same age. The anthropometric data height/length, weight, sex and age of the under-five children were exported to ENA for SMART 2008 software and were converted into Z-scores of the indices: height for age, weight for height and weight for age. Socio-economic, demographic, health and environmental data concerning the sample households were exported to SPSS Version 18 Software for analysis. Univariate analysis was used to describe the respondents' socio-economic, demographic, and health and environmental

characteristics. Bivariate analysis using Chi-Square test was applied to examine the association between independent variable with the dependent variable. Multivariate analysis using logistic regression conducted to assess independent effects of the explanatory variables on dependent variable based on standard analytical framework. Descriptive summary (frequencies, percentages, graphs and tables) were also used to present the results.

3.7. The Study Variables

Determinants and level of child malnutrition are the central theme to be investigated in this study. Hence, the following variables are included in the study:

Table 3: List of dependent and independent variables

Dependent variables	Independent variables
Stunting (low height-for-age)	Demographic and socio-economic characteristics of the household: <ul style="list-style-type: none"> • Household wealth status (1: low, 2: middle, 3: high) • Parental education (1: no education, 2: primary and above) • Family size (in number 1: ≤ 5, 2: ≥ 6) • Age of mother (in year 1: ≤ 25, 2: 26-34, 3: ≥ 35) • Number of under-five children in the household (in number 1: 1, 2: 2, 3: ≥ 3)
Underweight (low weight-for-age)	Behavioral and Child Demographic and Health Characteristic <ul style="list-style-type: none"> • Age of a child (in month 1: 6-11, 2: 12-23, 3: 24-35, 4: 36-47, 5: 48-59) • Sex of a child (1: male, 2: female) • Birth interval (in month 1: < 24, 2: 24-48, 3: > 48, 4: 1st birth) • Sign of Diarrhea, Fever, Measles and ARI in the past two weeks before the survey (1: yes, 2: no) • Duration of exclusive breast feeding (in month 1: < 6, 2: ≥ 6) • Vaccination (1: yes, 2: no) • Antenatal care attendance (1: yes, 2: no)
Wasting (low weight-for-height)	Environmental characteristics: <ul style="list-style-type: none"> • No. of house rooms (in number 1: 1-2, 2: ≥ 3) • Main sources of water (1: public pump, 2: pond, 3: unprotected spring) • Availability of latrine (1: yes, 2: no)

3.8. Ethical Considerations

Before starting to conduct the study, ethical clearance was obtained from Center for Population Studies of Addis Ababa University, and permission was assured from the selected study area administrator/Nonno Woreda City Administrator/. Ethical considerations were seriously taken into account so that the concern, integrity, anonymity, consents and other human elements of the participants, discussants, and interviewees would be protected. Essentially, respondents were told the purpose of the study prior to responding to the questions. They were assured that any information concerning them will never be passed to other unauthorized persons or institutes without their consent. On the household questionnaire and anthropometry measurement of 6-59 months of age children the names of the respondents were not specified in any part. The selected study participants were requested kindly whether they agree to participate in the study or not.

3.9. Dissemination of the Result

After being presented to the University for a Partial Fulfillment of the Masters of Population Studies, the result of this study will be communicated to relevant and concerned bodies and will also be presented at local, national, or international meetings and finally it will be submitted for publication to national or international peer reviewed journals, as deemed necessary.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Descriptive Analysis

4.1.1. Demographic and socio-economic characteristics of the household

Complete response was obtained from 408 (99.5%) of 410 study subjects. As Table 4 describes female headed households were 4.4% and 95.8% respondents were married. Average household size of the respondents was found to be 5.93 (2.05 SD). Minimum and maximum family size was 3 and 12, respectively. More than half (56.1%) of the households had a household size of ≥ 6 . About 39.2% of the households had only one under-five child, 44.4% had two and the rest 16.4% had 3 and above. Mean age of mothers were 26.5 (SD 5.75). Minimum and maximum age of mothers was 14 and 41, respectively. About 47.8% of mothers age were 25 and below, 40.4% were 26-34 and 11.8% were 35 and above. About 92.6 % of the mothers gave first birth before age 20; mean age of mothers at first birth was 17.54 (SD 2.32); minimum and maximum ages at first birth were 13 and 28 years, respectively.

Majority of mothers (85.5%) had no education. Only 14.5% of the mothers had primary+ education. And 91.7% of mothers were housewives. Whereas, 46.1% of fathers had no education while 53.7% had primary+ education. Concerning ethnicity and religion most of the respondents were Oromo (95.1%) and Muslim (92.9%).

The demographic analysis of the respondents indicate that about 94.1% of head of households were farmers and they produced either pepper or maize or both, which are considered as cash crops in the area. Nearly 85.5% of the households had at least one livestock animal and 90.9% of them had farmland meant for the production of different crops and for rearing animals. Most of the respondent households (64.2%) had ≥ 2 hectares of farmland that they obtained when they arrived at the site during the resettlement program. About 25 % of the households owned radio.

Wealth/Economic status of the household

Household wealth which shows economic status is an important determinant of child nutritional status which is identified in different literature (DHSE, 2011; Micheal, 2006). The wealth index used in this survey is a measure that has been used in many surveys to indicate inequalities in household economic status. The index was constructed using household data including ownership of livestock, radio, type of material used for roofing (thatched or corrugated), housing condition (presence of separate room for kitchen and animals), and availability of latrine. Each asset was assigned a weight 0 (No) or 1(Yes) for each household. Each household has been categorized into one of the three wealth status (low, middle or high) according to its asset briefed herein under.

- 1. Low wealth status:** a household who had none or only one or two of the identified assets i.e. corrugated iron sheet house type, livestock, radio, latrine, separate room for kitchen and separate room for animals.
- 2. Middle wealth status:** a household who had three or four of the identified assets
- 3. High wealth status:** those households who had all or five of the identified assets

Based on the wealth index, about 37.3% of the households was found at low wealth status, 48.3 % in the middle wealth status and only 14.5% of the households belonged to high wealth status.

Table 4: Demographic and socio-economic characteristics of the selected households

Characteristics	Frequency	Percent
Head of household		
Male	390	95.6
Female	18	4.4
Current marital status of head of household		
Married	391	95.8
Divorced	10	2.5
Separate	6	1.5
Widowed	1	0.2
Household size		
≤5	179	43.9
6+	229	56.1
Number of under-five children in the household		
1		
2	160	39.2
≥3	181	44.4
	67	16.4
Paternal education		
No education	188	46.1
Primary and above	219	53.7
Maternal education		
No education	349	85.5
Primary and above	59	14.5
Paternal occupation		
Farmer	384	94.1
Other	23	5.6
Maternal occupation		
House wife	374	91.7
Other	34	8.3
Mothers Age		
≤25	195	47.8
26-34	165	40.4
≥35	48	11.8
Mothers age at first birth		
≤20	378	92.6
≥21	30	7.4
Livestock animals		
Yes	350	85.8
No	58	14.2
Own farm land		
<2 hectare	109	26.7
≥2 hectare	262	64.2
No	37	9.1
Radio		
Yes	102	25
No	306	75
Wealth of household		
Low	152	37.3
Middle	197	48.3
High	59	14.5
Ethnicity		
Oromo	388	95.1
Other	20	4.9
Religion		
Muslim	379	92.9
Other	29	7.1

Source: Field survey data

4.1.2. Maternal behavior, child demographic and health characteristics

As vividly described in the methodology section of this thesis, only one under-five child was selected from each sample household. From those 408 selected children 47.5% were females. In terms of age of the children, 10% were found to be 6-11 months, 20.3%, 12-23 months, 24%, 24-35 months, 23.5%, 36-47 months, and 22.1%, 48-59 months. The children's mean age was computed to be 30.3 months. About 37.7% had less than two years interval with their preceding birth; About 21.3% of the children belonged to first birth order, 20.8% to second birth order, 24.3% to third birth order and about a third of children 4⁺ birth order.

As described in Table 5, out of the total 408 children, 90.4% were vaccinated, while 15%, 11.3% and 5.9% had sign of fever, diarrhea and ARI, respectively, in the past two weeks before the survey. According to the data from the respondent mothers, 13.3%, 9.8%, 8.6% and 6.1% of the children were frequently affected by malaria, diarrhea, fever and ARI, respectively. About 55% of the women reported that they did not plan to give birth for the selected child. Modern family planning methods were found to be more commonly used by 40% of the interviewed mothers. About a third of the mothers used Depo-Provera/injectables/ family planning method, while 6% used other methods. About 50% of the mothers reported receiving antenatal care during pregnancy of the selected child. However, 92% delivered at their home. About 85% of the mothers did not have any access to additional food in terms of quality and quantity during pregnancy or lactation of the selected child.

Breastfeeding is widely practiced among the respondent mothers. About 99% of them breast-fed their children. About 64% of them breast-fed their child exclusively for exactly 6 months. Only 7% of the mothers breast-fed for less than 6 months, and 29% breast-fed exclusively for more than 6 months.

