Ethiopian Public Health Institute

Ethiopian National Micronutrient Survey Report

September 2016

Ministry of Health

Partners Logo

Foreword

Micronutrient deficiencies, vitamin and mineral deficiencies remain one of the main risk factors forcausing infection and chronic disease morbidity and mortality among all ages.Micronutrient deficiency is one of the major public health problems in Ethiopia with women and children most at risk. Dietary inadequacy of consumed nutrients, low bioavailability of key micronutrients from plant based diets and infections are major contributing factors for micronutrient deficiencies in Ethiopia.

The Ethiopian government, together with its development partners, has shown unfaltering commitment to combat malnutrition and control micronutrient deficiencies. Accordingly, the government had developed a National Nutrition Program (NNP) and set targets to prevent and control micronutrient deficiency among under-five children as well as pregnant and lactating. The NNP called for multi-sectoral coordination in tackling undernutrition and a subsequent implementation guideline was developed to facilitate effective coordination between various sectors. The agriculture sector has beenpromoting diversified and sufficient food production whereas the education sector is working to improve awareness and school feeding programs.

Ministry of Health has various nutritional programmes and services including micronutrient supplementations, growth monitoring and promotion, community health day, rehabilitation for malnourished children, immunization programs and other nutrition programs that contribute to the reduction of micronutrient deficiencies in the country. On the other hand, Ministry of Industry is working toward achievingUniversal Salt Iodization and fortification of other food with key micronutrients.

However, lack of updated national and regional level data on the level of micronutrient deficiencies has been an impediment to designing, implementing and strengthening nutrition programs across the sectors. The national micronutrient survey, along with the previously conducted National Food Consumption Survey, will be highly valuable for policy makers and program implementers in developing and executing nutrition interventions aimed at reducing malnutrition and micronutrient deficiency in Ethiopia.

The Ethiopian Public Health Institute conducted this Survey in 2015 with financial support from the Government of Ethiopia (GoE), UNICEF, Micronutrient Initiative, World Bank, USAID/ENGINE,

WFP, FAO, GAIN and World Vision. The survey provided nationally representative estimates on the prevalence of anemia and deficiencies of Iron, vitamin A, Iodine, Zinc, B12, and Folate in Ethiopia.

The National Micronutrient Survey was a very complex study conducted in 9 regions and two city administration of Ethiopia, which involved tremendous amount of planning and coordination. Hence, I would like to express my heartfelt gratitude to the research team and advisory panel involved in the survey for their unreserved and highly regarded contribution. I also want to extend my appreciations to the survey respondents and experts from region and districts who participated in the study and to partners and donors who supported this work.

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The contributions from the field team who took time to traverse the countryside and very challenging terrain to obtain representative and quality data is hereby highly appreciated. The study team is listed on next page of this report. More specifically, special recognition is given to the study participants from the community who spent valuable time to provide the information and specimen as presented in this report. I hereby extend my sincere gratitude to all of you for the sacrifices you made in order to successfully complete this survey.

Finally, special acknowledgement is extended to all partners whose logo'slisted above for the financial and technical support that made all this possible.

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List of abbreviations and acronyms

AGP	α.1.acid glycoprotein
BMI	Body mass index
CBC	Complete blood count
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
CRP	C–reactive protein
DEFF	Design effect
DHS	Demographic and Health Survey
DOS	Department of Statistics
EA	Enumeration Area
EPCC	Ethiopia Population Census Commision
HAZ	Height for-age, Z. score
Hb	Hemoglobin
HH	Household
ICC	Inter. cluster correlation
ICCIDD	International Council for the Control of Iodine Deficiency Disorders
IDA	Iron deficiency anemia
IMMPaCt	International Micronutrient Malnutrition Prevention and Control Program
IVACG	International Vitamin A Consultative Group
MI	Micronutrient Initiative
MOH	Ministry of Health
NCEH	National Center for Environmental Health
NTDs	Neural tube defects
PPS	Probability proportional to size
QC	Quality control
RBC	Red blood cells
SD	Standard deviation
SF	Serum ferritin
SRS	Simple Random Selection
STH	Soil Transmitted Helminthes
UNICEF	United Nations Children's Fund

Executive summary

Health and vitality of human beings depends on diets with adequate amounts of vitamins and minerals. The adverse effects of micronutrient deficiencies are most severe for children, pregnant women and the developing fetus. Approximately 30% of the world's population is unable to use their full mental and physical potential as a result of micronutrient malnutrition. Micronutrient deficiencies are significant public health problems across populations in Ethiopia. Most common micronutrient deficiencies in Ethiopia include vitamin A, iodine, iron, and zinc.

The objective of this study was to estimate the prevalence of anemia, iron deficiency, vitamin A and B 12 deficiency, foliate deficiency, zinc deficiency, iodine deficiency and adequacy of iodized salt in Ethiopia. A large population-based cross sectional survey was conducted between March and July 2015 with a representative samples drawn from nine regions and two city administrations in Ethiopia. Data was collected from eligible households (HHs) using a structured, pre-tested and modular questionnaire, anthropometric measurements and collection of blood and stool samples.

Ninety five percent of eligible HHs participated in this study. In Ethiopia, the prevalence of inflammation measured by CRP and AGP among under-five children, school children and non-pregnant women of reproductive age was 44 %, 31.6 % and 27.3% respectively. The prevalence of anemia adjusted for altitude among preschool children, school age and non-pregnant women of reproductive age was 34.4, 25.6 and 17.7 %, respectively. Micronutrient deficiencies were more prominent among rural residents. The prevalence of Iron deficiency among preschool children, school age children and women of reproductive age, as measured by ferritin and adjusted for inflammation, was 17.8, 9.1 and 10.0% respectively. On the other hand, national prevalence of Iron deficiency among preschool age children, school age children and women of reproductive age, as measured by STFR, was estimated 29.6%, 19.5% and 16.4% respectively. Therefore, the deficiency of tissue iron and depleted body iron store was more prevalent among preschool children than other target groups. The prevalence of subclinical vitamin A deficiency was 14%, 10.9% and 3.4% in the preschool age children, school age children and women of reproductive age respectively. The national vitamin A supplementation coverage in the preschool age children was 63%. The national prevalence of zinc deficiency was 35% in the preschool age

children, 36% in school age children and 34% in women of reproductive age. The prevalence of Vitamin B12, serum folate and RBC folate among women of reproductive age was 15.1%, 17.3% and 32% respectively. The prevalence of iodine deficiency among school age children, with mean urinary iodine concentration below the cut-off, was 48%. Among women of reproductive age, the prevalence of iodine deficiency was 52%. National salt coverage was 85% but only about 26% of the households were getting adequately iodized salt.

The survey finding showed that Zinc, Vitamin A and Iodine are public health problem according to WHO classification. Since the magnitude of the deficiencies of these micro-nutrients are widely varied among different target groups, targeted intervention required to address the deficiency in needs. In addition, Food fortification and supplementation of micronutrient, health promotion and disease prevention programs should be strengthen to overcome high prevalence of micronutrient deficiency and inflammation in Ethiopia.In addition their availability should be ensured though improving production, processing, preservation, pricing and marketing of such foods. Moreover, industrialized scale salt processing and iodization should be aggressively promoted along with strong enforcement, monitoring and evaluation to improve Universal SaltIodization program (USI).

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1. Introduction

1.1.1 Types of micro-nutrient deficiencies

Nutrients are components in foods that an organism uses to survive and grow. There are two types of nutrients: Macronutrients and micronutrients. Macronutrients provide the bulk energy an organism's metabolic system needs to function, while micronutrients provide the necessary cofactors for metabolism to be carried out. Both types of nutrients can be acquired from diet. Macronutrients include carbohydrates, proteins, water and fats whereas micronutrients include vitamins and minerals.

Vitamins are a group of organic compounds that play important functions in body but cannot be made by the body. Some vitamins can be stored in the body so need to be eaten often but not every day (fat soluble vitamins A, D, E and K), while others cannot be stored and should be eaten daily (water soluble B vitamins, vitamin C). Vitamins play different roles in helping the body in important ways. Some examples include building protein and cells, protecting cells from damage, building bones, protecting vision, metabolizing macronutrients, and helping to heal wounds. Without essential vitamins, there are multiple nutritional diseases that can result.

Minerals are a solid, inorganic group of compounds that are like essential building blocks of different types of cells. Essential minerals include iron, zinc, calcium, and iodine among others. For example, iron is part of red blood cells, which transport oxygen through the body. Zinc has many critical functions in the body, including the make-up of cells and body systems including immune function.

The following sub-sections present different types of vitamins and minerals along with disease conditions associated with its deficiencies.

1.1.2 Vitamin A

Vitamin A is a fat soluble vitamin, needed for several metabolic activities in the body. It is found in two forms: preformed vitamin A (retinol and related compound) and provitamin-A (betacarotene). Vitamin A is one of the most versatile vitamins with roles in various functions such as vision, immune defense, maintenance of body linings and skin, bone and body growth,

normal cell development, and reproduction. Additionally, vitamin A helps to form and maintain healthy teeth, skeleton and soft tissue, mucous membranes, and skin. Therefore, vitamin A and related nutrients are collectively important in protecting against conditions related to oxidative stress, such as aging, cancer, cardiovascular disease, cataracts, diabetes mellitus and infection (Laquatra 2003).

Vitamin A deficiency is of utmost importance as a worldwide nutritional problem, particularly in developing countries (Berdanier 2002). The prevalence of serum retinol < 0.70 µmol/l in a population can be used to assess the severity of vitamin A deficiency in most age groups. This deficiency is a public health problem that requires intervention when at least one of two specifications is met: (1) the prevalence of low serum retinol is within the range specified by another biological indicator of vitamin A status (including night blindness, breast milk and widespread deficiency is indicated retinol, relative dose–response, modified dose–response or conjunctiva impression cytology); (2) the prevalence of low serum retinol indicates widespread deficiency, and the presence of certain demographic and ecological risk factors.(WHO 2013a)

1.1.3 Iodine

Iodine is an element that is needed for the production of thyroid hormone. If you do not have enough iodine in your body, you cannot make enough thyroid hormone. This hormone is usedfor normal energy metabolism, thermoregulation, intermediary metabolism, protein synthesis, reproduction, growth, physical and mental development, Thus, iodine deficiency can lead to enlargement of the thyroid (goiter), hypothyroidism and can cause mental retardation in infants and children whose mothers were iodine deficient during pregnancy.(Association 2014)
A cross sectional study conducted in Ethiopia showed that Ethiopia is at risk of iodine deficiency disorders. Total goitreprevalencein Ethiopia was 35.8% (95% CI 34.5–37.1), 24.3% palpable and 11.5% visible goitre. This demonstrates that more than 6 million women were affected by goiter in 2007(Abuye& Berhane 2007).

1.1.4 Iron

Iron is a trace mineral that is vital for growth and development. It plays a key role as a cofactor for enzymes involved in oxidation reduction reactions, which occur in all cells during

metabolism. Iron is also necessary as the component of hemoglobin, which allows red blood cells to carry oxygen throughout the body. It is also important for proper production and catabolism of several neurotransmitters, and most importantly, iron is essential for normal neurodevelopment during fetal and early childhood.(Edistein 2011)

Iron deficiency is the most frequently encountered nutritional deficiency in humans as an estimated 500–600 million people suffer from iron deficiency anemia(Truswell n.d.). When the supply of iron for the synthesis of new red blood cells becomes inadequate, the cells produced contain less hemoglobin and become smaller and fewer in number. As a result, the oxygen carrying capacity to the tissues is affected and the individual develops symptoms of anemia, including fatigue, apathy, loss of appetite, and poor temperature regulation. The affected person may also experience changes to the mouth, and digestive tract symptoms linked to reduced cell replication, as well as brittle nails. Deficiency of iron occurring in the first two years of life can significantly impair mental and motor development. This may result in poor memory and learning, and a low attention span (Barasi 2003).

1.1.5 **Zinc**

Zinc has long been recognized as an essential micronutrient for health and normal growth. Zinc is a constituent of a number of enzymes and is therefore involved in a large number of metabolic processes (Umeta et al. 2005). It is required for the catalytic activity of approximately 100 enzymes and it plays a role in immune function, protein synthesis, wound healing, DNA synthesis, and cell division. Zinc also supports normal growth and development during pregnancy, childhood, and adolescence and is required for proper sense of taste and smell. As the body has no specialized zinc storage system, a daily intake of zinc is required to maintain a steady state (King 2013). In the past 40 years, zinc has emerged as a critical nutrient factor for growth, immune function, cognitive development, and normal functioning of the central nervous system. Zinc participates in all major biochemical pathways and participates in the perpetuation of genetic material, including transcription of DNA, translation of RNA, and ultimately cellular division. It is required for the activity of more than 100 enzymes involved in most major metabolic pathways and, consequently, is necessary for a wide range of biochemical, immunological, and clinical functions(Hotz& Brown 2004).

Zinc deficiency is also another public health problem worldwide, especially among infants and young children living in impoverished conditions and in areas where infection prevalence rates are high. A dietary deficiency of zinc can lead to impaired gastrointestinal and immune function as well as stunted growth (WHO 2012). Zinc deficiency affects multiple functions in the body including physical growth, immune competence, reproductive function, and neurobehavioral development

1.1.6 **Folate**

Folate is a water-soluble B vitamin found naturally in foods. Folic acid, or vitamin B_9, is the synthetic form of folate that is added to fortified foods and is found in supplements(IOM 1998). Folate is essential during periods of rapid cell division and growth especially during infancy and pregnancy. Both adults and children require folate or folic acid for proper health including the prevention of anemia, healthy red blood cells, proper energy metabolism, and neurological health and development(NIH 2009). Folate deficiency and vitamin B_{12} deficiency combined can lead to megaloblastic anemia. Folate deficiency is also associated with a higher risk of neural tube defects and other birth defects in infants, increased risk of cardiovascular disease, cancer, and impaired cognitive function in adults(Allen & Benoist 2006).

Adequate consumption of folate or folic acid before and during the early weeks of pregnancy is vital for proper development of the brain and neurological system of the fetus. Inadequate intake of folate or folic acid immediately before and during the early weeks of preganancy increases the risk of the fetus developing neural tube defects (NTDs)(Bailey et al. 2015). NTDs can lead to malformations of the spine or improper development of the brain and skull and can result in death or lifelong disability.

1.1.7 Vitamin B 12

Vitamin B 12 is important for the function of nerves and for the production of the DNA and RNA in the cells. It also works together with folic acid to make red blood cells and other compounds that are important for your cardiovascular and immune systems. Vitamin B12 is a

water soluble vitamin that is mostly present in animal source foods. The symptoms of vitamin B 12 deficiencies are change in vision psychosis muscle weakness and diarrhea.

1.2 Epidemiology of Micro-nutrient deficiency

Micronutrient deficiencies are a major global public health problem with more than 2 billion people in the world estimated to be deficient in key vitamins and minerals, particularly vitamin A, iodine, iron and zinc:(unicef, 2009). Most of these people live in low-income countries and are typically deficient in more than one micronutrient. Deficiencies occur when people do not have access to micronutrient rich foods such as fruits, vegetables, animal products and fortified foods, frequently because they are expensive or unavailable. Micronutrient deficiencies increase the general risk of infections and dying from diarrhea, measles, malaria, and pneumonia. These conditions are among the ten leading causes of disease in the world today (Berdanier 2002).