Table 5: Maternal behavior, demographic and health characteristics of the selected child

Characteristics	Frequency	Percent
Sex		
Male	214	52.5
Female	194	47.5
Age		
6-11	41	10
12-23	83	20.3
24-35	98	24
36-47	96	23.5
48-59	90	22.1
Birth order of the selected child		
1 st	87	21.3
2 nd	85	20.8
3 rd	99	24.3
4 th and above	137	33.6
Preceding birth interval		
<24 months	154	37.7
24-48 months	93	22.8
>48 months	74	18.1
1 st birth	87	21.3
Vaccination		
Yes	369	90.4
No	39	9.6
Sign of disease in the past two weeks		
No disease	259	63.5
Fever	61	15
Diarrhea	46	11.3
ARI	24	5.9
Other	18	4.4
Frequent health problem of the child		
Malaria	54	13.2
Diarrhea	40	9.8
Fever	35	8.6
ARI	25	6.1
Other	26	6.4
No frequent health problem	228	55.9
Plan to give birth for the selected child		
Yes	182	44.6
No	226	55.4
Current use of family planning methods		
No	245	60
Depo-Provera	137	33.6
Other	26	6.4
Anti-natal care attendance/ANC/ during pregnancy of the selected child		
Yes	203	49.8
No	205	50.2
Delivery place		
Home	376	92.2
Health center	32	7.8
Additional food intake during pregnancy or lactation of the selected child		
Yes		

No	62	15.2
	346	84.8
Duration of breast feeding		
<6 months	29	7.1
6 months	261	64
>6 months	116	28.6
No breast feeding	2	0.5
Frequency of additional food given for the child per 24 hour		
Not started	10	2.5
1 times	7	1.7
2 times	98	24
≥ 3 times	293	71.8

Source: Field survey data

4.1.3. Environmental characteristics of the household

As vividly indicated in the Ethiopia Demographic and Health Survey (2011), physical characteristics of a household's environment are important determinants of the health status of household members, especially children. They can also serve as indicators of the socioeconomic status of households. From the total of 408 households, 60.8% had corrugated iron sheet roof and almost all households (98.3%) have earth floors. Almost on third, 31.4% households had one room, 42.4 % had two and 26.2% had 3⁺ rooms. Almost three quarters, 73.3%, of the households had houses without windows. No separate room is there for livestock as well as kitchen for (64% and 62%) of the households; respectively. For all the households wood and animal dung is the main type of cooking fuel.

About 27.5 % of the households had no any latrine facility. Of the total households which possess latrine facility, 68.4% had private traditional pit latrine, and the rest 4.2% had traditional shared latrine. Concerning main sources of water, 87.5% of the households used public pump and the rest used pond and unprotected spring. About 57.1% of the households disposed waste in open field.

Table 6: Percentage distribution of the households by their environmental characteristics

Characteristics	Frequency	Percent
Types of houses		
Tukul/thatched	160	39.2
Corrugated iron sheet	248	60.8
Type of floor of house		
Soil	401	98.3
Cement or brick	7	1.7
No of rooms		
1	128	31.4
2	173	42.4
>=3	107	26.2
Latrine		
No latrine	112	27.5
Private/wooden slab	279	68.4
Shared/wooden slab	17	4.2
Presence of window		
Yes	109	26.7
No	299	73.3
Main source of drinking water		
Public pump	357	87.5
Pond	41	10
Unprotected spring	10	2.5
Waste disposal		
Open field	233	57.1
In a pit	97	23.8
Composting	61	15
Burning	17	4.2
Separate room for kitchen		
Yes	155	38
No	253	62
Separate room for livestock		
Yes	147	36
No	261	64
Type of fuel		
Wood and animal dung	408	100

Source: Field survey data

4.2. Description of Nutritional Status

As vividly described in the methodology section of this thesis, only one under-five child was selected from each sample household. From 408 selected children 47.5%, were female.

Table 7: Distribution by age and sex of sampled children

Age in (month)	Boys		Girls		Total		Ratio Boy: girl
	Number	%	Number	%	Number	%	
6-17	50	53.2	44	46.8	94	23.0	1.1
18-29	45	45.0	55	55.0	100	24.5	0.8
30-41	58	54.2	49	45.8	107	26.2	1.2
42-53	55	56.7	42	43.3	97	23.8	1.3
54-59	6	60.0	4	40.0	10	2.5	1.5
Total	214	52.5	194	47.5	408	100.0	1.1

Source: Field survey data

The anthropometric data of 408 selected children were collected to measure their nutritional status. The three most commonly used nutritional status indicators (anthropometric indices) height-for-age, weight-for-age and weight-for-height were calculated using ENA for SMART software according to the WHO (2006) international growth standards. The three indices are expressed as standard deviation units from the median for the reference group. Children who fall below minus two standard deviations ($<-2SD$) from the median of the reference population are regarded as moderately malnourished, while those who fall below minus three standard deviations ($<-3SD$) from the median of the reference population are considered severely malnourished.

Height-for-age

Height-for-age is one of the three most commonly used anthropometric indices to assess malnutrition in children. Stunting refers to a low height-for-age at $<-2SD$ of the median value of the NCHS/WHO international growth reference. Severe stunting is considered as $<-3SD$. Stunting is a condition that reflects the cumulative effects of chronic malnutrition. If a child is exposed to long term inadequate nutrition, food shortages, chronic and frequent illnesses, and poverty and therefore a lower height compared to other children of the same age. Generally, stunting refers to shortness that is a deficit or linear growth retardation.

Table 8: Prevalence of stunting based on height-for-age z-scores and by sex

Stunting	Boys n = 214	Girls n = 194	All n = 408
Prevalence of stunting (< -2 z-score)	(105) 49.1 % (42.4 - 55.7 95% C.I.)	(84) 43.3 % (36.5 - 50.3 95% C.I.)	(189) 46.3 % (41.5 - 51.2 95% C.I.)
Prevalence of moderate stunting (< -2 z-score and ≥ -3 z-score)	(74) 34.6 % (28.5 - 41.2 95% C.I.)	(62) 32.0 % (25.8 - 38.8 95% C.I.)	(136) 33.3 % (28.9 - 38.0 95% C.I.)
Prevalence of severe stunting (< -3 z-score)	(31) 14.5 % (10.4 - 19.8 95% C.I.)	(22) 11.3 % (7.6 - 16.6 95% C.I.)	(53) 13.0 % (10.1 - 16.6 95% C.I.)

Source: Field survey data

As noted in Allen (1994), stunting is associated with impaired mental development and poor school performance. Stunting in childhood also leads to reduced adult size and reduced work capacity. This in turn has an implication on economic productivity at national level. A woman of short stature has a greater risk of obstetric complications because of small pelvic size and also to a greater risk of delivering a low birth weight infant.

Table 9: Prevalence of stunting by age based on height-for-age z-scores

Age (in month)	Total number of children	Severe stunting (< -3 z-score)		Moderate stunting (≥ -3 and < -2 z-score)		Normal (≥ -2 z score)	
		Number	%	Number	%	Number	%
6-17	94	2	2.1	26	27.7	66	70.2
18-29	100	18	18.0	42	42.0	40	40.0
30-41	107	21	19.6	40	37.4	46	43.0
42-53	97	11	11.3	26	26.8	60	61.9
54-59	10	1	10.0	2	20.0	7	70.0
Total	408	53	13.0	136	33.3	219	53.7

Source: Field survey data

Prevalence of stunting was found to be high in Nonno Resettlement Site where 46.3% of the children were stunted and 13% were severely stunted. Highest prevalence of stunting or chronic malnutrition (60%) was found in children of age 18-29 months and lowest (29.8%) in those aged 6-17 months. A little higher proportion of male children (49.1%) were stunted compared to female children 43.3%.

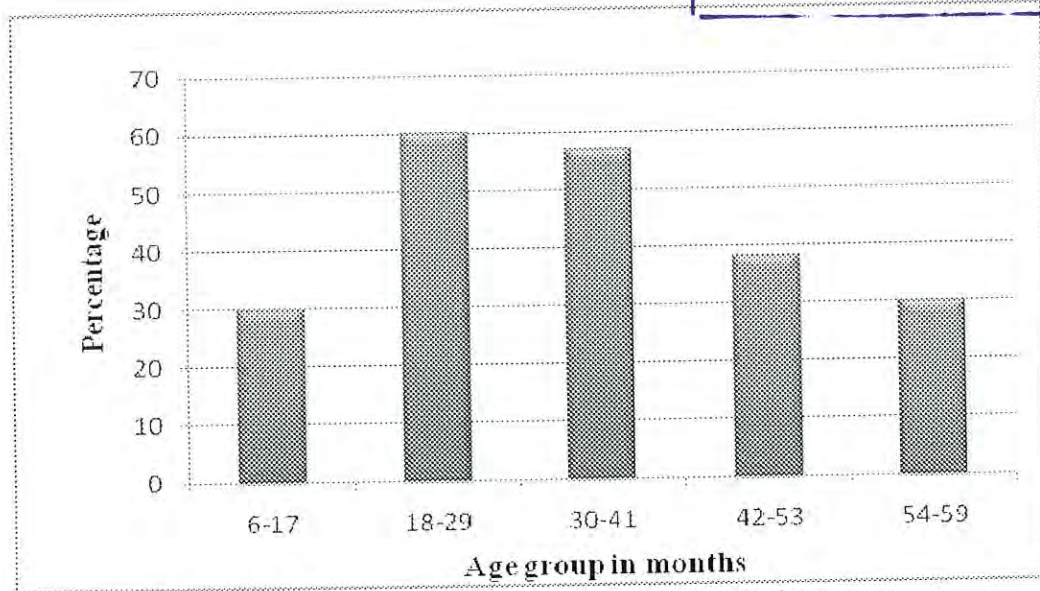


Figure 6: Level of stunting among children 6-59 months by age group

Weight-for-age

Weight-for-age is a composite index of weight-for-height and height-for-age, and thus does not distinguish between acute malnutrition (wasting) and chronic malnutrition (stunting). In other words, it is a composite indicator of both chronic and acute malnutrition. A child can be underweight for his/her age because s/he is stunted, wasted or both. Underweight refers to a low weight-for-age at $<-2SD$ of the median value of the NCHS/WHO international reference. Underweight is an overall indicator of a population's nutritional health and used frequently for monitoring growth, identifying children at risk of growth failure and assessing the impact of intervention actions in growth promotion programs.

Table 10: Prevalence of underweight based on weight-for-age z-scores by sex

Underweight	Boys n = 214	Girls n = 194	All n = 408
Prevalence of underweight (<-2 z-score)	(98) 45.8 % (39.3 - 52.5 95% C.I.)	(73) 37.6 % (31.1 - 44.6 95% C.I.)	(171) 41.9 % (37.2 - 46.8 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and ≥-3 z-score)	(67) 31.3 % (25.5 - 37.8 95% C.I.)	(50) 25.8 % (20.1 - 32.4 95% C.I.)	(117) 28.7 % (24.5 - 33.2 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(31) 14.5 % (10.4 - 19.8 95% C.I.)	(23) 11.9 % (8.0 - 17.2 95% C.I.)	(54) 13.2 % (10.3 - 16.9 95% C.I.)

Source: Field survey data

As described in Table 10, 41.9% of the children were underweight in the study area and 13.2% were severely underweight. Level of underweight children is highest in the age group 30-41 months (50.5%) and lowest in the age groups 54-59 months (20%). More male children (45.8%) were to some extent underweight than female children (37.6%).

Table 11: Prevalence of underweight by age based on weight-for-height z-scores

Age (in months)	Total Number	Severe underweight (<-3 z-score)		Moderate underweight (≥ -3 and < -2 z-score)		Normal (≥ -2 z score)	
		Number	%	Number	%	Number	%
6-17	94	6	6.4	26	27.7	62	66.0
18-29	100	15	15.0	30	30.0	55	55.0
30-41	107	19	17.8	35	32.7	53	49.5
42-53	97	13	13.4	25	25.8	59	60.8
54-59	10	1	10.0	1	10.0	8	80.0
Total	408	54	13.2	117	28.7	237	58.1

Source: Field survey data

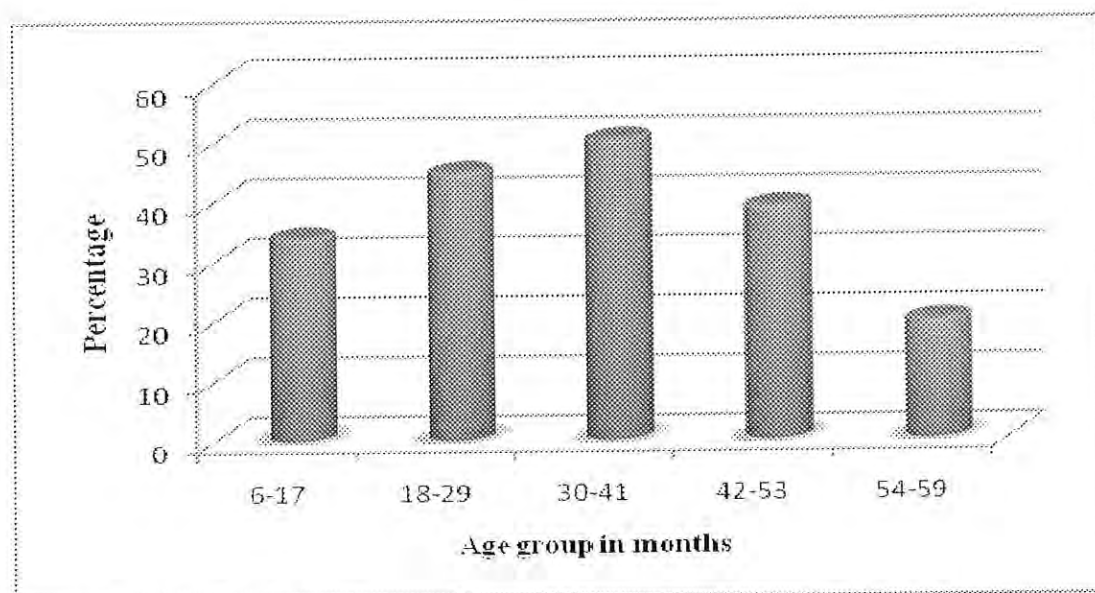


Figure 7: Level of underweight among children 6-59 months by age group

Weight-for-height

Weight-for-height is an indicator of acute malnutrition and it describes current nutritional status of the community. It measures body weight relative to the height of the children. Because weight can fluctuate rapidly due to illness or inadequate food intake, it reflects the current nutritional status of a child, with low weight-for-height indicating current acute

malnutrition with failure to gain weight or actual weight loss. Wasting refers to low weight-for-height <-2 standard deviations (SD) of the median value of the National Centre for Health Statistics /World Health Organization (NCHS/WHO) international weight-for-height reference.

Table 12: Prevalence of acute malnutrition based on weight-for-height z-scores and by sex

Wasting	Boys n = 214	Girls n = 194	All n = 408
Prevalence of global malnutrition (<-2 z-score)	(27) 12.6 % (8.8 - 17.7 95% C.I.)	(20) 10.3 % (6.8 - 15.4 95% C.I.)	(47) 11.5 % (8.8 - 15.0 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score)	(20) 9.3 % (6.1 - 14.0 95% C.I.)	(15) 7.7 % (4.7 - 12.4 95% C.I.)	(35) 8.6 % (6.2 - 11.7 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score)	(7) 3.3 % (1.6 - 6.6 95% C.I.)	(5) 2.6 % (1.1 - 5.9 95% C.I.)	(12) 2.9 % (1.7 - 5.1 95% C.I.)

Source: Field survey data

From 408 selected children, 11.5% were wasted and 2.9% were severely wasted. Wasting is highest in children within the age range of 18-29 months (16 percent) and lowest within the age range of 6-17 months (5.3 percent). Male children are slightly more likely to be wasted (12.6%) than female children (10.3%).

Table 13: Prevalence of acute malnutrition by age based on weight-for-height z-scores

Age in (months)	Total number of children	Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (≥-2 z score)	
		Number	%	Number	%	Number	%
6-17	94	0	0.0	5	5.3	89	94.7
18-29	100	2	2.0	14	14.0	84	84.0
30-41	107	5	4.7	9	8.4	93	86.9
42-53	97	5	5.2	6	6.2	86	88.7
54-59	10	0	0.0	1	10.0	9	90.0
Total	408	12	2.9	35	8.6	361	88.5

Source: Field survey data

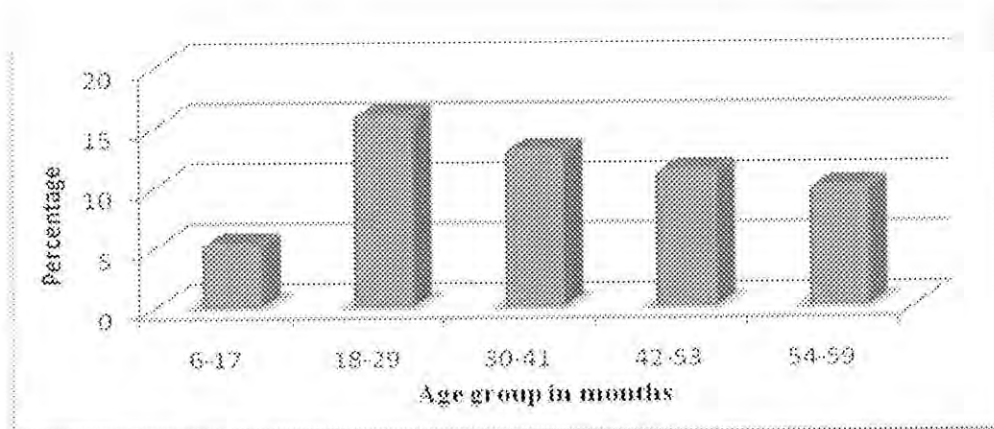


Figure 8: Level of wasting among children 6-59 months by age group

From the preceding analysis, one can conclude that overall prevalence of child malnutrition in the community was high and needs close attention and effort to averting the problems. The analysis indicates that 46.3%, 41.9% and 11.5% of children were stunted, underweight and wasted, respectively.

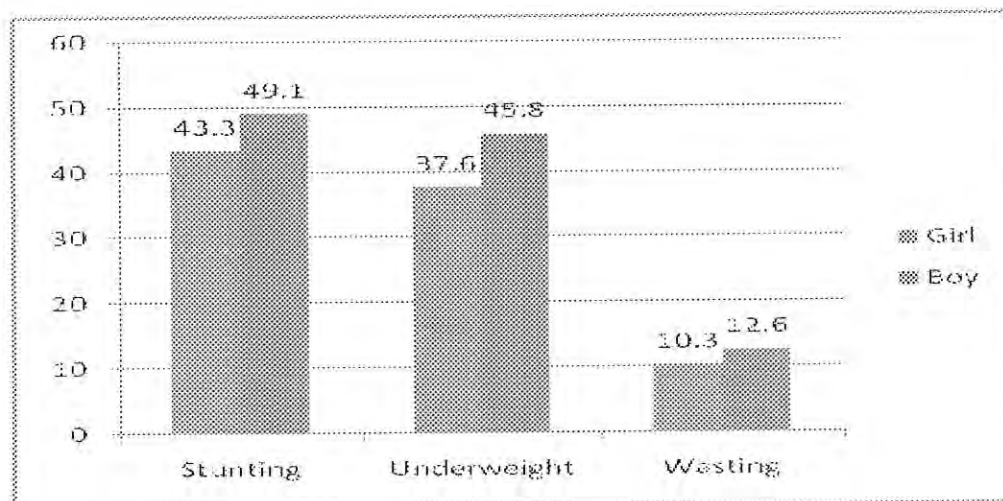


Figure 9: Level of stunting, underweight and wasting among children 6-59 months by sex

Moreover, 49.1%, 45.8% and 12.6% of male children and 43.3%, 37.6% and 10.3% of female children were stunted, underweight and wasted respectively. Hence from this analysis one can conclude that male children were found to be affected by malnutrition more than the female children do in the study area. This finding is in agreement with CSA and ICF International (2012) and Nebiyu (2007).

4.3. Bivariate Analysis

Bivariate analysis was conducted based on Chi-Square test. The result is presented in tables 14, 15 and 16. This Chi-Square test is performed between the selected independent variables (i.e. socio-economic, demographic, environmental, health and behavioral variables) and every one of the dependent variable (stunting, underweight or wasting). This was performed to look into the association between these selected independent variables and each dependent variable (stunting, underweight or wasting).

4.3.1. Chi-square test result showing the association between stunting and the selected variables

The Chi-Square test shows a significant association between stunting and the majority of the selected variables. The exception in this regard is that maternal age, sex of a child, sign of disease in the past two weeks before the survey and exclusive breast feeding were not found to have association with stunting.