Micronutrient deficiencies can increase the overall risk of mortality and are associated with a variety of adverse health effects, including poor intellectual development and cognition, decreased immunity, and impaired work capacity. The adverse effects of micronutrient deficiencies are most severe among children, pregnant women, and the developing fetus. Approximately 30% of the world's populations are unable to use their full mental and physical potential as a result of micronutrient deficiencies (UNICEF 2004).

The groups most at risk to micronutrient deficiencies are pregnant and lactating women and young children because they have a relatively greater need for vitamins and minerals and are more susceptible to the consequences of deficiencies. Pregnant woman are especially at a greater risk of dying during childbirth and having an underweight or mentally-impaired baby. For a lactating mother, micronutrient status determines the health and development of the infant she breastfeeds, particularly during the first six months of life. For a young child, micronutrient deficiencies increase the risk of dying due to infectious diseases and contribute to impaired physical and mental development.

Micronutrient deficiencies can easily develop during an emergency or worsen if they are already present (WHO 2001a). This happens because livelihoods and food crops are lost; food supplies

are interrupted; diarrheal diseases break out, resulting in mal-absorption and nutrient losses; and infectious diseases suppress the appetite while increasing the need for micronutrients to help fight illness.

Micronutrient deficiencies are significant public health problems across populations in Ethiopia. In Ethiopia, important micronutrient deficiencies include vitamin A, iodine, iron, and zinc. National goiter prevalence among women of reproductive age and children age 6- 12 years was 35.8% and 39.9% in 2007 respectively(Abuye et al. 2007). The national prevalence of night blindness among children and mothers was 0.8% and 1.8% respectively(Demissie et al. 2010). According to Ethiopia Demographic and Health Survey (EDHS) 2011 report the prevalence of anemia among women of reproductive age and children age 6 to 59 months was 16.6% and 44.2% respectively. The EDHS report also indicated that a higher proportion of pregnant women are anemic (22%) than women who are breastfeeding (19%) and women who are neither pregnant nor lactating (15%) (EDHS 2011).

1.3 Rationale for the survey

Under-nutrition is a major public health problem in Ethiopia. About five million people experience food shortages each year, and approximately 2.9 million people were expected to receive food assistance in 2015. The nutritional status of a population is indicated by the number of children under 5 who suffer from under-nutrition and accordingly, 8.7%, 40.4% and 25.2% of all children under 5 years were wasted, stunted and underweight in 2011, respectively. (EDHS 2011). Furthermore, micronutrient deficiency remains the major cause for economically and socially significant problems that could potentially cost the country enormous human capacity and economic loss.

It is crucial to have timely, accurate and nationally representative data in order to design, implement and evaluate impact of national policies and programmes to address problems related to micronutrient deficiencies. In Ethiopia, the prevalence of key micronutrient deficiencies, including iron, vitamin A, iodine, folate, zinc and vitamin B12, is unclear and there is urgent need and commitment to producing such data both by the government and its development partners.

It’s expected that data on micronutrient deficiencies in Ethiopia could inform the design, implementation and evaluation of Ethiopia’s National Food Fortification strategy, NNP-II micronutrient deficiency reduction target setting, initiatives for bio-fortification and other programmes intended to promote dietary diversity in Ethiopia. It will also contribute to local and regional level planning as well as to the teaching and learning process in the academic institutions. Having national representative data on micronutrient deficiencies in Ethiopia will also help to compare findings with others countries as well as between regions within Ethiopia.

1.4 Aim and Objectives

1.4.1 Aim

To estimate the prevalence of selected micronutrient deficiencies among children (age 6 to 59 months), school children (age 5 to 14 years), non-pregnant women of reproductive (age 15 to 49 years) in Ethiopia.

1.4.2 Objectives

1) To estimate the prevalence of anemia
2) To estimate the prevalence of iron deficiency
3) To estimate the prevalence of vitamin A deficiency
4) To estimate the prevalence of iodine deficiency
5) To estimate the prevalence of zinc deficiency
6) To estimate the prevalence of vitamin B12 deficiency
7) To estimate the prevalence of folate deficiency
8) To estimate the proportion of households with adequately iodized salt in Ethiopia

2. Methods

2.1. Study Design

Ethiopian National micronutrient survey was a large, population-based, cross sectional survey conducted from March to July 2015.

2.2. Study Area

The study was conducted in 9 regions and 2 city administrations of Ethiopia.

2.3. Sample Size

The sample size of the Ethiopian national micronutrient survey was determined using Fisher's formula, with the assumption of high prevalence of micronutrient deficiencies (50% prevalence when there is no regional level data), 5% desired precision at national and 10% precision at regional level for different indicators and considering the participation rate of 90% at household level and 85% at individual level with the design effect of 2 in to account heterogeneity of the deficiencies at regional as well as at national level.

The Fisher's formula for estimating the ample size for the national micronutrient survey was used as follows:

$$N = \frac{Z^2{}_{\alpha/2}\, p(1-P)}{d^2} * DEFF * \frac{100}{RR1} * \frac{100}{RR2}$$

Where;

N = Sample size

$Z_{\alpha/2}$= Standard errors from mean corresponding to the 95% confidence level

P = Prevalence

d = Allowable error/ desired precision

DEFF = Design effect

RR1 = Response rate at house hold level

RR2 = Response rate at individual level

RR = Response rate (%)

This survey was employ stratified sampling in each of the nine regions and two city administrations. For each region, the households were selected based on standard probability proportional to size (PPS) as indicated in the table 1. Within each selected EA (cluster) 11 households were randomly selected for enumeration.

2.4. Data Collection and Sampling Procedure

2.4.1. Sampling procedure

There were two stages of sampling applied. In the first stage of sampling,national list of enumeration areas' (EAs) was obtained from Central Statistics Authority and used as sampling frame (EPCC 2007). Central statistics agency randomly selected EAs using probability proportional to size (PPS) and provided to EPHI survey team.

At the second stage of sampling, Enumeration Areas (EA) were visited by team of data collectors to conduct a quick listing of all the HHs within the boundary of each selected EAprior to the actual survey from November, 2014 – January, 2015. Name, age and sex of occupant and the GPS location of the house were registered. The team was also recorded the road condition to the enumeration area, type of nearby health facility and proximity to the EA and any other potential infrastructure where could be used as temporary lab setup and availability of electricity within the EA or around the EA. Thus information has been used for logistical arrangement and necessary precaution to the survey teams. Then 11 households were selected from all households listed in each EA by simple random sampling using random number generated by excel.For those selected HHs GPS coordinates were used to see the accessibility using Google earth. If any of the 11 HHs selected inaccessible (more than 30 minutes by walking for biological sample collection , it was replaced using simple random sampling from the remaining HHs.

The selected households address and name of the head of household were loaded on the data collector smart phones.Women of reproductive age, men and school age children were used sub sample from the selected 11 HHs due to resource and time management. The eligible participants were different in each household's.To avoid selection bias this information was preloaded to the

data collection smart phones prior to the survey. From the selected 11 households the target population were selected as following order:

- All children 6-59 months of age,
- 7 women of reproductive age (1st, 2nd, 4th, 5th, 7th, 10thand 11th HHs),
- 3 men (3 rd.,5th,9th HHs) and
- 6 school age children (2nd, 4th, 6th, 8th, 9th and 10thHHs) were selected randomly.

2.4.2. **Data Collection team arrangement**

Although individual tasks have been broken down as shown in figure 1 below, each team were collectively responsible for the highest quality data collection, sample storage and transport. All survey team members have been worked together to ensure the highest quality of the work.

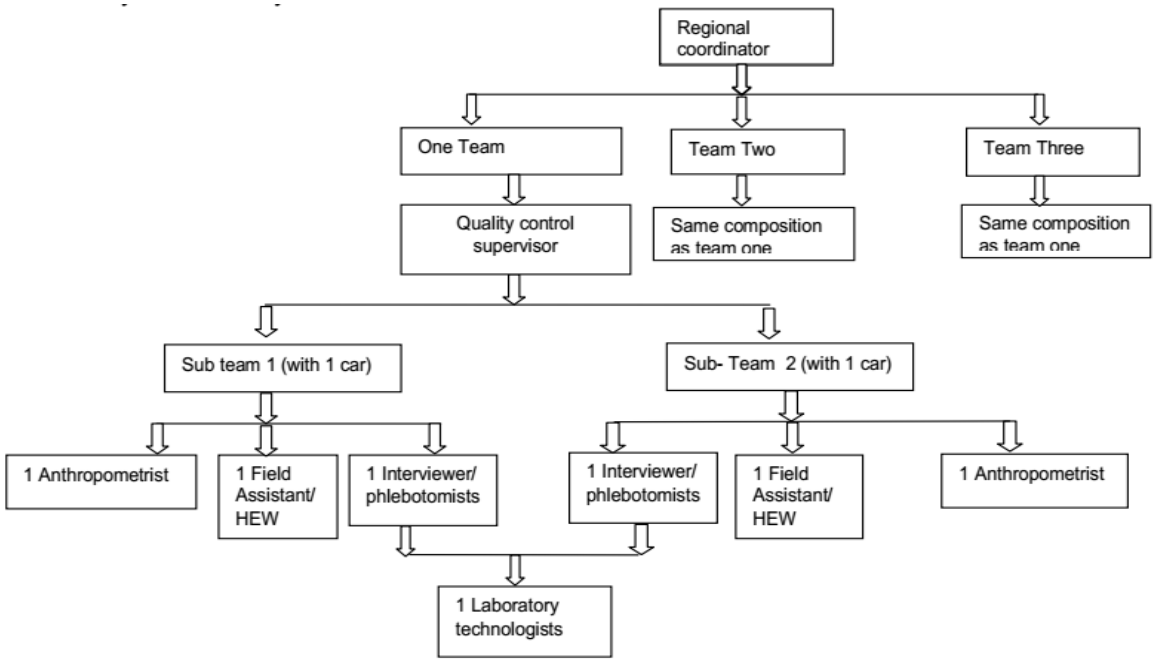

Figure 1.Survey team members responsibility

2.4.3. **Data collection through Questionnaire**

A questionnaire was developedfor data collection. The questionnaire was classified into five modules namely Household (HH), Preschool Children 6-59 months (PSC), School aged children

(SAC), Women of reproductive age (WRA), and Men questionnaires.A total of 130 individuals were recruited for different task. There were 41 Data collectors, 23 supervisors',46 phlebotomists and 23 laboratory technicians. The recruited teams had taken multiple training sessions, based on the content area required for training. One session of the training was dedicated specifically about interviewing. Another session was for laboratory procedures and a third session was about anthropometry. Each survey team was briefed on the roles and responsibilities of each team member. Sinceteam members were expected to do multiple tasks in the field several teams were organized. Teams werecombined on some days and split up on other days. During pilot testing all team members got the overall concept of the survey and understood how they can best work together as a team. In addition, the questioner was revised based on the feedback from survey team during pilot and training sessions. The principal investigator and all nutrition team members were at each session for guidance and supervision always.

During household visit the child's mother or caretakers were encouraged to answer questionnaires on behalf of the children. When eligible occupants of a house were not present, two continuative return visits with written appointment to the household were made. When no eligible respondents were available during the appointments the households was recorded as refusal or any reason given for the unavailability of eligible respondent without any replacement.

2.4.4. **Biological Sample collection Technique**

Biochemical specimens were collected from the following target groups living in the selected household. Venous blood, urine, stool were collected from non-pregnant women aged 15-49 years old. Fingertip blood, urine, stool were collected from pregnant women aged 15-49 years old. Only venous blood was collected from children 6-59 months old. Venous blood, urine and stool were collected from children 5-14 years old. Venous blood and stool were collected from men 15-54 years old.

2.4.5. **Blood collection, processing and storage**

Venous blood samples were collected by trained Phlebotomists blood samples were drawn into three vacationers as per blood collection protocol (WHO 2010). The first trace metal free vacutainer (blue top) contained a clot activator used specifically for zinc, retinol, and folate

analysis. The second vacutainer(red top) was used for ferritin, vitamin B12, sTfR, AGPand CRP analysis. The third vacationer (purple top) anticoagulant containing tubeswereusedfor the measurement of hemoglobin and malaria test using rapid diagnostic test (RDT) for P. Falciparum and P. vivax. When venous sampling was unsuccessful, or the participant refused venous blood collection, blood was taken by finger stick and tested for hemoglobin concentration and malaria using RDT. The amount of blood collected with blue vacutainer was 6 ml, with red vacutainer 5.5 ml and with purple vacutainer 4 ml. The time of last meal and time of blood draw was recorded during blood collection.

2.4.6. **Transportation of blood from household to temporary field laboratory**

Samples were transported promptly after collection in cold boxes containing frozen gel packs (<8 ^{o}C) by local guides appointed specifically to assist each laboratory technician in rapidly carrying the samples to the centralised temporary field lab site. Each team maintained a self-contained field laboratory that included a portable centrifuge to allow for immediate (less than 30 minutes) centrifugation and aliquoting serum in cryovials. This team also included a -20^{o}C freezer powered either by battery or electrical mains power for fast freezing of serum samples in the field. This freezer was used to maintain frozen gel packs for distributing in each cool box that went to the field during sample collection. In each EA (cluster), a temporary field lab was set up in a central location such as a school, pharmacy, health centre or other location for the technologist to immediately centrifuge samples transported from the field and aliquot the serum into appropriate cryovials. If there was no electricity available in the EA, the field lab was set up in the vehicle. Samples like stool preserved with 10% formalin within two hours of collection and urine was preserved with freezer (-18 ^{o}C).

2.5. **Laboratory methodsto determinationof biomarkers, Iodine and infections**

The stool was analyzed during the collection and within one month after collection in EPHI laboratory. The urine was analyzed with dip stick (glucose level, protein level, PH, Specific gravity, bilurubine, urinobulinogen, hematuria, and nitrite) during data collection in temporarily field laboratory and urinary iodine was done in EPHI.

Hemoglobin and malaria was done during data collection after blood was drowned in household. The rest of the blood sample was transported from household to field laboratory for centrifuge and to separate serum red and blue top, plasma and RBC foliate from purple top. In addition, edible salt was tasted for iodine with rapid test kit (RTK) during data collection and minimum 20 gm. salt was collected for EPHI laboratory for titration test in order to measure the amount of iodine.

2.5.1. **Laboratory methods to determination ofInflammation (infection)**

Determination of AGP and CRP concentration was conducted using immune-turbidimetriy method using Roche kits (set protein and analyzer n.d.) instrument. The change in turbidity, proportional to the AGP and CRP concentration, was measured on the modular Cobas Integra 6000 clinical analyzer and presence of inflammation was determined.(Thurnham& Mccabe 2012).

2.5.2. **Laboratory methods to determination ofAnemia**

Anemia was assessed inall age group **(**preschool and school children, women of reproductive age (pregnant and non-pregnant women and men) The prevalence of anemia was calculated based on the hemoglobin levels measured in venous blood samples using a Hemocue® photometer which wereprocessed in the field (Hb 201, Hemocue AB, Angelholm, Sweden). The Hemocue HB 201+ analyzer has an internal quality control, i.e. the build in "Self-test". Every time the analyzer is turned on, it automatically verifies the performance of the optronic unit of the analyzer. This test was performed every second hour if the analyzer remained switched on. Additionally, in order to ensure quality Control of the Hemocueinstrumentthe liquid controls for each specific instrument were used in each cluster. Liquid controls (High, Medium and Low) were used at the beginning of each day as further assurance of the quality of Hemocue readings. Cut-off values for anemia were adjusted as per recommendation of (WHO 2001b)on the basis of age, sex, smoking status and the altitude where the person lived. The participant's resident attitude was measured during data collection. The adjustment for altitude was done by (Hb adjustment = -0.032 x [altitude (m) x 0.0032808] + 0.022 x [(altitude (m) x 0.0032808)] ^{2}) for all persons living at an altitude of 1,000 meters above sea level or higher (Sullivan, 2008): Where the Hb adjustment was the value subtracted from each individual's observed hemoglobin level.

2.5.3. **Laboratory methods used to determination ofIron**

Iron status was assessed inall age group (preschool and school children, women of reproductive age (pregnant and non-pregnant women and men).Iron status was assessed using multiple biomarkers that reflect different stages of iron deficiency immune-turbidimetriy method usingCobas6000(Roche kits germen) instrument(Set 2015; Analytics 2014). Assessing the magnitude of iron deficiency requires the measurement of several biochemical indicators including ferritin, sTfR, CRP and AGP are also included as indicators of infection that have been used to account for the influence of infection on plasma ferritin levels.

2.5.4. **Laboratory methods used to determination of VitaminA**

Vitamin A status was assessed using serum retinol. Serum retinol was measured for all participating individuals. High performance liquid chromatography (HPLC) method was used to determine Serum retinol concentration. Serum retinol concentration <0.70 µmol/L indicates mild or subclinical VAD and a serum retinol value of <0.35 µmol/L indicates severe VAD for both adults and children ((WHO 2011). Circulating serum retinol is reduced in the presence of inflammation and prevalence of vitamin A deficiency can be overestimated. To account for the presence of inflammation, the prevalence of vitamin A deficiency was calculated for all participants by inflammation status. Inflammation is defined as having either elevated C reactive protein (CRP) $\geq$5.0 mg/L or Alpha.1acid glycoprotein (AGP) $\geq$1.0 g/L. Severity of vitamin A deficiency as public health problem using serum retinol was classified as per WHO recommendation(WHO 2011).

2.5.5. **To determination of recent Vitamin A Supplementation**

For children 6 to 59 months, the mother or caretaker of the child were shown a capsule and asked "Has (child's name) ever received vitamin A drops?" Among those who reported the child had received vitamin A drops, they were additionally asked "Did (child's name) receive a vitamin A drop within the last six months?" The date of the most recent vitamin A dose was recorded for children with this information available from a child clinic card and/or book. Women who had reported a live birth in the previous 12 months were asked, "After their last baby was born (most recent in previous 12 months), did they consume a vitamin A capsule like the interviewer

showed them?" Additionally, all women were asked, "During the last pregnancy that resulted in a live birth did they have difficulty with their vision at night (night blindness in local language)?" and "During their last pregnancy that resulted in a live birth did they had difficulty with their vision during daylight?"

2.5.6. **Laboratory methods used to determination of Zinc**

Zinc deficiency was assessed in preschool and school children, Non pregnant women of reproductive and men. Zinc was measured by serum zinc, which is the recommended biomarker to estimate zinc status in populations. Serum zinc was measured using atomic absorption spectrophotometry (AAS) (IZiNCG 2007). Samples were measured in duplicate and an internal control sample was analyzed with each batch of samples. Staff serum samples were used as a control during zinc analysis every 60 samples. Mean serum zinc for control sample was 84.0($\pm$1.8)µg/dL. Zinc concentration was done using Shimadzu Flame Atomic Absorption Spectroscopy (AA 6800) model and non-fasting serum zinc deficiency is defined as concentration < 70 µg/dL for all age group according to IZiNCG recommendation.

2.5.7. **Laboratory methods used to determination ofFolate**

Folate level was measured in venous blood samples collected from non-pregnant women.The prevalence of folate was determined from serum and red blood cell (RBC). The measurement of serum folate provides information on short-term status and red blood cell folate is reflective of longer-term status. RBC folate levels reflect folate stores over the last 3-4 months and are not affected by recent dietary intake.

Serum and RBC folate were assessed using a microbiologic assay. Diluted serum or whole blood hemolysate were added by the trained laboratory analyst to an assay medium containing*Lactobacillus rhamnosus*(formerly known as *L. casei*) and all of the nutrients necessary for the growth of *L. rhamnosus* except for folate. The inoculated medium was then incubated for 42 hours at 37^{o}C. Since the growth of *L. rhamnosus*is proportional to the amount of total folate present in serum or whole blood samples, then total folate level as the turbidity of the inoculated medium was measured at 590 nm using a microplate reader.

RBC folate samples were prepared by diluting one part of fresh EDTA whole blood (100 µL) with 10 parts of 1 g/dL (1%) ascorbic acid solution (1 mL), corresponding to a 1/11 dilution, and

freezing the hemolysate promptly, which keeps the folate in the reduced state. A minimum of 400 µL of serum and 500 µL of whole blood hemolysate were needed to do a proper dilution when using automated pipetting. The dilution factor depends on the population from which the samples are collected. Whole blood samples with a concentration less than 154 nmol/L or greater than 1540 nmol/L were repeated with lower or higher dilution, respectively. According to the WHO, a RBC folate result of <151 ng/mL and a serum folate result of <4 ng/mL is considered to represent potential folate deficiency and was repeated for confirmation.

2.5.8. **Laboratory methods used to determination of VitaminB_{12}**

Vitamin B_{12}deficiency was assessed in non-pregnant women of reproductive age. Itwas measured in survey samples using the electrochemiluminescence immunoassay principle (ECLIA) using ROCHE commercial kits on a clinical analyzer. The Roche B_{12} assay is a competition principle and fully automated method. According to the package insert on the Roche kit, a serum B_{12} level below the <200 pg/ml may indicate B_{12} deficiency.

2.5.9. **Laboratory methods used to determination ofsaltIodine**

Iodine deficiency was assessed in school age children 5-14 years and women of reproductive age 15-49 years. About 20 gram of salt was collected from each household.Iodine concentrations in salt samples were measured by titration. Iodine was released from an aqueous deionized solution of the salt sample by the addition of dilute sulfuric acid and quantified by titration with a solution of sodium thiosulfate, using starch as the indicator.

2.5.10. **Laboratory methods used to determination of Urinary Iodine**

Urine samples were collected from children aged 5 to 14 years of age and from all women aged 15 to 49 yrs. Respondents were asked to pass urine directly into a plastic cup with a tight fitting lid. Approximately 20 ml of urine was collected for analysis of urinary iodine. Two aliquots of 10 ml of urine were also stored for further testing for iodine and back up. Once the urine samples were collected, they were transported to the central laboratory facility and stored at -20 ºC. Then after freezing, urinary iodine excretion was assessed by Sandell Kolthoff reaction at EPHI Laboratory and deficiency is defined urine iodine concentration <100 µg/l.

2.6. **Data management**

Field data collection was conducted electronically using smart phone tablets Open access data kit (ODK) software. This software had skipping pattern and didn't allow entering unnecessary information or skipping necessary information. Data collectors checked completeness of the questionnaire and submitted to the supervisor for confirmation. Supervisors checked the data and sent it to the central database managed by data base manager based at EPHI. Completed household data were transferred every day to the central database. Whenever there was a software malfunction, the data manager mobilized ODK specialists to the field for troubleshooting.

2.7. **Data quality assurance**

All survey activities were monitored to ensure the data quality. Subsequent consultation meeting was held to review and approve the survey protocol, methodology and key indicators prior to survey implementation. The questionnaire was developed after reviewing the other standard survey questionnaires. The questionnaire was translated in to Amharic and Oromifa and back translated both to English to ensure quality of translation. Questionnaire was pre-tested prior to implementation in the field.

A pilot survey was conducted at the end of training workshop in rural and town of Sebeta. The field forms and specimen collection system were reviewed and feedback was given to all teams for further improvement. The pilot data was reviewed by trainers and approval was given for implementationof actual survey.

Competency of field staff was also taken in account during recruitment process prior to hiring. Standardization tests were also performed during training and field staff was oriented for standardization. Many steps were taken to ensure quality of data collection at field. Team leaders were instructed to review all the filled tablets for completeness and inconsistencies before leaving from location/EAs. The regional nutrition focal were trained as external monitors to ensure data collection activity and provide necessary support to the survey team in their respective regions. Regional coordinators were also supposed to visit and provide support for the field activity during data collection in their assigned respective regions. Checklist have been used by supervisors and regional coordinators to monitor the activities of field teams and based on

observations they could suggest the actions to be taken. They were empowered to stop the survey, if deemed necessary based on observations. Each regional coordinator and supervisor were given the task to check 10% to 20% of the EAs in his/her respective region. There were three teamsin each region as shown in figure 1. The supervisor monitored the daily work of the team. Each coordinator was supposed to supervise 2-3 regions and visited the teams in the field. The coordinators monitored the teams' activities, provided feedback and make sure all specimens were collected and kept as per the protocol. Supervisors were instructed to check equipment including measuring scales, sample collection supplies also available with teams daily prior to field activity. During data collection, supervisors meet the teams on a daily basis to review the progress of data collection and performance of each team. The challenges faced by teams were discussed, best suited solution were advised and were followed up with team leaders.

2.8. **Data Analysis**

The statistical analysis of data was performed using STATA version 12. Descriptive results were expressed as means for continuous variables and proportions for categorical variables. Because of the distributions of AGP, CRP, FERR, STFR, Zinc and Urinary iodine were typically skewed toward large values, so we used the log transformation of these concentrations and a geometric mean (i.e. the back transformed mean of logs) were used to see the concentrations among different groups. Simple Linear and multivariable regression analysis was applied to estimate the correction factors of inflammation as a function of FERR, STFR, Vitamin A and Zinc separately for each marker.

2.9. **Ethical clearance**

Ethical approval was obtained from the national research ethicsreview committee. During data collection period, official request letters were sent to each region and approval was granted. Before participation in the survey, informed consent was taken from head of household of all selected households. The respondents were informed about their rights to withdraw any time from the study.Confidentiality of all collected data was assigned high priority during each stage of data handling. Individual names and personal information of respondents were kept confidential and data sets were kept anonymous for analysis.

3. Result

3.1 Response rate

A total of 4,026 households were selectedfrom 366 clusters(11 HHs per cluster) across 9 region and 2 administrative cites in Ethiopia. Over 94 %(n=3805) of selected HHs provided consent and were included in the study. The 6 % non-respondents were due to refusal, inaccessibility,and unavailabilityand partially or fully demolished houses. See household response rateTable 1.

Table 1.Survey Enumeration areas and household participation rate by region.

Region/City Administration	Number of EAs per regions	Number of SelectedHH per regions	Number of ParticipatedHH per regions	Response rate
Tigray	36	396	371	93.7
Afar	29	319	290	90.9
Amhara	44	484	462	95.5
Oromiya	46	506	505	99.8
Somali	26	286	257	89.9
B/Gumuz	28	308	304	98.7
SNNPR	42	462	448	97.0
Gambela	27	297	255	85.9
Hareri	27	297	286	96.3
Addis Ababa	34	374	372	99.5
DireDawa	27	297	255	85.9
Total	366	4026	3,805	94.5

3.2 Socio-demographic and household characteristics

About half of the householdheads did not attained any formal education and only one in four head of HH completed primary education, 10.2% completed secondary education, and 6.8% attended more than secondary education (Technical/vocational/college/University). Two thirds of all HHs (66.3%) lived in rural area and the mean number of individuals living per household was found to be 4.8%. The detail characteristics of householdsare presented inTable 2.

Table 2.Demographic Characteristics by region

Region		Head of household sex		Household head Educational status					Household head Religion			
		Male	Female	No formal education	primary	Secondary	Technical/Vocational/Certificate	University/Collage	Orthodox	Roman Catholic	Protestant/other Christian	Muslim
Tigray	N (%)	801 (49.1)	831 (50.9)	174 (50.4)	130 (37.7)	29 (8.4)	2 (0.6)	10 (2.9)	316 (91.6)	0	10 (2.9)	19 (5.5)
Afar	N (%)	738 (49.8)	743 (50.2)	199 (72.1)	47 (17.0)	19 (6.9)	1 (0.4)	10 (3.6)	41 (14.7)	-	2 (0.7)	235 (84.2)
Amhara	N (%)	958 (49.2)	988 (50.8)	289 (66.6)	93(21.4)	29(6.7)	3 (0.7)	20 (4.6)	342 (78.4)	-	1 (0.2)	93 (21.3)
Oromiya	N (%)	1230 (48.9)	1287 (51.1)	228 (52.9)	153 (35.5)	30 (7.0)	5 (1.2)	15 (3.5)	144 (33.3)	1 (0.2)	95 (22.0)	188 (43.5)
Somali	N (%)	642 (50.2)	636 (49.8)	153 (66.8)	45 (19.7)	19 (8.3)	3 (1.3)	9 (3.9)	25 (10.9)	-	1 (0.4)	200 (87.0)
B/G	N (%)	569 (51.2)	542 (48.8)	125 (53.0)	73 (30.9)	16 (6.8)	6 (2.5)	16 (6.8)	100 (42.4)	-	17 (7.2)	113 (47.9)
SNNPR	N (%)	953 (47.8)	1040 (52.2)	209 (53.0)	120 (30.5)	45 (11.4)	6 (1.5)	14 (3.6)	84 (21.3)	5 (1.3)	248 (62.9)	50 (12.7)
Gambela	N (%)	560 (49.2)	579 (50.8)	89 (39.7)	76 (33.9)	34 (15.2)	3 (1.3)	22 (9.8)	66 (29.3)	23 (10.2)	113 (50.2)	18 (8.0)
Harari	N (%)	552 (49.3)	568 (50.7)	125 (48.1)	64 (24.6)	38 (14.6)	6 (2.3)	27 (10.4)	99 (38.1)	-	9 (3.5)	151 (58.1)
Addis Ababa	N (%)	679 (44.8)	835 (55.2)	23 (32.9)	19 (27.1)	14 (20.0)	2 (2.9)	12 (17.1)	55 (78.6)	-	5 (7.1)	10 (14.3)
D/D	N (%)	519 (46.9)	588 (53.1)	118 (46.1)	78 (30.5)	42 (16.4)	2 (0.8)	16 (6.3)	86 (33.3)	-	10 (3.9)	162 (62.8)
National	N (%)	8201 (48.7)	8637 (51.3)	1732 (54.9)	898 (28.5)	315 (10.0)	39 (1.2)	171 (5.4)	1358 (42.9)	29 (0.9)	511 (16.1)	1239 (39.1)

There was a big disparity access for electricity between urban and rural households. More than 93% of the rural household used wood as main fuel for cooking, and 41.9% of rural households do not have separate room for cooking their food rather they used room which served as living and/or sleeping. Shown in Table 3.

Table 3.Household's characteristics by their place of residence.