Table 14: Chi square test result showing relationship between stunting and the selected variables

Selected variables	Stunting		Chi-square value	P-value
	Yes	No		
	Frequency (%)	Frequency (%)		
Household size				
≤5	41 (10.05)	138 (33.82)	70.34	0.000*
≥6	148 (36.27)	81 (19.85)		
No. of under-five children				
1	58 (14.22)	102 (25.00)	21.82	0.000*
2	84 (20.59)	97 (23.77)		
≥3	47 (11.52)	20 (4.90)		
Paternal education				
No education	123 (30.22)	65 (15.97)	52.00	0.000*
Primary and above	65 (15.97)	154 (37.84)		
Wealth of household				
Low	122 (29.9)	30 (7.35)	115.90	0.000*
Middle	58 (14.22)	139 (34.07)		
High	9 (2.21)	50 (12.25)		
Ethnic group				
Oromo	179 (43.87)	209 (51.23)	0.114	0.735
Other	10 (2.45)	10 (2.45)		
Religion				
Muslim	173 (42.40)	206 (50.49)	0.98	0.32
Other	16 (3.92)	13 (3.19)		

Mothers age				
≤25	91 (22.30)	104 (25.49)		0.81
26-34	74 (18.14)	91 (22.30)	0.41	
≥35	24 (5.88)	24 (5.88)		
Maternal education				
No education	187 (45.83)	162 (39.71)	51.13	0.000*
Primary and above	2 (0.49)	57 (13.97)		
Sex of a child				
Female	86 (21.08)	108 (26.47)	0.59	0.44
Male	103 (25.25)	111 (27.21)		
Age of a child				
6-11	8 (1.96)	33 (8.09)		
12-23	40 (9.80)	43 (10.54)		
24-35	54 (13.24)	44 (10.78)	23.84	0.000*
36-47	55 (13.48)	41 (10.05)		
48-59	32 (7.84)	58 (14.22)		
Preceding birth interval				
<24 months	88 (21.57)	66 (16.18)		
24-48 months	36 (8.82)	57 (13.97)	13.22	0.004*
>48 months	26 (6.37)	48 (11.76)		
1 st birth	39 (9.56)	48 (11.76)		
ANC attendance				
Yes	63 (15.44)	140 (34.31)	37.98	0.000*
No	126 (30.88)	79 (19.36)		
Exclusive breast feeding				
<6 months	12 (2.94)	17 (4.17)	0.31	0.85
≥6 months	176 (43.14)	201 (49.26)		
No EBF	1 (0.25)	1 (0.25)		
Frequency of additional food given for the child per 24 hour				
≤2 times	73 (17.89)	49 (12.00)	13.30	0.001*
≥3 times	109 (26.72)	163 (39.95)		
Not started	7 (1.72)	7 (1.72)		
Vaccination				
Yes	156 (38.24)	213 (52.21)	25.42	0.000*
No	33 (8.09)	6 (1.47)		
Sign of disease in the past 2 weeks before the survey				
Yes	74 (18.14)	75 (18.38)	1.05	0.30
No	115 (28.19)	144 (35.29)		
Main source of drinking water				
Public pump	145 (35.54)	212 (51.96)		
Pond	37 (9.07)	4 (0.98)	38.7	0.000*
Unprotected spring	7 (1.72)	3 (0.74)		
Availability of latrine				
Yes	116 (28.43)	180 (44.12)	22.07	0.000*
No	73 (17.89)	39 (9.56)		
No. of house rooms				
1-2	159 (38.97)	142 (34.80)	19.50	0.000*
3+	30 (7.35)	77 (18.87)		

*Significant at $p < 0.05$

Source: Field survey data

4.3.2. Chi-square test result showing association between underweight and the selected variables

Table 15 presents the selected socio-economic, demographic, environmental, health and behavioral variables and their relation to underweight. As shown in the table, in the Chi-square test, all selected variables except maternal age, exclusive breast feeding and sex of a child showed significant association with underweight.

Table 15: Chi-square test result showing relationship between underweight and the selected variables

Selected variables	Underweight		Chi square value	P-value
	Yes	No		
	Frequency (%)	Frequency (%)		
Household size				
≤5	25 (6.13)	154 (37.75)	102.29	0.000*
≥6	146 (35.78)	83 (20.34)		
No. of under-five children				
1	51 (12.50)	109 (26.72)	31.28	0.000*
2	72 (17.65)	109 (26.72)		
≥3	48 (11.76)	19 (4.66)		
Paternal education				
No education	112 (27.52)	76 (18.67)	24.2	0.000*
Primary and above	59 (14.49)	160 (39.31)		
Wealth of household				
Low	119 (29.17)	33 (8.09)	136.09	0.000*
Middle	47 (11.52)	150 (36.76)		
High	5 (1.23)	54 (13.23)		
Ethnic group				
Oromo	159 (38.97)	229 (56.13)	2.82	0.09
Other	12 (2.94)	8 (1.96)		
Religion				
Muslim	155 (37.99)	224 (54.90)	2.25	0.133
Other	16 (3.92)	13 (3.19)		
Mothers age				
≤25	81 (19.85)	114 (27.94)	0.03	0.985
26-34	70 (17.16)	95 (23.28)		
≥35	20 (4.90)	28 (6.86)		
Maternal education				
No education	168 (41.17)	181 (44.36)	38.42	0.000*
Primary and above	3 (0.74)	56 (13.72)		
Sex of a child				
Female	74 (18.14)	120 (29.41)	2.15	0.142
Male	97 (23.77)	117 (28.67)		
Age of a child				
6-11	10 (2.45)	31 (7.59)	26.71	0.000*
12-23	36 (8.82)	47 (11.52)		
24-35	46 (11.27)	52 (12.74)		
36-47	47 (11.52)	49 (12.00)		
48-59	32 (7.84)	58 (14.21)		

Preceding birth interval				
<24 months	86 (21.07)	68 (16.67)	19.86	0.000*
24-48 months	30 (7.35)	63 (15.44)		
>48 months	26 (6.37)	48 (11.76)		
1st birth	29 (7.11)	58 (14.22)		
ANC attendance				
Yes	51 (12.50)	152 (37.25)	20.77	0.000*
No	120 (29.41)	85 (20.83)		
Exclusive breast feeding				
<6 months	13 (3.18)	16 (3.92)	1.54	0.462
≥6 months	158 (38.72)	219 (53.67)		
No EBF	0 (0.00)	2 (0.49)		
Frequency of additional food given for the child per 24 hour				
≤2times	74 (18.14)	48 (11.76)	20.03	0.000*
≥3 times	87 (21.32)	185 (45.34)		
Not started	10 (2.45)	4 (0.98)		
Vaccination				
Yes	139 (34.07)	230 (56.37)	28.53	0.000*
No	32 (7.84)	7 (1.72)		
Sign of disease in the past 2 weeks before the survey				
Yes	89 (21.81)	60 (14.71)	30.61	0.000*
No	82 (20.10)	177 (43.38)		
Main source of drinking water				
Public pump	130 (31.86)	227 (55.64)	35.45	0.000*
Pond	33 (8.09)	8 (1.96)		
Unprotected spring	8 (1.96)	2 (0.49)		
Availability of latrine				
Yes	94 (23.04)	202 (49.51)	45.67	0.000*
No	77 (18.87)	35 (8.58)		
No. of house rooms				
1-2	147 (36.04)	154 (37.74)	22.61	0.000*
3+	24 (5.88)	83 (20.34)		

*Significant at $p < 0.05$ Source: Field survey data

4.3.3. Chi-square test showing the association between wasting and the selected variables

As depicted in Table 16, in the case of wasting, some selected variables do not establish a significant association with it as compared to stunting and underweight. Paternal education, sex and age of a child, antenatal care attendance, maternal age and exclusive breast feeding were not found to have association with wasting. The other selected variables such as maternal education, wealth status, signs of disease in the past two weeks of the survey, number of under-five children showed a significant association with wasting.

Table 16: Chi square test result to showing relationship between wasting and the selected variables

Selected variables	Wasting		Chi-square value	P-value
	Yes	No		
	Frequency (%)	Frequency (%)		
Household size				
≤5	8 (1.96)	171 (41.91)	16.35	0.000*
≥6	40 (9.80)	189 (46.32)		
No. of under-five children				
1	5 (1.22)	155 (37.99)	78.45	0.000*
2	14 (3.43)	167 (40.93)		
≥3	29 (7.11)	38 (9.32)		
Paternal education				
No education	26 (6.38)	162 (39.80)	1.39	0.238
Primary and above	22 (5.40)	197 (48.40)		
Wealth of household				
Low	30 (7.35)	122 (29.9)	15.81	0.000*
Middle	16 (3.93)	181 (44.36)		
High	2 (0.49)	57 (13.97)		
Ethnic group				
Oromo	45 (11.03)	343 (84.06)	0.21	0.645
Other	3 (0.73)	17 (4.17)		
Religion				
Muslim	44 (10.78)	335 (82.11)	0.12	0.725
Other	4 (0.98)	25 (6.13)		
Mothers age				
≤25	24 (5.88)	171 (41.91)	0.14	0.928
26-34	19 (4.66)	146 (35.78)		
≥35	5 (1.23)	43 (10.54)		
Maternal education				
No education	47 (11.52)	302 (74.02)	12.73	0.001*
Primary and above	1 (0.24)	58 (14.22)		
Sex of a child				
Female	21 (5.14)	173 (42.40)	0.31	0.575
Male	27 (6.62)	187 (45.83)		
Age of a child				
6-11	1 (0.24)	40 (9.80)	6.82	0.145
12-23	8 (1.96)	75 (18.38)		
24-35	17 (4.17)	81(19.85)		
36-47	12 (2.94)	84 (20.59)		
48-59	10 (2.45)	80 (19.61)		
Preceding birth interval				
<24 months	35 (8.58)	119 (29.17)	9.56	0.001*
24-48 months	4 (0.98)	89 (21.81)		
>48 months	6 (1.47)	68 (16.67)		
1 st birth	3 (0.73)	84 (20.58)		
ANC attendance				
Yes	24 (5.88)	179 (43.87)	0.001	0.97
No	24 (5.88)	181 (44.36)		
Exclusive breast feeding				
<6 months	7 (1.72)	22 (5.39)	4.83	0.089
≥6 months	41 (10.05)	336 (82.35)		
No EBF	0 (0.00)	2 (0.49)		