Characteristic	Residence				Total	
	Urban		Rural			
	n	%	n	%	n	%
Access for electricity	1069	91.5	433	18.4	1502	42.7
Flooring Material						
Earth/sand	440	37.7	1978	84.1	2418	68.7
Dung	24	2.1	248	10.5	272	7.7
wood planks	8	0.7	4	0.2	12	0.3
Palm/bamboo	4	0.3	11	0.5	15	0.4
parquet or polished wood	4	0.3	0	0	4	0.1
Vinyl or asphalt strips	6	0.5	1	0	7	0.2
Ceramic tiles	29	2.5	0	0	29	0.8
Cement	502	43	74	3.1	576	16.4
Carpet	151	12.9	36	1.5	187	5.3
Roofing Materials						
Grass/thatch	0	0	1	0	1	0
Dung/mud	44	3.8	813	34.6	857	24.3
Rustic mat/plastic sheets	1	0.1	12	0.5	13	0.4
Reed/bamboo	13	1.1	125	5.3	138	3.9
Wood	3	0.3	25	1.1	28	0.8
Cardboard	21	1.8	203	8.6	224	6.4
Corrugated iron	71	6.1	3	0.1	74	2.1
wood plank	987	84.5	1124	47.8	2111	60
Asbestos sheet	4	0.3	12	0.5	16	0.5
Cement concrete	4	0.3	1	0	5	0.1
Tiles	16	1.4	4	0.2	19	0.5
Rooms used for sleeping						
No room for sleeping	36	3.1	93	4	129	3.7
One room	725	62.1	1684	71.6	2409	68.4
Two rooms	311	26.6	494	21	805	22.9
Three rooms	78	6.7	73	3.1	151	4.3
Place for cooking						
In the house	278	23.8	986	41.9	1264	35.9
In a separate building	562	48.1	802	34.1	1364	38.7
Outdoor	328	28.1	565	24	893	25.4
Cooking fuel						
Electricity	295	25.3	6	0.3	301	8.5
LPG/natural gas	4	0.3	0	0	4	0.1
Biogas	2	0.2	0	0	2	0.1
Kerosene	29	2.5	4	0.2	33	0.9
Charcoal	428	36.6	79	3.4	507	14.4

Wood	395	33.8	2193	93.2	2588	73.5
Straw/shrubs/grass	0	0	14	0.6	14	0.4
Animal dung	3	0.3	51	2.2	54	1.5
No food cooked in the house	7	0.6	3	0.1	10	0.3

Note: The n's are un-weighted denominators for each subgroup

3.3 Household possessions

More than 80% of the rural HHs owned farm animals. Ownership of electronic goods in urban areas was higher than rural residents as shown in Table 4.

Table 4. Distribution of household possessions, by residence.

	Residence					
	Urban		Rural		Total	
Possession	n	%	n	%	n	%
Household effects						
Clock/Watch	495	42.4	411	17.5	906	25.7
Radio	693	59.3	640	27.2	1333	37.9
Television	866	74.1	150	6.4	1016	28.9
Mobile	1026	87.8	1042	44.3	2068	58.7
Landline phone	290	24.8	31	1.3	321	9.1
Refrigerator	428	36.6	51	2.2	479	13.6
Means of transportation						
Bicycle	68	5.8	38	1.6	106	3.0
Motor Cycle	23	2	20	0.8	43	1.2
Car	18	1.5	10	0.4	28	0.8
Cart	71	6.1	43	1.8	114	3.2
Ownership of farm animals						
Farm animals	185	15.8	1889	80.3	2074	58.9

Note: The n's are un-weighted denominators for each subgroup; subgroups that do not sum to the total have missing data

3.4 Water Hygiene and Sanitation

3.4.1 Source of drinking water

The ENMS 2015 finding showed nationally 63% of households had access for safe drinking water supplies, i.e. their source of drinking water were bottled, piped(in to dwell or compound) or public tap water. There was difference between urban (89.5 %) and rural (49.7 %) access for safe drinking water (Table 5).

Table 5. Source of Drinking Water in Urban and Rural in 2015.

	Residence					
	Urban		Rural		Total	
Characteristic	n	%	N	%	N	%
Water Source						
Piped into dwelling	67	5.7	17	0.7	84	2.4
Piped to compound/plot	710	60.8	62	2.6	772	21.9
Public tap/standpipe	260	22.3	1091	46.4	1351	38.4
Tube well or borehole	8	0.7	63	2.7	71	2
Protected well	5	0.4	92	3.9	97	2.8
Unprotected well	1	0.1	63	2.7	64	1.8
Protected spring	11	0.9	194	8.2	205	5.8
Unprotected spring	20	1.7	243	10.3	263	7.5
Rainwater	0	0	34	1.4	34	1
Tanker truck	8	0.7	8	0.3	16	0.5
Cart with small tank	9	0.8	1	0	10	0.3
River/dam/lake/pond/stream/canal /irrigation channel	26	2.2	439	18.7	465	13.2
Bottled water	8	0.7	1	0	9	0.3
Time to obtain drinking water (round trip)						
Water on premises	802	68.7	123	5.2	925	26.3
Less than 30 minutes	319	27.3	1611	68.5	1930	54.8
30 minutes or longer	47	4	619	26.3	666	18.9
Water treatment prior to drinking						
No	1171	91.3	2388	94.8	3559	93.6
Boil	13	1	28	1.1	41	1.1
Water purifying chemicals	75	5.8	70	2.8	145	3.8
Strain through cloth	8	0.6	26	1	34	0.9
Ceramic filter	8	0.6	1	0	9	0.2

Note: Water purifying treatment may Include use of water guard, BishanGari, aquatabs and others.

3.4.2 Availability of sanitary facilities

Municipality and private establishments collected and disposed waste from most urban households. But,HHs in rural areas disposed their waste either in to an open field, or burred it in own compound. Most households were observed in using pit latrines with slab or open pit latrine. Therefore, urban residents have better access for sanitary facilities compared to HHs in rural areas (**Table 6**).

Table 6.Distribution of Sanitary Facilities, by Residence in 2015.

	Residence					
	Urban		Rural		Total	
Characteristic	n	%	n	%	N	%
Primary waste disposal						
Collected by municipality	275	23.5	24	1	299	8.5
Collected by private setting up	453	38.8	19	0.8	472	13.5
Buried	85	7.3	490	20.8	575	16.4
Dumped on filed/open space	67	5.7	721	30.6	788	22.5
Disposed in the compound	40	3.4	516	21.9	556	15.9
Dumped in river	22	1.9	83	3.5	105	3.0
Burned	214	18.3	458	19.5	672	19.2
Other	13	1.1	44	1.9	35	1.0
Toilet facility						
Flush to piped sewer system	21	1.8	1	0	22	0.6
Flush to septic tank	45	3.9	16	0.7	61	1.7
Flush to pit latrine	11	0.9	12	0.5	23	0.7
Flush to somewhere else	6	0.5	5	0.2	11	0.3
Flush, don't know where	6	0.5	1	0	7	0.2
Ventilated improved pit latrine (vip)	61	5.2	99	4.2	160	4.6
Pit latrine with slab	519	44.4	131	5.6	650	18.5
Pit latrine without slab/open pit	372	31.8	1124	47.8	1496	42.7
No facility/bush/field	119	10.2	957	40.7	1076	30.7

Note: The n's are un-weighted denominators for each subgroup; subgroups that do not sum to the total have missing data.

3.5 Inflammation status

3.5.1 Inflammation among preschool and school age children

The combination of the two proteins CRP and AGP can detect those who have only recently been infected. Raised CRP means those who are infected not yet showing clinical evidence of disease. Those individuals who have recovered and are convalescing have raised AGP with or without a raised CRP(Thurnham & Mccabe 2012).

The value of AGP and CRP ranges from 0.01 g/l to 13.47 g/l and 0 to 44.64 g/l respectively. There was a big variability among different age group and sub-population of the study population as indicated in Table 7.

Table 7.Geometric mean concentration of AGP and CRP

Variable	Children 6 to 59 months			Children aged 5 to 14 years			15 to 49 years non-pregnant women		
	n	GM	[Q1, Q3]	n	GM	[Q1, Q3]	n	GM	[Q1, Q3]
AGP(g/L)	1180	0.95	0.92, 0.98	1578	0.82	0.8, 0.84	1723	0.76	0.75, 0.78
CRP(g/L)	1164	0.64	0.58, 0.73	1564	0.38	0.17, 1.04	1721	0.68	0.64, 0.73

Note: The value of AGP and CRP were not normally distributed. GM = Geometric mean

Prevalence of inflammation was higher in children. Nearly half of children aged 6 to 59 month had inflammation. The prevalence of elevated AGP > 1 g/L or CRP > 5 g/L was highest among children 12 to 23 months (52%). Prevalence of inflammation decreased as the age increase as child age increased as presented in Table 8.

Table 8.Prevalence of Inflammation as measured by AGP and CRP, stratified by sex, age, and place of residence children 5 to 14 age (years)

		AGP>1, CRP≤5	AGP≤1, CRP>5	AGP>1, CRP>5		AGP>1, CRP≤5	AGP≤1, CRP>5	AGP>1 CRP>5
Variable		%	%	%	Variable	%	%	%
National		30.9	11.5	44.3	National	25.5	5.3	31.6
Sex	Male	33.2	11.3	46.4	Male	26.8	6.1	34.2
	Female	28.4	11.6	41.9	Female	23.5	4.8	29.3
Age (Months)	6 -11	31.1	13.3	46.7	5-8 yr.	27.5	6.6	35.4
	12-23	37.5	12.5	51.5	9-11 yr.	26.9	3.8	31.6
	24-35	31	10.3	43.3	12-14 yr.	18.8	5	25.1
	36-47	31.9	13.2	46.8				
	48-59	28.1	10.3	40.3				
Residence	Urban	34.6	8.2	44	Urban	23.3	5.6	29.8
	Rural	30.2	12.1	44.3	Rural	25.5	5.3	32.1

Note: incubation when AGP≤1& CRP>5, early convalescence when AGP>1& CRP>5 and late convalescence if AGP>1& CRP≤5

3.5.2 Inflammation among non-pregnant women of reproductive age

Inflammation was highest among women 15-19 years and 40 to 49 years of age and, urban women were at a higher risk of having inflammation than rural women as shown in Figure 2. Using AGP and CRP, we classified the stage of inflammation as incubation (CRP >5 mg/L, AGP ≤1 g/L), early convalescence (CRP >5 mg/L, AGP >1 g/L), and late convalescence (CRP ≤ 5 mg/L, AGP >1 g/L).

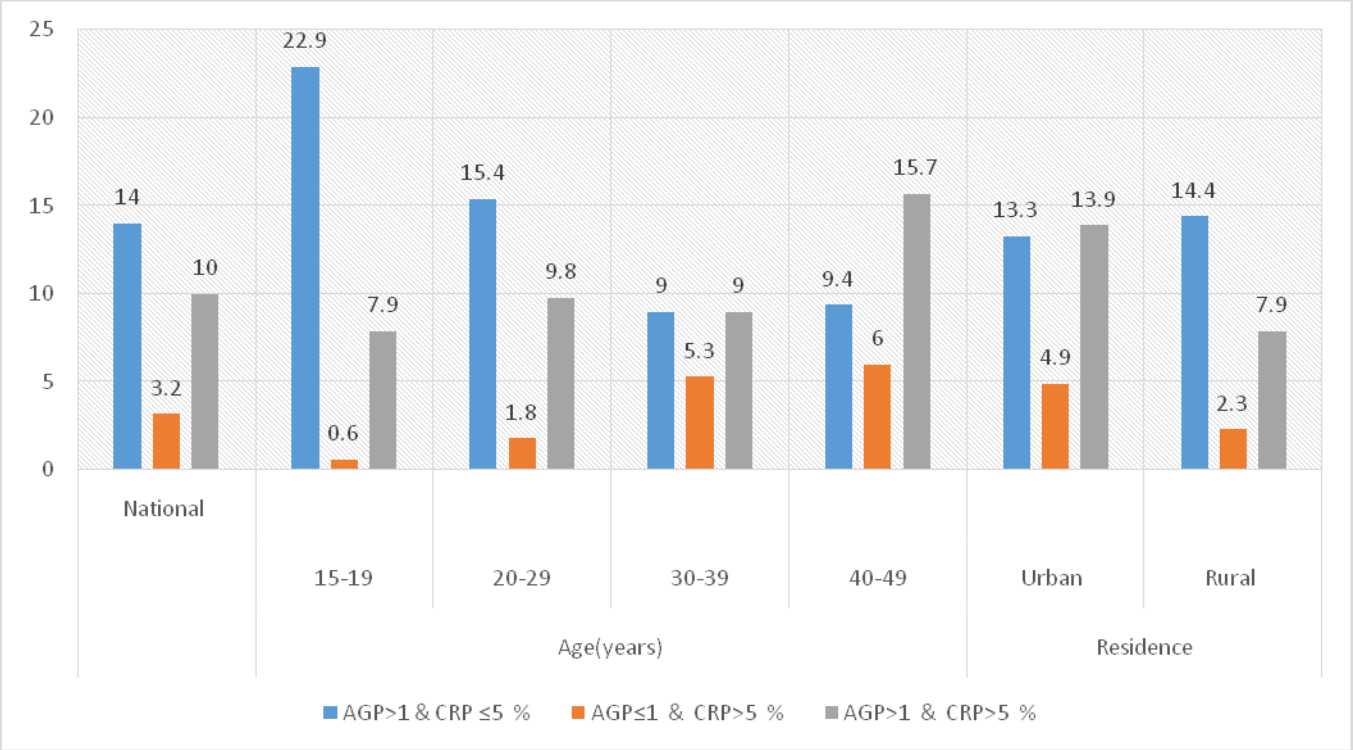

Figure 2.Inflammation among non-pregnant women of reproductive age

3.5.3 Summary of Inflammation status by target group

The highest prevalence of inflammation was found among preschool children 6 to 59 months of age (44.4 %) followed by 31.6 % school age children 5 to 14 year of age and 27.3% among non-pregnant women age 15 to 49 years as shownFigure 3. Boys and girls were equally affected by inflammation across all age categories.

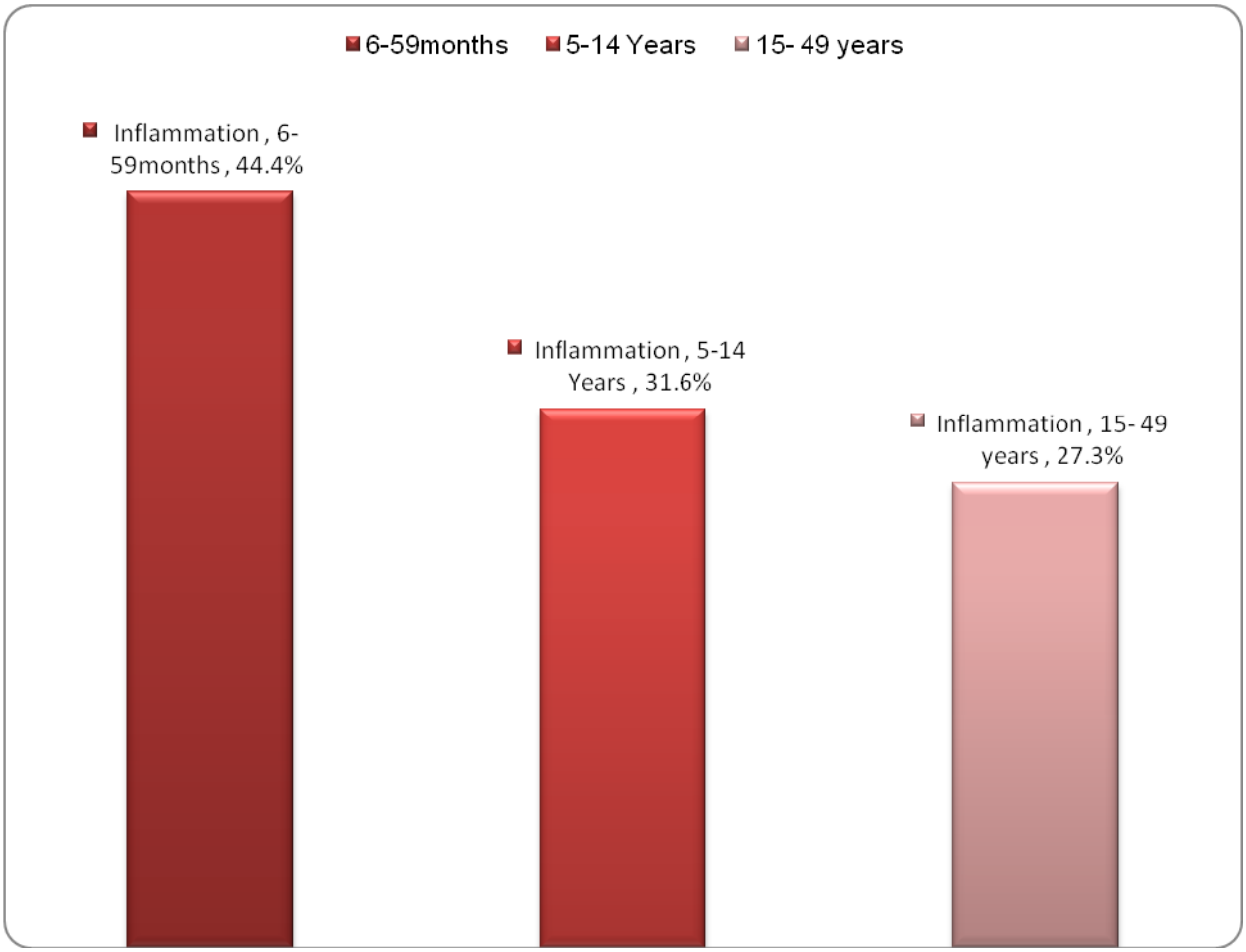

Figure 3. Prevalence of inflammation among different target groups

3.6 Anemia andIronstatus; and Iron deficiency anemia

3.6.1 Anemia among preschool children

Altitude adjusted hemoglobin values varied from 4.13 to 19.92 g/dL with mean hemoglobin concentration of 11.4 g/dL (95%CI: 11.3, 11.5). No children were excluded from hemoglobin and anemia analyses due to hemoglobin level being out of range <4.0 g/dL but only 2 children were excluded because of their hemoglobin level was greater than Hb>18.0 g/d. The study result showed that children aged 6 to 11 and 12 to 23 months have higher risk of anemia than the other groups. Nationally more than one in three children were anemic475(34.4%). Of the total children435(31.6%)percent had moderate anemia and about three percent 40(2.9%) suffered from severe anemia (Table 9).

Table 9.Prevalence of anemia among preschool children by Sex and age category

Variables		Anemia status			Total Anemic N (%)
		Severe n (%)	Moderate n (%)	Normal n (%)	
Sex	National	40(2.9)	435(31.6)	900(65.5)	475(34.4)
	Boys	27(3.8)	224(31.2)	468(65.1)	251(35)
	Girls	13(2.0)	211(32.2)	432(65.9)	224(34.2)
Age (months)	6-11	1(1.3)	41(51.9)	37(46.8)	42(53.2)
	12-23	10(5.0)	106(53.3)	83(41.7)	116(58.3)
	24-35	7(2.5)	88(31.2)	187(66.3)	95(33.7)
	36-47	10(2.7)	103(28.2)	252(69.0)	113(30.7)
	48-59	12 (2.7)	97 (21.6)	341 (75.8)	109(24.3)

Individual Hemoglobin vales were adjusted for Altitude greater than 1000 meter above sea level. Anemia is defined as Hb<11.0 g/dL for children 6 to 59 months, Classification: Severe Hb<7 g/dL, Moderate Hb 7-11 g/ dL. and total anemic Hb<11 g/dL and Normal Hb>11 g/dL (WHO, 2011)

The ENMS 2015 showed that national anemia prevalence estimate has similar reduction trend with the 2011 Ethiopian demographic and health survey report (EDHS, 2012). There was high variation among regions, and the lowest and highest prevalence of anemia was found in Addis Ababa and Somali regional state as indicated in Table 10.

Table 10. Anemia status by region and residence among preschool children

Variables			Anemia status			Total Anemic
		N	Severe n (%)	Moderate n (%)	Normal n (%)	N (%)
National		1375	40(2.9)	428(31.6)	892(65.5)	475(34.4)
Region	Tigray	176	2(1.1)	46(26.1)	128(72.1)	48(27.2)
	Afar	112	3(2.7)	37(33.0)	72(64.3)	40(35.7)
	Amhara	171	3(1.8)	51(29.8)	117(68.4)	54(31.6)
	Oromia	232	11(4.7)	80(34.5)	141(60.8)	91(39.2)
	Somali	121	11(4.7)	62(51.2)	48(39.7)	73(60.3)
	B/Gumuz	105	1(1.0)	28(26.7)	76(72.4)	29(27.7)
	SNNPR	201	1(0.5)	57(28.4)	143(71.1)	58(28.9)
	Gambella	85	0(0.0)	24(28.2)	61(71.8)	24(28.2)
	Harari	68	3(4.4)	18(26.5)	47(69.1)	21(30.9)
	A/Ababa	176	0(0.0)	2(13.3)	13(86.7)	2(13.0)
	D/Dawa	74	5(6.8)	23(31.1)	46(62.2)	28(37.9)
Residence	Urban	218	2(0.9)	56(25.7)	160(73.4)	58(26.6)
	Rural	1157	38(3.3)	379(32.8)	740(64.0)	417(36.1)

Individual Hemoglobin vales were adjusted for Altitude greater than 1000 meter above sea level (Sullivan et al. 2008).

Anemia is defined as Hb<11.0 g/dL for children 6 to 59 months, Classification: Severe Hb<7g/dL, Moderate Hb 7-11 g/dL and total anemicHb<11g/dL and Normal Hb>11g/dL(WHO, 2011).

3.6.2 Anemia among School children

Anemia status indicators were measured on 1509 children between the ages of 5 and 14 years (Table 11). No children were excluded from hemoglobin and anemia analyses due to their hemoglobin level being less than 4.0 g/dL but 5 children were excluded because of having hemoglobin level of greater than 18.0 g/dL).

More than one in four (25.8 %) school children assessed by this survey were anemic, 24.5% children had moderate anemia and only 1.3 percent have severe anemia. Boys leaving in rural area were more likely to become anemic ($p<0.05$) than girls and those wholived in urban. Prevalence of anemia was significantly (<0.05) higher in the younger age category (5 to 8 years) compared with the elder groups and dramatically dropped as age increases.

Table 11. Prevalence of anemia by Sex and age group among School age children

Variables		Anemia status			
		Severe Hb<8g/dL n (%)	Moderate (Hb 8-12 g/dL) n (%)	Normal (Hb>12 g/dL) n (%)	Total (Hb<12 g/dL) n (%)
National		20(1.3)	369(24.5)	1120(74.2)	389(25.8)
Sex	Boys	9(1.3)	183(26.0)	511(72.7)	192(27.3)
	Girls	11(1.4)	186(23.1)	609(75.6)	197(24.5)
Age (years)	5-8	12(1.8)	223(33.0)	441(65.2)	235(34.8)
	9-11	6(1.4)	87(20.5)	331(78.1)	93(21.9)
	12-14	2(0.5)	59(14.4)	348(85.1)	61(14.9)

Individual Hemoglobin vales were adjusted for Altitude greater than 1000 meter above sea level (Sullivan et al., 2008). Anemia is defined as Hb<11.0 g/dL for children 5 to 14 years, Classification: Severe Hb<8 g/dL, Moderate Hb 8-12 g/dL and total anemic Hb<12 g/dL and Normal Hb>12g/dL (WHO, 2011)

Children in Afar, Amhara and Oromia regions have higher anemia deficiency than other regions as shown in table 3-12. According to the WHO classification this level of anemia in the total population is considered as moderate public health problem (WHO, 2011).

3.6.3 Anemia among non-pregnant women of reproductive age

The mean hemoglobin concentration unadjusted and adjusted for altitude were 13.9 g/dL (95%CI: 13.8, 14.0) and 12.8 (95%CI: 12.7, 12.9) respectively as presented in Table 12. The national average mean difference between unadjusted and adjusted hemoglobin for altitude was 1.1 g/dL. About eighteen percent (17.7) of Ethiopian non-pregnant women age 15 to 49 are anemic, 16.5 percent have moderate and only 1.2 percent have severe anemia. There was significant ($P<0.05$) variation in prevalence of anemia between urban and rural. Higher proportion of women in rural areas are anemic (21.3 percent) than those in urban areas. According to the WHO classification any anemia with the prevalence of 19.7 percent in a total population is considered as mild public health problem (WHO, 2011).

Table 12. Prevalence of anemia by age range and residence among women of reproductive age

Variables		N	Anemia status			Total Anemic n (%)
			Severe n (%)	Moderate n (%)	Normal n (%)	
National		1741	21(1.2)	288(16.5)	1432(82.3)	306(17.7)
Residence	Urban	623	4(0.6)	89(14.3)	530(85.1)	93(14.9)
	Rural	1118	17(1.5)	199(17.8)	902(80.7)	216(19.3)
Age (years)	15-19	313	4(1.3)	33(10.5)	276(88.2)	37(11.8)
	20-29	665	10(1.5)	119(17.9)	536(80.6)	129(19.4)
	30-39	540	7(1.3)	110(20.4)	423(78.3)	117(21.7)
	40.49	234	0(0.0)	32(13.7)	202(86.3)	32(13.7)

Individual Hemoglobin vales were adjusted for Altitude greater than 1000 meter above sea level (Sullivan et al. 2008).

Anemia is defined as Hb<11.0 g/dL for children 15 to 49 years, Classification: Severe Hb<8 g/dL, Moderate Hb 8-12 g/dL and total anemic Hb<12 g/dL and Normal Hb>12 g/dL (WHO, 2011)

Women in the Somali, Gambella and Afar regions have a relatively high prevalence of anemia (34.8, 26.7, and 26.2 percent respectively). These regions had exhibited higher prevalence of anemia in 2011. Women in Addis Ababa and the SNNP, Amhara and Tigray regions have relatively low prevalence of anemia as shown in Table 13. Nationally the decline in the burden of anemia in the present study is in agreement with the trend showed in Ethiopian Demographic and health surveys (EDHS, 2012).

Table 13.Prevalence of anemia by region among women of reproductive age

Variables		N	Anemia status			Total Anemic, n (%)
			Severe n (%)	Moderate n (%)	Normal n (%)	
National			21(1.2)	288(16.5)	1432(82.3)	309(17.7)
Region	Tigray	212	1(0.5)	30(14.2)	181(85.4)	31(14.7)
	Afar	112	0(0.0)	32(26.2)	90(73.8)	32(26.2)
	Amhara	253	1(0.4)	25(9.9)	227(89.7)	26(10.3)
	Oromia	185	4(2.2)	31(16.8)	150(81.1)	35(19)
	Somali	115	6(5.2)	34(29.6)	75(65.2)	40(34.8)
	B/Gumu	126	0(0.0)	20(15.9)	106(84.1)	20(15.9)
	SNNPR	195	2(1.0)	24(12.3)	169(86.7)	26(13.3)
	Gambela	123	0(0.0)	15(12.2)	108(87.8)	29(26.7)
	Harari	109	3(2.8)	26(23.9)	80(73.4)	15(12.2)
	A/Ababa	179	0(0.0)	18(10.1)	161(89.9)	18(10.1)
	D/Dawa	122	4(3.3)	33(27.0)	85(69.7)	18(10.1)

Individual Hemoglobin vales were adjusted for Altitude greater than 1000 meter above sea level. Anemia is defined as Hb<11.0 g/dL for children 15 to 49 years, Classification: Severe Hb<8g/dL, Moderate Hb 8-12 g/dL and total anaemicHb<12g/dL and Normal Hb>12g/dL (WHO, 2011)

3.6.4 Summary of anemia status by target group

According to the ENMS 2015 highest prevalence of anemia was observed in preschool children 6 to 59 months of age, followed by school age children 5 to 14 year of age and non-pregnant women age 15 to 49 years as shown in Figure 4. As per the WHO classifications in Ethiopia anemia was moderate public health problem in children 6 to 59 months and 5 to 14 years of age, whereas a mild problem in non-pregnant women.

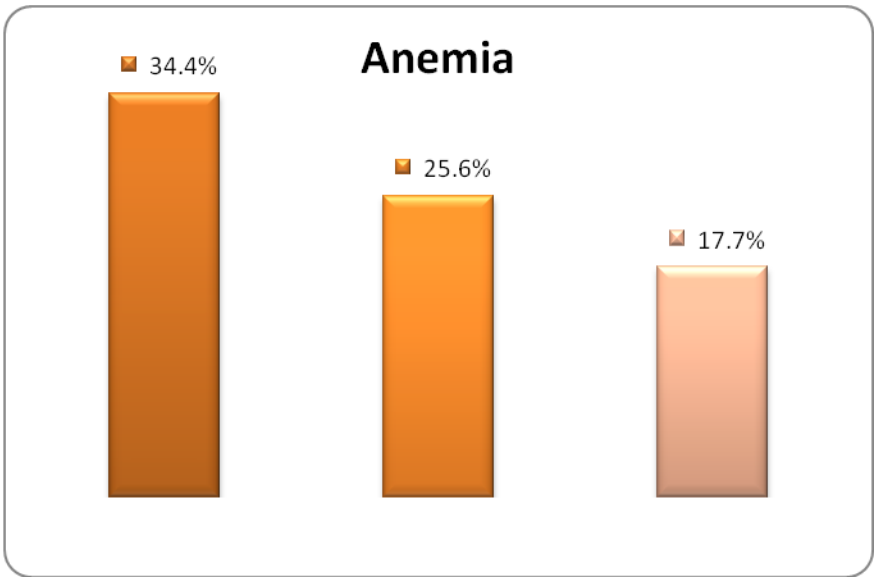

Figure 4.Summary of anemia status by target group

3.6.5 Iron deficiency and iron deficiency anemia

3.6.6 Iron and iron deficiency anemia among preschool children

Iron deficiency status indicators were available for 1138 and 1140 children for soluble transferrin receptor (sTfR) and ferritin (FERR) measurements among 6 and 59 months of age. sTfR values ranged from 2.9 mg/L to 5.1 mg/L at the 25th and 75th percentile respectively with a median concentration of 3.5 mg/L (95%CI:3.3, 3.6) as shown in Table 14. The 25th and 75th percentile of serum ferritin values varied from 15.9 to 51.7 µg/L with a median concentration of27.9 µg/L (95%CI: 26.5, 29.3).