Frequency of additional food given for the child per 24 hour				
≤2 times	31 (7.60)	91 (22.30)	92.02	0.000*
≥3 times	7 (1.72)	265 (64.95)		
Not started	10 (2.45)	4 (0.98)		
Vaccination				
Yes	24 (5.88)	345 (84.56)	102.91	0.000*
No	24 (5.88)	15 (3.68)		
Sign of disease in the past 2 weeks before the survey				
Yes	42 (10.29)	107 (26.22)	60.98	0.000*
No	6 (1.47)	253 (62.01)		
Main source of drinking water				
Public pump	34 (8.33)	323 (79.17)	13.89	0.000*
Pond	11 (2.69)	30 (7.35)		
Unprotected spring	3 (0.73)	7 (1.72)		
Availability of latrine				
Yes	14 (3.43)	282 (69.12)	51.40	0.000*
No	34 (8.33)	78 (19.12)		
No. of house rooms				
1-2	45 (11.03)	256 (62.74)	11.21	0.001*
3+	3 (0.73)	104 (25.49)		

*Significant at $p < 0.05$ Source: Field survey data

4.4. Multivariate Analysis

The Chi-square test results revealed significant relationship between each dependent variable (stunting, underweight or wasting) and the selected independent variables. As a result, it is impossible to assess the independent effects of the explanatory variables on the dependent variable. Against this background, the logistic regression was conducted to discover independent effects of the selected explanatory variables on the dependent variable. As indicated earlier, logistic regression analysis was conducted for each dependent variable (stunting, underweight and wasting). The results are presented in tables 17, 18 and 19. To avoid an excessive number of variables and unstable estimates in the model (logistic regression analyses) only ten selected variables were kept for stunting and nine variables for each underweight and wasting with a p value less than 0.001 (high Chi-square value).

To ensure the efficiency of the results, multicollinearity test was conducted. The test result shows that multicollinearity is not a problem in all the three regression analyses as confirmed by the values of *Tolerance and the Variance Inflation Factor /VIF/* (See Annex

4). Hosmer and Lemeshow test was also conducted to check the model of fitness or the significance of the logistic regression model. The test result shows that the model well fitted the data in all the three regression analyses (See Annex 4).

4.4.1. Factors associated with stunting

As depicted in Table 17, stunting was found to be associated with maternal education [OR: 6.89, 95% CI (3.98, 9.46)]. Children born to women with no education were found to be 7 times more likely to be stunted almost compared to those born to women with primary and above education. Paternal education level was also found to have strong association with stunting [OR: 2.357, 95% CI (1.303, 4.264)]. Children born to uneducated fathers were found to be 2 times more likely to be stunted as compared to those born to fathers with primary and above education level.

Similarly, household wealth status was found to have a statistically significant effect on stunting. The odds of households low wealth status [OR: 7.889, 95% CI (6.451, 9.608)] and medium wealth status [OR: 2.779, 95% CI (1.073, 5.198)] indicates children who were born to parents of low wealth status were found to be about 8 times and children who were born to parents of middle wealth status about 3 times more likely to be stunted almost compared to those born to high wealth status households.

Number of under-five children in the household was found to have significant association with stunting. As number of under-five children increases, in the household the chance for children to be stunted was found to be more likely. The odds of a household that had two children [OR: 1.790, 95% CI (1.289, 3.038)] and 3+ children [OR: 3.218, 95% CI (2.073, 6.655)] shows as number of under-five children increases in the household the chance for a children to be stunted was found to be more likely almost compared to the case in the households that had only one child. The odds of higher number (6⁺) household size [OR: 3.402, 95% CI (1.783, 5.488)] also shows a significant association with stunting. As household size increases children were three times more likely to be stunted almost compared to those from households of less than five household size.

The age of the children showed an effect on the risk of stunting. For instance, the risk was found high at age segments 12-23 months [OR: 2.491, 95% CI (1.493, 3.934)] and 24-35 months [OR: 1.423, 95% CI (1.156, 3.880)] and 36-47 months [OR: 2.488, 95% CI (1.694, 4.166)] as compared to 6-11 months of age group. There was no significant association in the age group 49-59 months. Not attended antenatal care during the pregnancy had a chance to increase stunting by about three times [OR: 3.287, 95% CI (1.745, 5.193)] as compared to attended antenatal care.

Children born to parents who use pond water source were found to be about five times more exposed to the risk of stunting than those who were born to parents who had access to public pump water facility [OR: 5.036, 95% CI:(3.285,7.090)]. Use of unprotected spring water source, availability of latrine facility and immunization/vaccination were found not to have significant effect on stunting.

Table 17: Logistic regression analysis result of stunting and the selected variables

Selected variables	Coefficient /B/	Standard error/S.E/	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Household size ≤5 ^{RC} ≥6	1.224	.329	.000	3.402*	1.783	5.488
No. of under-five children 1 ^{RC} 2 ≥3	1.026 1.828	.394 .561	.009 .001	1.790* 3.218*	1.289 2.073	3.038 6.655
Paternal education No education Primary and above ^{RC}	.857	.302	.005	2.357*	1.303	4.264
Wealth of household Low Middle High ^{RC}	2.884 1.022	.520 .486	.000 .035	7.889* 2.779*	6.451 1.073	9.608 5.198
Maternal education No education Primary and above ^{RC}	2.292	.821	.005	6.899*	3.981	9.461
Age of a child 6-11 ^{RC} 12-23 24-35 36-47 48-59	1.721 1.464 1.790 1.181	.674 .631 .644 .649	.011 .020 .005 .069	2.491* 1.423* 2.488* 1.257	1.493 1.156 1.694 .912	3.934 3.880 4.166 4.630
ANC attendance Yes ^{RC} No	1.190	.323	.000	3.287*	1.745	5.193
Vaccination Yes ^{RC} No	.618	.615	.315	1.854	.556	3.190
Main source of drinking water Public pump ^{RC} Pond Unprotected spring	2.488 .972	.662 1.235	.000 .431	5.036* 2.644	3.285 .235	7.090 7.736
Availability of latrine Yes ^{RC} No	-.491	.381	.197	.612	.290	1.291

*Significant at p<0.05; RC indicates reference category; Source: Field survey data

4.4.2. Factors associated with underweight

As described earlier in the bivariate analysis (chi-square test), various variables were found to have significant associations with underweight. Logistic regression analysis was conducted to identify the determinant factors associated with underweight cases in the area. As shown in Table 18, similar to stunting, maternal education, the households' wealth status, numbers of under-five children in the household, household size and main sources of water for household consumption were found to have strong association with the underweight.

Children to a household with no latrine facility [OR: 2.319, 95% CI (1.069, 5.031)] have two times higher chance to be underweight as compared to those from a household having access to latrine facility. In fact, it was found out that latrine facility had no association with stunting. Age of a child did not show a significant association with underweight; but a significant association with stunting. Immunization/vaccination has no significant effect on both stunting as well as underweight. The other variable that showed significant effect with underweight which was not included in stunting regression is sign of disease in the past two weeks before the survey. The odds of this variable [OR: 3.473, 95% CI:(1.847, 4.304)] shows children had sign of disease in the past two weeks before the survey were three times more likely to be underweight almost compared to those children who had no sign of disease in the past two weeks before the survey.

Table 18: Logistic regression analysis result of underweight and the selected variables

Selected variables	Coefficient /B/	Standard error/S.E/	Sig.	Exp(B)	95% C.I.for EXP(B)	
					Lower	Upper
Household size ≤5 ^{RC} ≥6	2.497	.389	.000	6.440*	5.663	8.025
No. of under-five children 1 ^{RC} 2 ≥3	.408 1.593	.436 .614	.050 .009	1.503* 3.421*	1.139 1.978	3.535 5.380
Wealth of household Low Middle High ^{RC}	1.580 1.589	.650 .595	.000 .008	5.353* 4.497*	3.279 3.525	7.663 5.730
Maternal education No education Primary and above ^{RC}	1.604	.712	.024	3.971*	1.230	5.083
Age of a child 6-11 ^{RC} 12-23 24-35 36-47 48-59	.436 -.437 .162 .145	.666 .624 .624 .645	.512 .484 .795 .822	1.547 .646 1.176 1.156	.420 .190 .346 .326	5.704 2.196 3.995 4.096
Vaccination Yes ^{RC} No	.747	.661	.258	2.111	.578	5.705
Sign of disease in the past 2 weeks before the survey Yes No ^{RC}	1.301	.351	.000	3.473*	1.847	4.304
Main source of drinking water Public pump ^{RC} Pond Unprotected spring	2.201 2.740	.683 1.340	.001 .041	3.030* 5.494*	2.367 1.122	4.450 9.045
Availability of latrine Yes ^{RC} No	.841	.395	.033	2.319*	1.069	5.031

*Significant at $p < 0.05$; RC indicates reference category; Source: Field survey data

4.4.3. Factors associated with wasting

Regression result on wasting presented in Table 19, showed that sign of disease in the past two weeks before the survey, frequency of additional food given for the child per 24 hour, number of under-five children in the household, main sources of water and vaccination had showed a significant association with wasting. Unlike stunting and underweight, maternal

education, household wealth status, household size and latrine facility were not found to have significant association with wasting.