Table 14. Median concentrations STFR and FERR, children 6 to 59 months of age

Variable	Observation	Median (95%CI)	25 and 75%
STFR (mg/L)	1138	3.5(3.3, 3.6)	2.9, 5.1
FERR(µg/L)	1140	27.9(26.5, 29.3)	15.9, 51.7

Among the surveyed children the measured values of FERR and STFR corrected for inflammation showed 17.8 percent of children had depleted iron stores (serum ferritin ≤12 ug/L) and 29.6 percent children had tissue iron deficiency (serum sTfR ≥4.4 mg/l). Considering this we

estimated the prevalence of iron deficiency anemia (IDA) using the corrected serum ferritin and soluble transferrin receptor for inflammation combined with hemoglobin adjusted for altitude. Hence, IDA from children who had FERR and hemoglobin below the cutoff (i.e. FERR<12 µg/L and Hb<11g/dL) were 8.6 percent and IDA as measured from elevated sTfR and hemoglobin below the cutoff (sTfR> 4.4 mg/L and Hb<11 g/dL) were 12.3 percent. Children living in Ethiopian rural areas and the youngest age category had high risk of iron and iron deficiency anemia than urban residence and the older age category Table 15.

Table 15.Prevalence of iron and iron deficiency anemia, children 5 to 14 years of age

		FERR≥15	ID (FERR<15)	STFR≤4.4	ID (STFR>4.4)	IDA (FERR)	IDA (STFR)
Variable		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
	National	1434(90.9)	143(9.1)	1244(80.5)	302(19.5)	61(4.4)	96(7.0)
Sex	Boys	680(92.0)	59(8.0)	576(79.7)	147(20.3)	25(3.9)	40(6.3)
	Girls	754(90.0)	84(10.0)	668(81.2)	155(18.8)	36(4.8)	56(7.6)
Age (Years)	5-8	633(88.9)	79(11.1)	557(79.8)	141(20.2)	42(6.8)	64(10.5)
	9-11	417(93.7)	28(6.3)	357(81.5)	81(18.5)	9(2.3)	16(4.2)
	12-14	384(91.4)	36(8.6)	330(80.5)	81(19.5)	10(2.6)	16(4.3)
Residence	Urban	311(91.7)	28(8.26)	268(81.0)	63(19.0)	7(2.4)	14(4.9)
	Rural	1122(90.9)	115(9.3)	975(80.3)	239(19.7)	54(4.9)	82(7.6)
Region	Tigray	188(96.4)	7(3.6)	182(94.3)	11(5.7)	1(0.6)	3(1.7)
	Afar	142(95.3)	7(4.7)	107(75.4)	35(24.6)	2(1.8)	11(10.3)
	Amhara	218(96.9)	7(3.1)	198(88.0)	27(12.0)	5(2.4)	9(4.3)
	Oromiya	230(87.5)	33(12.5)	199(75.9)	63(24.1)	18(7.3)	29(11.8)
	Somali	107(83.6)	21(16.4)	5(85.0)	19(15.0)	10(9.8)	9(8.9)
	B/G	96(96.0)	4(4.0)	75(75.0)	25(25.0)	2(2.2)	4(4.5)
	SNNPR	192(91.0)	19(9.0)	180(85.7)	30(14.3)	8(4.0)	8(4.0)
	Gambella	94(82.5)	20(17.5)	57(58.8)	40(41.2)	6(6.7)	12(16.7)
	Harari	51(85.0)	9(15.0)	53(89.8)	6(10.2)	3(6.2)	2(4.3)
	Addis/A	25(89.3)	3(10.7)	24(85.7)	4(14.3)	0(0.0)	0(0.0)
	Dire/D	90(87.4)	13(13.6)	66(64.1)	37(35.9)	6(6.7)	9(10.0)

3.6.7 Iron deficiency and iron deficiency anemia among non-pregnant women of reproductive age

Iron deficiency status indicators (sTfR and FERR) are available for non-pregnant women of reproductive age from 15 to 49 years of age as shown in Table 16. The median concentration of STFR was found 3.1 mg/L (95%CI: 2.9, 3.2). Whereas the median concentration of serum FERR was 52.3 (95%CI: 50.2, 54.6)

Table 16. Median concentrations STFR and FERR, Non-pregnant women of reproductive age

Variable	Observation	Median (95%CI)	25 and 75%
STFR (mg/L)	1726	3.07 (2.97, 3.16)	2.6, 4.19
FERR(µg/L)	1700	52.34 (50.19, 54.57)	33.17, 94.86

Nationally among the assessed non-pregnant women of reproductive age the values of FERR and STFR corrected for inflammation showed that 10.0 percent of women had depleted iron stores (serum ferritin ≤15 ug/L) and 16.4 percent of women had tissue iron deficiency (serum sTfR ≥4.4 mg/l). Then iron deficiency anemia was estimated only from individuals who had depleted iron store and anemic (FERR ≤ 15 and Hb<12) and deficient in soluble transferrin receptor plus anemic (i.e. sTfR ≥4.4 and Hb<12) were 4.7 percent and 5.8 percent respectively as shown in Table 17.

Table 17. Iron and iron deficiency anemia status, non-pregnant women, 15 to 49 years of age

		FERR≥15 n(%)	FERR<15 n(%)	STFR≤4.4 n(%)	STFR>4.4 n(%)	IDA (FERR) n(%)	IDA (STFR) n(%)
	National	1473(90.0)	163(10.0)	1391(83.6)	273(16.4)	72(4.7)	89(5.8)
	15-19	278(90.0)	31(10.0)	264(83.8)	51(16.2)	9(3.2)	12(4.7)
Age (years)	20-29	545(88.8)	69(11.2)	518(83.0)	106(17.0)	32(5.6)	37(6.3)
	30-39	446(91.8)	40(8.2)	413(84.3)	77(15.7)	22(4.9)	29(6.4)
	40-49	204(89.9)	23(10.1)	196(83.6)	39(16.4)	9(43)	11(5.1)
Residence	Urban	525(90.0)	58(10.0)	482(81.0)	113(19.0)	25(4.6)	33(5.9)
	Rural	937(90.0)	104(10.0)	897(84.9)	160(15.1)	47(4.9)	56(5.7)
	Tigray	176(97.2)	5(2.8)	171(94.5)	10(5.5)	0(0.0)	3(1.7)
	Afar	88(86.3)	14(13.7)	89(86.4)	14(13.6)	6(5.9)	6(5.8)
	Amhara	228(98.7)	3(1.3)	216(91.9)	19(8.1)	0(0.0)	4(1.7)
	Oromia	219(89.4)	26(10.6)	210(85.4)	36(14.6)	13(7.7)	10(5.9)
Regions	Somali	52(54.2)	44(45.8)	67(65.7)	35(34.3)	24(25.0)	26(25.5)
	B/G	105(99.1)	1(0.9)	87(81.3)	20(18.7)	0(0.0)	1(0.9)
	SNNPR	180(92.8)	14(7.22)	177(90.8)	18(9.2)	4(2.4)	4(2.4)
	Gambella	107()94.7	6(5.3)	93(79.0)	24(20.5)	2(1.8)	7(6.0)
	Harari	75(80.7)	18(19.3)	67(72.5)	26(28.0)	11(11.8)	10(10.8)
	Addis/A	151(90.9)	15(9.1)	132(75.0)	44(25.0)	3(1.9)	7(4.2)
	Dire/D	81(83.5)	16(16.5)	70(72.2)	27(27.8)	9(9.3)	11(11.3)

3.6.8 Summary of iron deficiency by target group

Figure 5 shows the status of iron deficiency by target group. The highest prevalence of iron deficiency using sTfR was found in preschool children (29.6 %) followed by school age children (19.5%) and non-pregnant women were the least (16.4%). Whereas the highest prevalence of iron deficiency using serum ferritin was found in preschool children (17.8%) followed by women of reproductive age (10.0%) and school age children (9.1%).

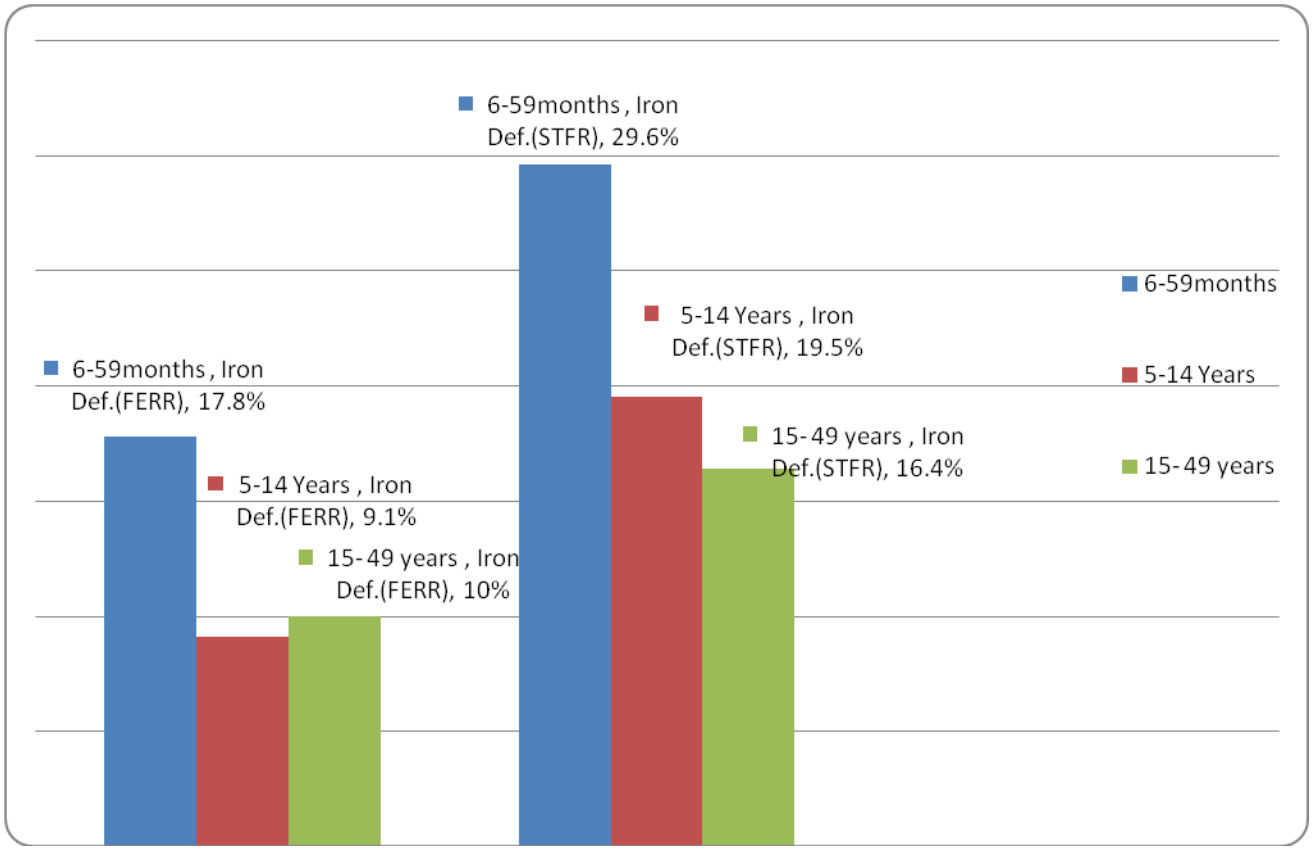

Figure 5. Summary of iron deficiency by target group

Iron deficiency determined by sTfR(>4.4 mg/L for children 6 to 59 months, children 5 to 14 years and women 15 to 49 years; >5.0 mg/L for men 15.54 years) or low serum ferritin (<12.0 µg/L for children 6 to 59 months; <15.0 µg/L for children 5 to 14 years, non-pregnant women 15 to 49 years, and men 15.54 years).

3.6.9 Summary of iron deficiency anemia by target group

The highest prevalence of iron deficiency anemia as estimated based on FERR was observed in preschool children 6 to 59 months of age (8.6%), followed by non-pregnant women (4.7%)and children age of 5 to 14 years (4.4%) as shown in Figure 6.

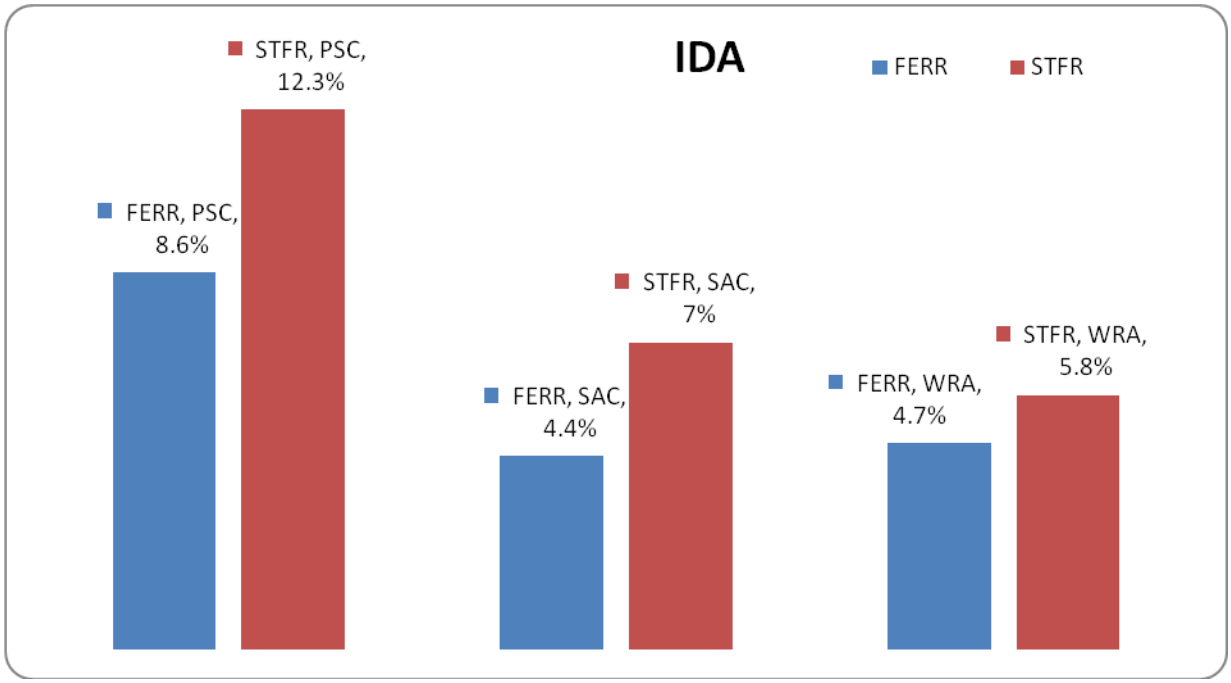

Figure 6. Prevalence of iron deficiency anemia by target group

IDA determined by low serum ferritin (<12.0 µg/L for children 6 to 59 months (PSC); <15.0 µg/L for school age children (SAC) 5 to 14 years, women of reproductive age (WRA) 15 to 49 years and low hemoglobin (<11.0 g/dL for PSC; <12 g/dL for SAC and WRA.

3.7 Vitamin A Status

3.7.1 Vitamin A status of Preschool children

All the analysis outputs presented below were adjusted for inflammation. Only children who have elevated acute phase protein markers of AGP≥ 1g/L and CRP ≥ mg/L were subjected for correction. The result of mean retinol concentration and the prevalence of vitamin A deficiency among preschool children by region, age and sex category are presented in Table 18.