Table 19: Logistic regression analysis result of wasting and the selected variables

Selected variables	Coefficient /B/	Standard error/S.E/	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Household size ≤5 ^{RC} ≥6	.837	.655	.201	2.310	.640	3.339
No. of under-five children 1 ^{RC} 2 ≥3	2.918 2.144	1.159 1.177	.012 .008	1.898* 2.688*	1.107 1.307	3.424 3.076
Wealth of household Low Middle High ^{RC}	-.386 .091	.956 .903	.686 .920	.680 1.095	.104 .187	4.426 4.429
Maternal education level No education Primary and above ^{RC}	.269	1.146	.814	1.309	.138	2.383
Frequency of additional food given for the child per 24 hour Not started ≤2 times ≥3 times ^{RC}	3.223 1.822	1.278 .579	.000 .002	6.689* 3.183*	5.164 1.987	8.001 5.246
Vaccination Yes ^{RC} No	2.331	.704	.001	3.293*	2.592	4.884
Sign of disease in the past 2 weeks before the survey Yes No ^{RC}	2.181	.579	.000	6.858*	4.848	8.546
Main source of drinking water Public pump ^{RC} Pond Unprotected spring	2.940 3.537	1.247 1.461	.018 .015	3.910* 4.364*	1.642 1.962	7.815 8.952
Availability of latrine Yes ^{RC} No	.652	.537	.225	1.919	.669	4.501

*Significant at p<0.05; RC indicates reference category; Source: Field survey data

4.5. Discussion

The results show that the overall prevalence of malnutrition in Nonno Resettlement Site was high among children aged 6-59 months as measured by stunting, wasting and underweight. To be specific 46.3% of children were stunted and 13% were severely stunted. Stunting or chronic malnutrition refers to low height-for-age or it is linear growth retardation reflecting long-term cumulative effects of inadequate nutrition, food shortages, chronic and frequent illnesses and poverty.

The level of underweight is also high in the area where 41.9% of the children were underweight and 13.2% were severely underweight. Underweight refers to a deficit and is defined as low weight-for-age. Weight-for-age is influenced by the height and weight of a child and is thus a composite indicator of stunting and wasting/chronic and acute malnutrition.

Prevalence of wasting was also high in Nonno Resettlement Site. About 11.5% of the children were wasted and 2.9% were severely wasted. Wasting is an acute malnutrition referring to low weight-for-height and it reflects inadequate food intake or illness in children. As indicated in Zewditu, Kalbesa, Timotiyos and Ayele (2001), the highest prevalence of wasting occurs in times of famine, during seasonal food shortages, severe illness or infectious disease which results in rapid weight loss. Food shortage and/or infectious disease were the major problem in the study area for the observed high prevalence of wasting (11.5%).

The overall findings of this study indicate that prevalence of child malnutrition in the community was high. The analysis indicates that 46.3%, 41.9% and 11.5% of children were stunted, underweight and wasted, respectively.

The summary of the views of the focus group discussants indicate that there were various causes for the prevailing child malnutrition in the area. The discussants agreed that the fact that the single most important food grain in the area is maize is one of the major causes of the problem. In addition, they pointed out that lack of access to adequate potable water and the hot agro-climatic conditions, early marriage, prevalence of infectious diseases like

malaria, and inadequate access to well-equipped and well-stuffed health centers are among the major problems in the community. It is the fervent belief of the researcher that some of these might be the cause of high prevalence of malnutrition in the area. The views of the discussants directly correlate with the findings of Messay (2012) who investigated the causes and status of the resettlers' food security painstakingly.

The summary of interviews held with various health professionals, development agents and rural health extension workers in the area agrees with the findings of the quantitative results and the ideas of the focus group discussants indicated above. All the interviewees agree child malnutrition is prevalent in the area. They also agree with major causes of the problem indicated above. Particularly, a health professional (an interviewee) in Jiru Gamachu Health Center pointed out that inadequate food supply, hygienic problems, and the prevalence of infectious diseases are the prominent causes of the problem. In fact, rates of vaccination in Jiru Gamachu Health Center have been improving according to the interviewee in Jiru Gamachu Health Center which will undoubtedly improve the prospects of the situation.

Similar to the views of the interview above, Messay (2012: 213) quoted a health extension worker in Biftu Jalala who explained the status, causes and outcomes of dietary deficiency in the resettlement sites based on her closest experience with the community as follows:

Malnutrition seems rife in the sites. This may be because most resettlers in this place usually eat monotonous and inadequate diet. They regularly consume meals made of only maize and sorghum in the form of bread, *injera*, *kolo* [roasted grains] or *nifro* [boiled grains] usually without any additional flavors such as *wat* [local sauce]. ...They seldom use animal products such as meat, milk and butter, mainly because such food items are either scarce or meant for sale. I think they have no access to adequate and balanced diet as a result of which majority of them, particularly children and mothers, remain malnourished and susceptible to diseases like diarrhea.

There is no other research conducted on child malnutrition in the study area to compare the level of child malnutrition and its determinants in under-five children. However, this finding was in conformity with different studies conducted in other areas of the country.

Prevalence of stunting was 46.3% for the study area while it was 52%, 47% and 44% in the Demographic and Health Survey of Ethiopia for 2000, 2005 and 2011, respectively. Prevalence of underweight was 41.9 % in this study and it was 41%, 33%, and 29% in the Demographic and Health Survey of Ethiopia for 2000, 2005 and 2011, respectively. In the same way, prevalence of wasting was 11.5% in this study and it was 11%, 11%, 10% in Demographic and Health Survey of Ethiopia in 2000, 2005 and 2011, respectively. Another survey conducted by Concern Ethiopia in Goro *Woreda* Bale Zone of Oromia Region in 2006 shows that prevalence of stunting among children (6-59 months) was 44.5%.

Parental education, wealth status of household, household size, total number of under-five children in the household, age of a child and antenatal care attendance were found to be the major determinant factors of stunting. In similar ways, maternal education, wealth status of household, household size, total number of under-five children in the household, sign of disease in the past two weeks before the survey, source of water and availability of latrine were the determinant factors of underweight. The total number of under-five children in the household, frequency of additional food given for the child per 24 hours, vaccination, sign of disease in the past two weeks before the survey, and main sources of water were found to be the major determinant of wasting. Amazingly, number of under-five children in the household was a determinant factor for all stunting, wasting and underweight. Maternal education and household wealth status has a significant association with stunting and underweight. This is in agreement with the findings of 2011 Demographic and Health Survey of Ethiopia. A study conducted in Dara *Woreda* of Sidama Zone, SNNPR Region, by Nebiyu (2007) identified the factors maternal education, household income and immunization/vaccination status of the children to affect nutritional status of under-five children.

A study conducted by Woldemariam and Timotewos (2002) shows that parental education, economic status of the household, number of antenatal care visits, age of a child were found to be the major determinants of child nutritional status. Another longitudinal study carried out by Daniel (2006) in fifteen villages of rural Ethiopia identified age of the child,

parental education, household size and access to safe water as important determinants of child nutrition. A study by Micheal (2006) on the role of maternal characteristics on nutritional status of Ethiopian children indicates that maternal educational level, household economic status and age of a child showed a strong association with nutritional status of the children.

Generally, the overall situation of child nutritional status in Nonno Resettlement Site equates with the cases in other rural parts of Ethiopia. It was found to be high like the cases in other places in the country. The determinant factors also seem to be comparable with the cases in other areas as supported by other findings indicated above. This calls for improved food and potable water supply, child and maternal healthcares, access to education and improved sanitation at household level in the area.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The nutritional status of a population is recognized as a key indicator of the status of poverty, food security, health, education and other related socio-economic conditions. This is because good health, cognitive development and productivity highly related with good nutrition. Poorly nourished children cannot grow and develop properly, resist infections or learn to their full potential. Ethiopia is also one of the countries in the Sub-Saharan Africa with the highest rates of malnutrition. Basic causes for this high prevalence of malnutrition in this country were poor socioeconomic status, poor health service and care, infectious disease, low and inadequate food consumption, drought and famines and wide-ranging poverty.

This finding shows that high prevalence of child malnutrition was observed in Nonno resettlement site. The analysis indicates that 46.3%, 41.9% and 11.5% of children were stunted, underweight and wasted, respectively. Parental education, wealth status of household, household size, number of under five children, age of a child, anti natal care attendance for stunting, maternal education, wealth status of household, household size, number of under-five children, sign of disease in the past two weeks before the survey, source of water and availability of latrine for underweight, number of under five children, frequency of additional food given for the child per 24 hour, vaccination, sign of disease in the past two weeks before the survey, main sources of water for wasting were found to be the important determinant factors. Most of the observed variables were equally responsible to cause child malnutrition in the study area.

Child malnutrition is a serious health problem in rural communities, and the problem is deep-seated because of poor socioeconomic status, poor health service and care, infectious disease, low and inadequate food consumption, drought and famines and wide-ranging poverty. Although major progress has been made to reducing the prevalence of child malnutrition, it still stands at high level. Reducing malnutrition rapidly requires paying

attention and taking systematic action in the areas of food security, education, child and maternal health care. To conclude no one solution by itself can eliminate malnutrition; integrated effort of all sectors is required to overcome the problem of malnutrition and poverty.

5.2. Recommendations

It has already been pointed out that the principal objective of this study was to assess the level and causes of child malnutrition in Nonno Resettlement Sites. Based on the empirical findings of the study, the investigator recommends the following points to be given critical attention in the study area.

- The findings of the empirical analysis show that maternal education is one of the significant contributing factors to nutritional status of children. Education is the basic tool towards improving socio-economic status, food security, health, living condition, and poverty reduction. Hence, women empowerment, improvement in women's educational status, leading them to increased decision making ability, improvement in their income earning capacity, and enhancement in the quality of childcare should be given more attention by the concerned bodies such as governmental offices, NGOs and CBOs
- Improving sanitation, environmental factors, and quality and quantity of food and potable water supply at household level should attract more attention.
- Improving health facilities, child and maternal healthcares, training on nutrition, sanitation, health and family planning at community level
- Increasing accessibility of different types of modern family planning methods.
- Designing intervention actions like nutritional rehabilitation which targets malnourished children and lactating and pregnant women
- Reducing the problem of malnutrition through continuous efforts focusing on increased production that come up with sustainable food security

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Annex 1

**Addis Ababa University
Institute of Development Studies
Center for Population Studies**

Questionnaire for the assessment of child malnutrition in Nonno resettlement site, located in West Shewa Zone, Oromia National Regional State, in Central Ethiopia.

Identification

Name of *woreda* _____, Kebele (Site) _____

Introduction and consent

My name is _____, I am working as data collector for the Center for Population Studies, Institute of Development Studies to assess child malnutrition status and determinants in Nonno resettlement site. You are one of the individual chosen to participate in the study. For the purpose of the study I would like to ask you some questions on demographic, socio economic, environmental factors like sanitation, water supply, immunization, feeding practice, lifestyle, housing condition. No harm is expected to come on you, your child or your family because of participating in this study. Information obtained from you and your child will be kept strictly confidential; only the research team will access it for research purpose. Your name will not be written on this form. You don't have to answer any questions that you don't want to answer and you may end this interview at any time you want. However, your honest answer to these questions is very important for the purpose of the study. We would very much appreciate your participation in this survey by genuinely responding to the interviews. It would take _____ minutes to complete the questionnaire. Would you be willing to participate? 1. Yes 2. No

Signature of the interviewer certifying that informed consent has been given verbally by respondent _____.

011. Questionnaire identification number _____

022. Interviewer code _____ Name _____

033. Date of interview _____ Time started _____ Time completed _____

044. Result: 1. Completed 2. Respondent not available

3. Refused 4. Partially completed

055. Respondent available on: First visit Second visit Other _____

Checked by supervisor; Name _____, Signature _____

Anthropometrical Measurement

Weight of the child in kilogram	_____ Kg
Height/length of the child in centimeter	_____ Cm

Demographic and socio-economic characteristics of a household			
No	Question	Response	Remark
101	Is the household head male or female?	1. Male 2. Female	
102	What is current marital status?	1. Married 2. Divorced 3. Widowed 4. Separate 5. Single	
103	How many people currently living in the house?	_____ in number	
104	How many under-five children live in the household?	_____ in number	
105	Paternal education level Have you ever attended basic education?	1. Yes 2. No	If no skip to 107
106	If yes what is the highest grade you completed?	1. If grade: _____ 2. Technical/vocational certificate 3. College or university diploma 4. College or university degree	
107	Do you read and write?	1. Yes 2. No	
108	What is the occupation of head of the household?	1. Farmer 2. Merchant 3. Government/Private employee 4. Daily laborer 5. Other specify: _____	
109	What is the household monthly income?	Birr _____	
110	Who decides in the overall activities (expenses, meals ...) in the household?	1. Mother 2. Father 3. Jointly	
111	Do you have livestock, herd or farm animal?	1. Yes 2. No	If no skip to 113
112	If yes	Cattle _____ Equine _____ Goat _____ Sheep _____ Chicken _____	
113	Does the household have its own farmland?	1. Yes 2. No	
114	If yes size of land	_____ (Please, indicate the unit: hectare ...)	
115	Does the household have radio or television?	1. Yes 2. No	
116	Which Ethnic Group do you belong to?	1. Oromo 2. Amhara 3. Tigre 4. Gurage 5. Other specify: _____	
117	What is your Religion?	1. Orthodox 2. Muslim 3. Protestant 4. Catholic	

		5. Other specify: _____	
118	How old were you at your last birthday?	_____ (completed years)	
119	How old were you when you had your first child?	_____ years	
120	How many children have you ever born alive?	Male _____ (in number) Female _____ (in number)	
121	Maternal education level Have you ever attended basic education?	1. Yes 2. No	If no skip to 123
122	If yes what is the highest grade you completed?	1. If grade: _____ 2. Technical/vocational certificate 3. College or university diploma 4. College or university degree	
123	Do you able to read and write?	1. Yes 2. No	
124	What is your occupation?	1. Housewife 2. Farmer 3. Merchant 4. Government/Private employee 5. Daily laborer 6. Other specify: _____	

Child characteristics (a selected child by lottery method)

201	Sex of a child	1. Female 2. Male	
202	Age of a child	_____ Months	
203	Birth order	_____ th	
204	Birth interval /differences between the selected, and the back and forth child if applicable/	Back	1. Less than 24 months 2. Within 24-48 months 3. Greater than 48 months
		Forward	1. Less than 24 months 2. Within 24-48 months 3. Greater than 48 months
205	Have you ever attended ANC at the time when you were pregnant of the selected child?	1. Yes 2. No	If no skip to 207
206	How many times have you visited health facility for ANC during the pregnancy?	_____ times	
207	During pregnancy or lactation of the selected child do you think that you have access to adequate food in terms of quality, quantity and diversity?	1. Yes 2. No	
208	Where did you deliver the child?	1. Home 2. Health center 3. Other specify: _____	
209	Did you give the child pre-lactation food/fluid such as fresh butter?	1. Yes 2. No	If no skip to 211
210	If 'Yes', what did you gave him (her)?	1. Water 2. Butter 3. Milk 4. Other specify: _____	
211	Do you have any idea/knowledge about exclusive breast feeding, additional food etc	1. Yes 2. No	

212	Did you ever breast-feed the child?	1. Yes 2. No	If yes skip to 213
213	If 'No', Why not?	1. Health problem/Illness 2. Lack of knowledge 3. Child refuses to suck 4. Other specify: _____	
214	Did you squeeze out and throw the first milk?	1. Yes 2. No	
215	How long after birth did you first provide the child to breast-feed?	1. Immediately 2. After ___ hours (if less than 24 hours) 3. After ___ Days 4. Don't know/not sure/	
216	For how many months did you exclusively breast-fed the child?	1. _____ Months 2. Don't know/not sure/	
217	How many months did you breast-feed the child?	1. _____ Months 2. Don't know/not sure/	
218	Did you give the child additional food other than breast milk?	1. Yes 2. No	If no skip to 221
219	If yes, what ingredients did you gave? (more than one answer is possible)	1. Animal source like milk, meat 2. Formula milk 3. Fruits and vegetables 4. Porridge, Atmit, Bulla, etc 5. Other specify: _____	
220	How many times in 24 hours?	_____ Times	
221	At what age did you start feeding other additional food?	1. Less than 4 months 2. 4-6 months 3. At 6 months 4. 6-8 months 5. Above 8 months	
222	How often did you wash the child?	1. Everyday 2. Every two days 3. Every three days 4. Every four days 5. Every five days 6. Every six days 7. Weekly 8. Other specify: _____	
223	How did you usually treat your child when he/she gets sick	1. Usually home treatment 2. Taking to traditional healers 3. Taking to health centers 4. Other specify: _____	
224	Have you ever taken your child to health institution for sickness?	1. Yes 2. No	
225	Do you have any idea about family planning?	1. Yes 2. No	If no skip to 227
226	Have you ever used any family planning methods?	1. Yes 2. No	
227	If yes which method have you ever used? (more than one answer is possible)	1. Pills 2. Norplant 3. Condom	

		4. Depo-Provera 5. Other specify: _____	
228	Did you have a plan to give birth for the selected child for this study?	1. Yes 2. No	
229	Do you have any idea/knowledge about vaccine?	1. Yes 2. No	
230	Did the selected child ever receive vaccines?	1. Yes 2. No	If no skip to 230
231	If yes vaccines the child received (more than one answer is possible) (You can see from card, if not available ask them to recall)	1. BCG only 2. BCG, DPT 1, and Polio 1 3. BCG, DPT 2, and Polio 2 4. BCG, DPT 3, and Polio 3 5. BCG, DPT 3, and Polio 3, measles 6. No card found/They cannot recall	
232	If 'No' why was it that the child did not the vaccine?	1. Lack of knowledge 2. Inaccessibility of service 3. Time shortage 4. Fear of side effect 5. Other specify: _____	
233	Did the child get vitamin A supplementation in the last twelve months?	1. Yes 2. No	
234	Has the child been sick in the last two weeks?	1. Yes 2. No	If no skip to 234
235	If 'Yes' what was the sickness? (more than one answer is possible)	Fever 1. Yes 2. No Diarrhea 1. Yes 2. No ARI 1. Yes 2. No Measles 1. Yes 2. No Other: _____ 1. Yes 2. No	
236	What do you think is the frequent health problem to the child	1. _____ Disease/s 2. I do not know/not sure/	
Hygienic and Environmental Conditions			
301	Do you have any idea/knowledge about clean and healthy environment etc	1. Yes 2. No	
302	What is the main source of drinking water?	1. River 2. Pond 3. Unprotected spring 4. Protected spring 5. Private pipe 6. Public pipe 7. Other specify: _____	
303	What is the amount of water used in the household daily?	In liters _____	
304	How long does it take you to go and come back to fetch water?	In minutes: _____ In kilometers: _____	

305	Do you treat water in any way to make it safer?	1. Yes 2. No	
306	When do you usually wash your hands? (more than one answer is possible)	1. After latrine use 2. Before preparing food 3. Before serving food 4. After cleaning child feces 5. Other specify: _____	
307	How do you wash your hand?	1. Using water only 2. Using soap sometimes 3. Using soap always 4. Using ash sometimes 5. Other specify: _____	
308	Do you have latrine?	1. Yes 2. No	If no skip to 309
309	Type of latrine you use? (observation)	1. Private pit/Wooden slab 2. Private slab/ Cement Slab 3. Shared latrine/ wooden slab 4. Shared VIP latrine 5. Other specify: _____	
310	How do you dispose garbage?	1. Open field disposal 2. In a pit 3. Common pit 4. Composting 5. Burning 6. Other specify: _____	
311	Type of House (Observation)	1. Tukul/thatched 2. Corrugated Iron sheet 3. Other specify: _____	
312	How many rooms do you have?	_____ in number	
313	Type of house floor (Observation)	1. Soil 2. Cement or brick 3. Wooden 4. Ceramic 5. Other specify: _____	
314	Floor area of the house per person	_____ Km ²	
315	Presence of windows (Observation)	1. Yes 2. No	
316	Do you have separate room which is used as kitchen?	1. Yes 2. No	
317	If you have livestock, do you have separate room for them?	1. Yes 2. No	
318	What type of fuel do you mainly use for cooking	1. Wood 2. Kerosene 3. Electricity 4. Animal Dung 5. Other specify: _____	

Annex 2: Key informant interview guide

Key Informant Interview for the assessment of child malnutrition in Nonno Resettlement Site, located in West Shewa Zone, Oromia National Regional State, Central Ethiopia.