Table 18. Prevalence of vitamin A deficiency among preschool children, 6 to 59 months of age

		N	Mean± SD	% (Retinol <0.7 μ mol/l)
	National	1148	1.01±0.33	13.9
Age	6-11	76	1.05± 0.65[a]	18.4
(Month)	12-23	190	1.02± 0.32[a]	13.7
	24-35	257	1.02± 0.32[a]	12.1
	36-47	296	0.99± 0.27[a]	14.2
	48-59	329	1.00± 0.29[a]	14.3
Sex	Boys	586	0.99± 0.29[a]	16.6
	Girls	562	1.03± 0.36[b]	11.2
Region	Tigray	150	1.11± 0.50[b,c]	11.1
	Afar	86	0.10± 0.30[a,b]	17.4
	Amhara	146	1.06± 0.30[a,b]	10.3
	Oromiya	208	0.95± 0.29[a]	15.9
	Somali	85	0.98± 0.26[a,b]	12.9
	B/G	91	1.07± 0.33[a,b]	13.2
	SNNPR	165	0.98± 0.29[a,b]	13.3
	Gambella	91	0.95± 0.25[a]	15.4
	Harari	62	0.97± 0.31[a]	21.0
	Addis/A	10	1.23± 0.40[c]	0.0
	Dire/D	51	0.94± 0.25[a]	15.7

The national mean retinol concentration of preschool children adjusted for inflammation was found (1.01±0.33 μmol/l). The regional analysis result shows that preschool children who live in Harari region has the lowest mean retinol concentration as compared to other region ($p<0.05$)whereas preschool children in Addis Ababa have significantly higher retinol concentration ($p<0.05$). The mean retinol concentration of preschool girls was found significantly higher than preschool boys ($p<0.05$). The analysis result based on age difference showed that there was no significant difference among the five age category mean retinol concentration ($p>0.05$).

The national prevalence of vitamin A deficiency estimated based on retinol adjusted for inflammation among preschool children was found 13.9%. Among the regions the prevalence of vitamin A deficiency of preschool school children who live in Harari was the highest as compared to other region at a prevalence of 21.0%. And lowest prevalence was observed in Addis Ababa, almost all preschool children in this city administration were not at risk of vitamin

A deficiency. The analysis based on sex difference showed that vitamin A deficiency was higher in boys than girls and also children in the age of 6 to 11 month were more prevalent than the other age groups.

3.7.2 Vitamin A supplementation among Children aged 6 to 59 months

A history of vitamin A supplementation was obtained from mothers or caretakers of the preschool children aged 6 to 59 months. Of all the assessed children 62.8% were ever received vitamin A supplement. Among children who had ever received vitamin A supplementation, 57.9% had received the most recent supplementation in the previous six months. From the total children who had received supplementation in the last 6 months only 10.5 % had written records confirming the date of supplementation. Table 19shows the prevalence of children who ever received vitamin A supplementation, and among those who answered yes to this question, those who received a vitamin A drop in the last six months by age, region, place of residence, mother's education, wealth quintile, and evidence of inflammation.

Table 19. Vitamin A supplementation coverage among preschool children

Variable	Response	N	%
Ever received Vit A	Yes	1,116	62.84
	No	660	37.16
Received last 6 month	Yes	1,028	57.9
	No	662	37.3
Received date recorded	Yes	108	10.5
	No	648	63.0

3.7.3 Vitamin A status of School age children

The analysis outputs presented below were adjusted for inflammation. Only children who have elevated acute phase protein markers of AGP≥ 1g/L and CRP≥ mg/L were subjected for correction. The result of mean retinol concentration and the prevalence of vitamin A deficiency among school age children by region, age and sex category are presented in Table 20.

The national mean retinol concentration of school age children was found (**1.10± 0.37** μmol/l). The regional analysis result shows that the school age children who live in Oromia, Somalia, SNNPR, Gambela, Harari and Dire Dawa showed no significant difference in mean concentration among themselves and has the lowest mean retinol concentration as compared to other regions ($p<0.05$) and significantly higher retinol concentration was found in the school age children who lives in Addis Ababa city administration ($p<0.05$). The mean retinol concentration

of school age girls was found significantly higher than school age boys ($p<0.05$). The analysis result based on age difference showed that the school age children in the age range of 12 to 14 have significantly higher retinol concentration than children in the age range of 5 to 8 years and 9 to 11 years.

Table 20.Vitamin A status among school age children

		N	Mean± SD	% (Retinol <0.7 μmol/l)
National		1555	1.10± 0.37	10.9
Age (Year)	5-8	705	1.04± 0.37[a]	13.3
	9-11	438	1.09±0.35 [a]	11.4
	12-14	412	1.20±0.35 [b]	6.3
Sex	Boys	732	1.08± 0.38[a]	11.9
	Girls	823	1.12± 0.36[b]	10.1
	Tigray	193	1.13± 0.38[b,c]	10.4
	Afar	149	1.16± 0.36[c]	5.4
	Amhara	225	1.13± 0.32[b,c]	8
	Oromiya	253	1.1± 0.38[a,b,c]	14.2
	Somali	128	1.1± 0.35[a,b,c]	5.5
Region	B/G	99	1.15±0.32[b,c]	10.1
	SNNPR	205	1.03±0.37[a,b]	18
	Gambella	112	1.1±0.29 [a,b,c]	4.5
	Harari	60	0.99±0.34[a]	25
	Addis/A	28	1.45± 0.58[d]	0
	Dire/D	103	1.04±0.38[a,b]	13.6

The national prevalence of vitamin A deficiency among school age children was found 10.9%. Among the regions the prevalence of vitamin A deficiency of school age children who live in Harari is the highest as compared to other region at a prevalence of 25.0%. And lowest deficiency was observed in Addis Ababa; almost all children in this region were not at risk of Vitamin A deficiency during the survey period.

3.7.4 Vitamin A status of non-pregnant women of reproductive age

All the analysis outputs presented below were adjusted for inflammation. Only women who have elevated acute phase protein markers of AGP≥ 1g/L and CRP≥ mg/L were subjected for correction. The result of mean retinol concentration and the prevalence of vitamin A deficiency among Ethiopian women's of reproductive age by region, age and area of residence are presented in Table 21.

The national mean retinol concentration of women's of reproductive age was found to be (**1.47±0.45**μmol/l). The regional analysis result shows that the women's who live in Dire Dawa city administration has the lowest mean retinol concentration as compared to other region ($p<0.05$) and women in Addis Ababa have significantly higher retinol concentration ($p<0.05$). The mean retinol concentration of women who live in urban area was found to be significantly higher than the women in rural area ($p<0.05$). The analysis result based on age difference showed that women in the age range of 30 to 39 and 40 to 49 years showed no significance difference in retinol concentration between, and they were found containing significantly higher retinol concentration than the younger women (15 to 19 and 20 to 29 years).

The national prevalence of vitamin A deficiency among women's of reproductive age was found to be 3.4 %. Among the regions the prevalence of vitamin A deficiency of women who live in Harari is the highest as compared to other region. And lowest prevalence was observed in Amhara region. The analysis based on the area of residence showed that the rural woman has the highest prevalence as compare to the urban women. Furthermore the older women in the age range of 40 to 49 years were found with the highest prevalence.

Table 21. Prevalence of vitamin A deficiency among non-pregnant women's of reproductive

		N	Mean±SD	% (Retinol <0.7 µmol/l)
National		1619	1.47±0.45	3.4
Age (Year)	15-19	309	1.40±0.43[a]	3.2
	20-29	605	1.44±0.45[a]	3.8
	30-39	475	1.52±0.45[b]	2.9
	40-49	230	1.51±0.47[b]	3.5
Residence	Urban	577	1.50±0.47[b]	2.3
	Rural	1042	1.45±0.44[a]	4
	Tigray	174	1.50±0.44[c,d]	3.4
	Afar	103	1.51±0.44 [c,d]	1
	Amhara	231	1.53±0.43 [c,d]	0.4
	Oromiya	241	1.35±0.44 [a,b]	5.8
	Somali	101	1.42±0.38 [a,b,c]	2
	B/G	105	1.45±0.41 [b,c]	1.9
	SNNPR	194	1.53±0.49 [c,d]	4.6
	Gambella	110	1.49±0.36 [c,d]	1.8
	Harari	90	1.34±0.42 [a,b]	5.6
	Addis/A	173	1.59±0.54 [d]	4.6
	Dire/D	97	1.30±0.38[a]	5.2

The prevalence of Vitamin A deficiency among preschool children was found 13.9 %at a national level. Hence based on WHO classification, this prevalence can be categorized as a moderate public health problem in Ethiopia. Likewise the prevalence of Vitamin A deficiency can be considered as a moderate public health problem in all regions, except Harari and Addis Ababa. Vitamin A deficiency is a severe public health problem among the Harar preschool children at a prevalence of 21%. On the other hand vitamin A deficiency is not a public health problem among the Addis Ababa preschool children. The prevalence of Vitamin A deficiency of both school boys and girls as well as among all age categories can be categorized as a moderate public health problem.

The prevalence of Vitamin A deficiency among school age children was found 10.9% at a national level. Hence based on WHO classification, this prevalence can be categorized as a moderate public health problem in Ethiopia. Likewise the prevalence of Vitamin A deficiency can be considered as a moderate public health problem in all regions, except Harari and Addis Ababa. Vitamin A deficiency is a severe public health problem among the Harar school age children at a prevalence of 25%. On the other hand vitamin A deficiency is not a public health

problem among the Addis Ababa school age children. The prevalence of Vitamin A deficiency of both school age boys and girls as well as among all age categories can be categorized as a moderate public health problem.

The prevalence of Vitamin A deficiency among women's of reproductive age at a national level was found at 3.4%. According to WHO classification (Mild: ≥2 to ≤10, Moderate: ≥10 to <20 and Severe: >20 μmol/l) this prevalence can be categorized as a mild public health problem. The prevalence of vitamin A deficiency in Tigray, Oromia, Somalia, SNNPR, Harari, Addis Ababa and Dire Dawa can also be considered as a mild public health problem. However, in Afar, Amhara, BenshangulGumuz and Gambela the vitamin A deficiency is not a public health problem among women of reproductive age. Moreover, the prevalence of vitamin A deficiency in both urban and rural, and among all age group can be considered as a mild public health problem.

3.7.5 Summary of Vitamin A deficiency among different target group

According to the ENMS 2015, highest prevalence of Vitamin A deficiency was observed in preschool children 6 to 59 months of age, followed by school age children 5 to 14 year of age and non-pregnant women age 15 to 49 years as shown in Figure 7. As per the WHO classifications, Vitamin A deficiency could be considered as mild for women of reproductive age and moderate public health problem for children 6 to 59 months and 5 to 14 years of age(WHO, 2005).

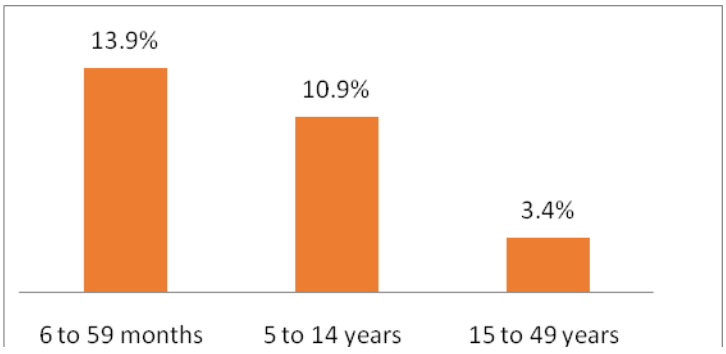

Figure 7. Summary of Vitamin A deficiency among different target group

3.8 Zinc Status

3.8.1 Prevalence of zinc deficiency among children 6 to 59 months of age

Serum zinc was analyzed for a total of 1143 children 6 to 59 months. The national prevalence of zinc deficiency among preschool children was 35.0% with a median serum zinc concentration of 76.9 µg/l (95% CI: 75.6, 78.1; SD=22.4). The highest prevalence was report among in the age range of 12 to 23 month. Boys were less likely to suffer from zinc deficiency than girls. The highest prevalence of serum zinc was reported in Tigary, Amhara and Afar and the lowest reported in Gambella (Figure 8).

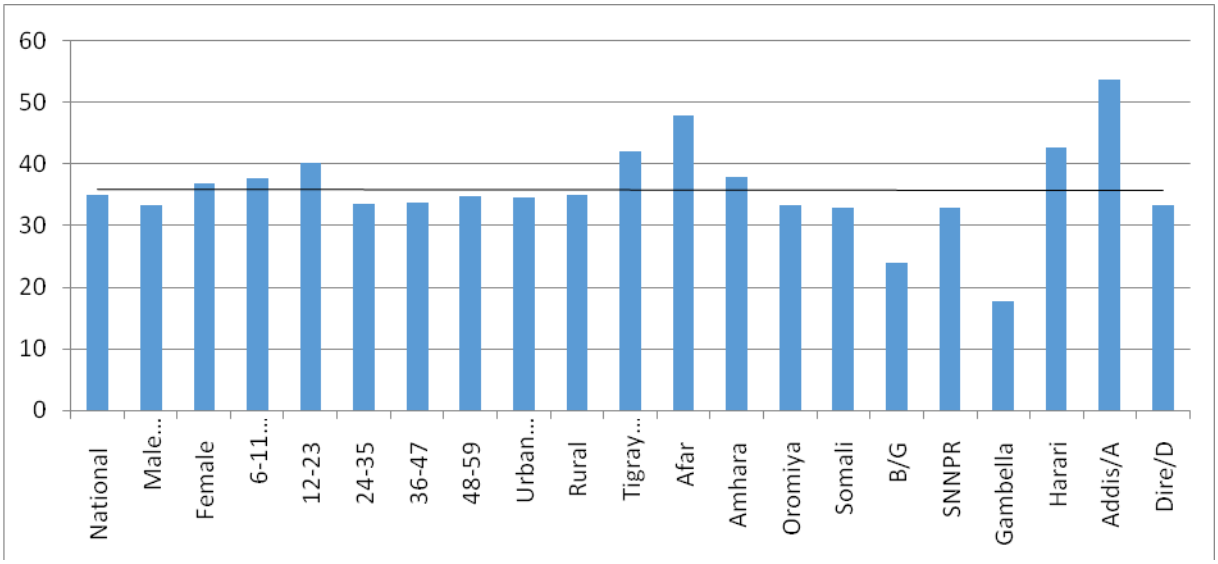

Figure 8. Prevalence of zinc deficiency among children

3.8.2 Prevalence of zinc deficiency among Children aged 5 to 14 years

Serum zinc was analyzed for a total of 1569 children aged 5 to 14 years. The national prevalence of zinc deficiency among children in age group of 5 to 14 year was about 36% with a median serum zinc concentration of 79.4 ug/l (95% CI: 78.1, 80.7; SD=23.6). Among children aged 5 to 14, the prevalence of zinc deficiency varied between regions. The highest and lowest prevalence reported in Dire Dawa and Gambella respectively as shown in Figure 9.