Key Informants: Health professionals, rural health extension workers and development agents

Note: The interview session was held after briefly explanation of the purpose of the study

1. What do you think about nutritional status of children in this area?
2. What do you think about the society's child feeding experience?
3. Do you think that the households have access to adequate food supply?
4. What are the main diseases affecting children in this area?
5. What do you feel about the adequacy of health facility? /access to well-equipped and well-stuffed health centers/
6. How did people usually treat their child/ren when they get sick? /Taking to health institution or traditional healers/
7. What does immunization/vaccination coverage look like?
8. What does antenatal care attendance and health center delivery look like?

Annex 3: Focus group discussion guide

Focus Group Discussion for the assessment of child malnutrition in Nonno resettlement site, located in West Shewa Zone, Oromia National Regional State, in Central Ethiopia.

Focus Group Discussion Participants: Community elders, religious leaders and women

Instruction to the facilitator

Briefly explain about the purpose of the study

1. What does health, hygiene, nutrition and child caring practice look like in the community?
2. What are the main disease affecting children in this area?
3. How did people usually treat their child/ren when they get sick? /Taking to health institution or traditional healers/
4. What does health facility look like? /Adequate or inadequate access to well-equipped and well-stuffed health centers/
5. What do you think about the society's child feeding experience? /Adequate or inadequate food supply/
6. What is/are main source of water in this area?
7. What are the types of foods that usually consumed in the society?

Annex 4: Multicollinearity test and Hosmer and Lemeshow test results

Coefficients of variables

Independent variables	Collinearity Statistics	
	Tolerance	VIF
Household family size	.778	1.285
Number of under-five children live in the household?	.712	1.404
Paternal education level	.824	1.213
Wealth of the household	.843	1.187
Maternal education level	.843	1.187
Age of a child	.973	1.028
Antenatal care attendance at the time when you were pregnant of the selected child?	.864	1.157
Did the selected child ever receive vaccines?	.763	1.311
What is the main source of drinking water?	.821	1.218
Do you have latrine?	.771	1.297

Dependent Variable: Stunting

Independent variables	Collinearity Statistics	
	Tolerance	VIF
Household family size	.799	1.251
Number of under-five children live in the household?	.735	1.361
Wealth of the household	.867	1.153
Maternal education level	.899	1.113
Age of a child	.976	1.024
Did the selected child ever receive vaccines?	.766	1.305
Has the child been sick in the last two weeks?	.925	1.081
What is the main source of drinking water?	.828	1.208
Do you have latrine?	.776	1.289

Dependent Variable: Underweight

Independent variables	Collinearity Statistics	
	Tolerance	VIF
Household family size	.797	1.254
Number of under-five children live in the household?	.731	1.368
Wealth of the household	.862	1.160
Maternal education level	.900	1.111
Frequency of additional food given for the child per 24 hour	.878	1.138
Did the selected child ever receive vaccines?	.754	1.326
Has the child been sick in the last two weeks?	.921	1.086
What is the main source of drinking water?	.837	1.195
Do you have latrine?	.765	1.307

Dependent Variable: Wasting

Hosmer and Lemeshow test result

Dependent variable	Hosmer and Lemeshow Test (Sig.)
Stunting	.317
Underweight	.728
Wasting	.368

Annex 5: Plausibility check for data quality

Standard/Reference used for z-score calculation: WHO standards 2006

(If it is not mentioned, flagged data is included in the evaluation. Some parts of this plausibility report are more for advanced users and can be skipped for a standard evaluation)

Overall data quality

Criteria	Flags* Unit	Good	Accept	Poor	Unacceptable	Score
Missing/Flagged data (% of in-range subjects)	Incl %	0-2.5	>2.5-5.0	>5.0-10	>10	
		0	5	10	20	0 (0.0 %)
Overall Sex ratio (Significant chi square)	Incl p	>0.1	>0.05	>0.001	<0.000	
		0	2	4	10	0 (p=0.322)
Overall Age distrib (Significant chi square)	Incl p	>0.1	>0.05	>0.001	<0.000	
		0	2	4	10	10 (p=0.000)
Dig pref score - weight	Incl #	0-5	5-10	10-20	> 20	
		0	2	4	10	3 (8)
Dig pref score - height	Incl #	0-5	5-10	10-20	> 20	
		0	2	4	10	0 (5)
Standard Dev WHZ	Excl SD	<1.1	<1.15	<1.20	>1.20	
		0	2	6	20	0 (1.25)
Skewness WHZ	Excl #	<±1.0	<±2.0	<±3.0	>±3.0	
		0	1	3	5	0 (0.15)
Kurtosis WHZ	Excl #	<±1.0	<±2.0	<±3.0	>±3.0	
		0	1	3	5	0 (-0.31)
Poisson dist WHZ-2	Excl p	>0.05	>0.01	>0.001	<0.000	
		0	1	3	5	0 (p=)
Timing	Excl	Not determined yet				
		0	1	3	5	
OVERALL SCORE WHZ =		0-5	5-10	10-15	>15	13 %

At the moment the overall score of this survey is 13 %, this is acceptable.

There were no duplicate entries detected.

Anthropometric Indices likely to be in error (-3 to 3 for WHZ, -3 to 3 for HAZ, -3 to 3 for WAZ, from observed mean - chosen in Options panel - these values will be flagged and should be excluded from analysis):

Percentage of values flagged with SMART flags: WHZ: 0.0 %, HAZ: 0.0 %, WAZ: 0.0 %

Age distribution:

Month 6 : #####
 Month 7 : ##
 Month 8 : #####
 Month 9 : #####
 Month 10 : #####
 Month 11 : #####
 Month 12 : #####

Month 13 : #####
Month 14 : ###
Month 15 : #####
Month 16 : #####
Month 17 : #####
Month 18 : #####
Month 19 : #####
Month 20 : ##
Month 21 : ##
Month 22 : ###
Month 23 : #####
Month 24 : #####
Month 25 : #####
Month 26 : #####
Month 27 : ###
Month 28 : ##
Month 29 : #####
Month 30 : #####
Month 31 : ##
Month 32 : ##
Month 33 : ##
Month 34 : ##
Month 35 : #####
Month 36 : #####
Month 37 : #####
Month 38 : #####
Month 39 : ##
Month 40 : ###
Month 41 : ##
Month 42 : #####
Month 43 : ##
Month 44 : ###
Month 45 : ##
Month 46 : #####
Month 47 : #####
Month 48 : #####
Month 49 : #####
Month 50 : #####
Month 51 : #####
Month 52 : ##
Month 53 : #
Month 54 : ##
Month 55 : ##
Month 56 : ##
Month 57 : ##

Month 58 : ##
 Month 59 : ###

Age ratio of 6-29 months to 30-59 months: 0.91 (The value should be around 1.0)

Statistical evaluation of sex and age ratios (using Chi squared statistic):

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	50/49.7 (1.0)	44/45.0 (1.0)	94/94.7 (1.0)	1.14
18 to 29	12	45/48.4 (0.9)	55/43.9 (1.3)	100/92.3 (1.1)	0.82
30 to 41	12	58/46.9 (1.2)	49/42.5 (1.2)	107/89.5 (1.2)	1.18
42 to 53	12	55/46.2 (1.2)	42/41.9 (1.0)	97/88.0 (1.1)	1.31
54 to 59	6	6/22.8 (0.3)	4/20.7 (0.2)	10/43.5 (0.2)	1.50
6 to 59	54	214/204.0 (1.0)	194/204.0 (1.0)		1.10

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: $p = 0.322$ (boys and girls equally represented)

Overall age distribution: $p = 0.000$ (significant difference)

Overall age distribution for boys: $p = 0.002$ (significant difference)

Overall age distribution for girls: $p = 0.002$ (significant difference)

Overall sex/age distribution: $p = 0.000$ (significant difference)

Digit preference Weight:

Digit .0 : #####
 Digit .1 : #####
 Digit .2 : #####
 Digit .3 : #####
 Digit .4 : #####
 Digit .5 : #####
 Digit .6 : #####
 Digit .7 : #####
 Digit .8 : #####
 Digit .9 : #####

Digit Preference Score: 4 (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Digit preference Height:

Digit .0 : #####
 Digit .1 : #####
 Digit .2 : #####
 Digit .3 : #####
 Digit .4 : #####
 Digit .5 : #####

Declaration

I, Haregewoin Mirotaw Shumiye, do hereby declare to Addis Ababa University School of Graduate Studies that this thesis is a product of my original research work, and it has not been submitted to any other university for any academic degree. Materials and information other than my own are duly acknowledged.

Name: Haegewoin Mirotaw

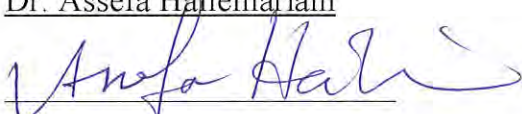
Signature: 

Place: Center for Population Studies, Addis Ababa University

Date of Submission: June 2012

As the principal thesis advisor, I hereby certify that I have critically read and evaluated this thesis entitled 'Child Malnutrition in Nonno Resettlement Site, West Shewa, Oromia National Regional State' prepared under my guidance by Haregewoin Mirotaw. I recommend that this thesis submitted as a fulfillment for the requirements of Masters of Science in Populations Studies.

Name: Dr. Assefa Hailemariam

Signature: 

Date: Jun 3, 2012

Digit .6 : #####
Digit .7 : #####
Digit .8 : #####
Digit .9 : #####

Digit Preference Score: **100** (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)