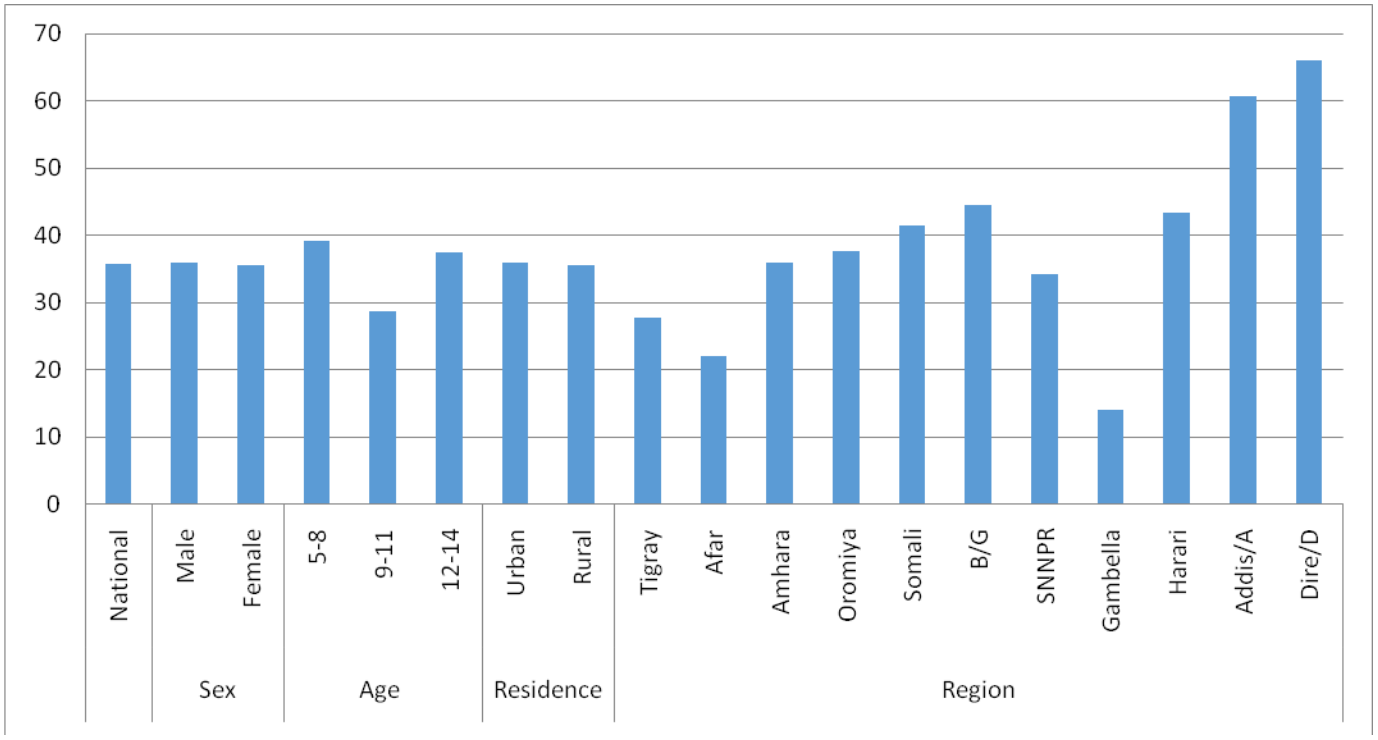

Figure 9. Prevalence of zinc deficiency among school age children

3.8.3 Prevalence of zinc deficiency in women of reproductive, 15 to 49 year of age

Serum zinc was analyzed from a total of 1625 non-pregnant women of reproductive age from 15 to 49 years. The overall prevalence of zinc deficiency was around 34% with a mean zinc concentration of 81.7 ug/dl (95% CI: 80.4, 82.9; SE= 0.68). Figure 10 below shows the prevalence of zinc deficiency among all non-pregnant women aged 15 to 49 years by place of residence and age. The prevalence was higher in rural areas (35.8 %) compared to urban areas (30.3 %). The deficiency has significant ($P<0.05$) variability among regions, women living in Dire Dawa are at high risk of zinc deficiency than others.

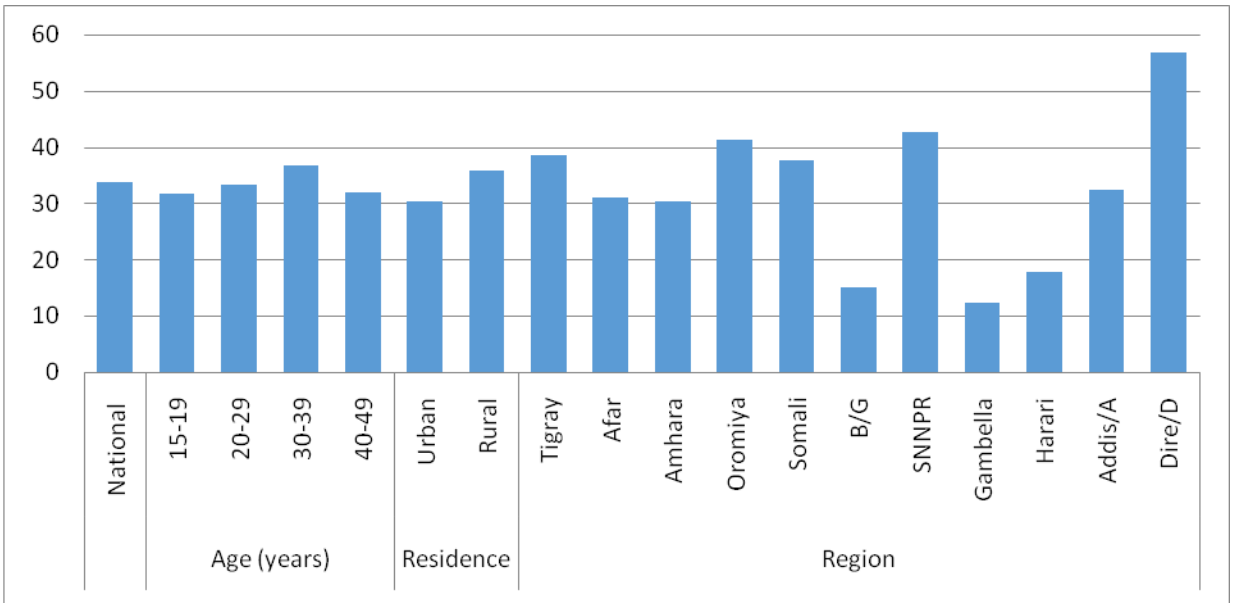

Figure 10. Prevalence of zinc deficiency in women of reproductive age

3.8.4 Summary of Zinc deficiency among different target group

According to the ENMS 2015, highest prevalence of zinc deficiency was observed in school children 5 to 14 years of age, followed by preschool age children 6 to 59 months of age and non-pregnant women age 15 to 49 years as shown in Figure 11. According to the IZiNC group recommendation with this high level of zinc deficiency the whole population can be considered as at risk zinc deficiency (IZiNCG 2007).

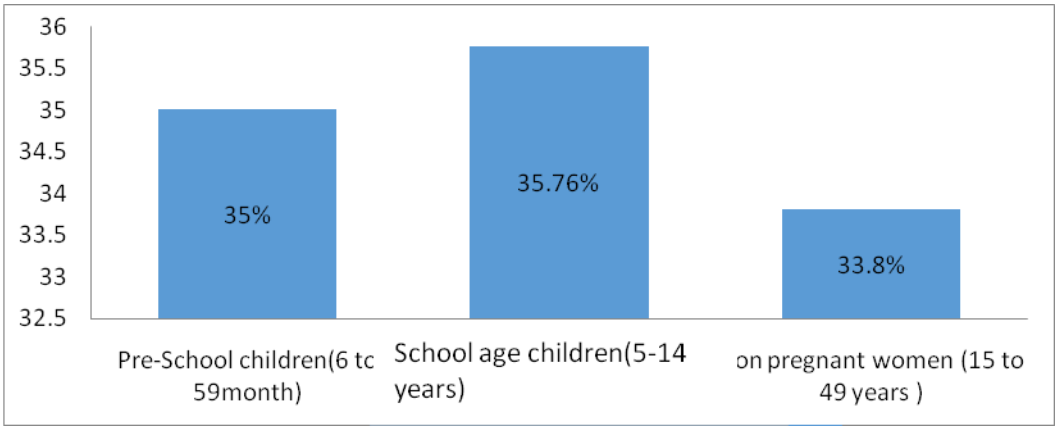

Figure 11. Summary of Zinc deficiency among different target group

3.9 Folate Status

3.10 Prevalence of RBC folate in non-pregnant Women of Reproductive Age

All the analysis outputs presented below are adjusted for inflammation and only women who have elevated acute phase protein markers (AGP≥1 g/L and CRP≥ mg/L) were subjected for the correction. Based on the current survey Ethiopian women has the median RBC folate concentration of 510.7 nmol/L (95% CI: 487.3, 527.1) with the 25th and 75th percentile concentration of 359.0 and 753.2 nmol/L respectively. Among the 1647 non-pregnant women for whom RBC folate concentrations were measured, 32.0% of women exhibited folate deficient according to the WHO criteria (<340 nmol/L) and they are folate insufficient for the prevention of neural tube defects/ NTDs (Daly et al. 1995).Among the surveyed non pregnant women of reproductive age, deficiency was highest in Harari, Afar, Somali and BenishangulGumuz regions compared to women form other regions. Table 22below shows the prevalence of RBC folate deficiency among all non-pregnant women aged 15-49 years stratified by age, region and place of residence.

Table 22.Prevalence of RBC Folate deficiency among non-Pregnant WRA

	Variable	Normal (RBC folate ≥340 nmol/L)		Deficient (RBC folate <340 nmol/L)	
		n	%	n	%
National		1,121	68	527	32.0
Age (years)	15-19	224	71.57	89	28.43
	20-29	406	65.7	212	34.3
	30-39	330	68.46	152	31.54
	40-49	161	68.51	74	31.49
Residence	Urban	397	66.96	216	33.05
	Rural	724	68.63	361	31.37
	Tigray	116	64.09	65	35.91
	Afar	55	57.14	48	46.6
Region	Amhara	186	79.83	47	20.17
	Oromiya	174	71.02	71	28.98
	Somali	58	56.86	44	43.14
	B/G	61	57.01	46	42.99
	SNNPR	151	77.44	44	22.56
	Gambella	81	69.23	36	29.41
	Harari	42	45.16	51	54.84
	Addis/A	131	74.86	44	25.14
	Dire/D	66	68.04	31	31.96

3.11 Prevalence of Serum folate in non-pregnant women of reproductive age

All the analysis presented below are adjusted for inflammation. Only women who have elevated acute phase protein markers (AGP≥ 1g/L and CRP≥ mg/L) were subjected for the correction. The median concentration of serum folate was 11.28 nmol/L (95% CI: 10.80, 11.76) with the 25th and 75th percentile serum folate concentration of 7.69 and 17.86 nmol/L respectively.

From 1,647 non-pregnant women whose serum folate concentrations were measured, 17.3 % of women exhibited folate deficiency as per the WHO classification(WHO, 2015). Among women serum folate deficiency was higher in Somali followed by Harari and Afar region compared with women in other regions (Table 23).

Table 23.Prevalence of Serum Folate deficiency among non-pregnant women of reproductive age

Variable		Normal (Serum folate ≥6.8 nmol/L)		Deficient (Serum folate <6.8nmol/L)	
		n	%	n	%
National		1,362	84.7	285	17.3
Age (years)	15-19	267	85.3	46	14.7
	20-29	493	79.9	124	20.1
	30-39	404	83.8	78	16.2
	40-49	198	84.3	37	15.7
Residence	Urban	502	84.8	90	15.2
	Rural	860	81.5	203	18.5
Region	Tigray	149	82.3	32	17.7
	Afar	76	74.5	26	25.5
	Amhara	200	85.8	33	14.2
	Oromiya	216	88.1	29	11.8
	Somali	57	55.9	45	44.1
	B/G	89	83.2	18	16.8
	SNNPR	169	86.7	26	13.3
	Gambella	96	82.1	21	17.9
	Harari	80	76.3	22	23.7
	Addis/A	159	90.9	16	9.1
	Dire/D	80	82.5	17	17.5

3.12 Summary of Folate deficiency among non-pregnant women of reproductive age

Based the Ethiopian National micronutrient survey finding, considerable number of women are at risk of folate deficiency as measured by Serum folate (17.3%) and RBC folate (32.0%). And highest prevalence of folate deficiency was observed among women living in Somali, BenishangulGumuzand Gambella regions compared with others. Therefore, according to the WHO and other studies suggests that an individual or population with RBC folate concentration below 340 ng/ml has insufficient folate in the body to protect risk of neural tube defect which may be causes of megaloblastic or macrocytic anemia and increases the likelihood for pregnancies associated with low birth weight, preterm delivery and fetal growth retardation. The deficiency is high in a people consuming low amounts of animal-source foods in low income countries (WHO 2012; Bailey et al. 2015)

3.13 Vitamin B_{12} Deficiency

Table 24below shows the prevalence of vitamin B_{12} deficiency among non-pregnant women aged 15 to 49 years stratified by age, place of residence and region. Among the 1619 non-pregnant women for whom serum vitamin B_{12} concentrations were measured, values ranged between 4.7 and 1337 pg/ml with a geometric mean of 335.4 pg/ml (95% CI: 323.6 , 342.2). Of all surveyed women, 15.1% were deficient (B12 <200 pg/ml) 84.9% were normal. Among the surveyed women in Ethiopia, deficiency was higher in Dire Dawa and Harari regions compared to women in all other regions.

Table 24.Prevalence of Vitamin B12 deficiency among non-pregnant women 15 to 49 years age

Variable		Normal (>300 pg/ml)	Deficient (<203 pg/ml)
National		1374(84.9)	245(15.1)
Age(year)	15-19	266(86.4)	42(13.6)
	20-29	515(85.1)	90(14.9)
	30-39	396(82.7)	83(17.3)
	40-49	197(86.8)	30(13.2)
Residence	Urban	405(82.4)	102(17.6)
	Rural	886(86.3)	141(13.7)
Region	Tigray	149(89.2)	18(10.8)
	Afar	88(87.1)	13(12.9)
	Amhara	208(91.6)	19(8.4)
	Oromia	203(83.2)	41(16.8)
	Somali	85(83.3)	17(16.7)
	B/Gumuz	90(84.9)	16(15.1)
	SNNPR	169(89.4)	20(10.6)
	Gambella	97(85.8)	16(14.2)
	Harari	61(66.3)	31(33.7)
	A/Ababa	154(56.2)	14(8.3)
	D/Dawa	59(24.7)	38(39.2)

3.14 Iodine status

3.14.1 Iodine status in school age children (5 to 14 years)

The median Urinary iodine levels in children aged 5 to 14 years was 104.0 ug/L with inter quartile range of 62.6 to 197.0 ug/l. Nationally 47.5% of school children had urinary iodine levels less than 100 µg/L. According to the WHO recommendation about half of the children's had insufficient intake of iodine. Table 25below shows the prevalence of iodine deficiency among all children aged 5 to 14 years stratified by age, sex, region and place of residence. As the present study shows children in rural area had insufficient intake of iodine than children from urban area. Among all children, deficiency was higher in BenishangulGumuz regions compared to children in all other regions. Excessive intake was in Afar and Somali regional states.

Table 25. Prevalence of iodine deficiency, children aged 5 to 14 years

		Severe Def. <20µg/L	Mild Def. 20-49.9 µg/L	Moderate Def. 50-99.9 µg/L	Adequate 100-299.9 µg/L	Excess >300 µg/L
Variable		n(%)	n(%)	n(%)	n(%)	n(%)
National		44(2.7)	341(20.5)	406(24.3)	620(37.3)	252(15.2)
	Boys	16(2.0)	149(19.3)	183(23.7)	305(39.5)	120(15.5)
Sex	Girls	28(3.2)	192(21.6)	223(25.1)	315(35.4)	132(14.8)
	5-8	21(2.7)	165(21.4)	172(22.3)	279(36.2)	133(17.3)
Age (Years)	9-11	15(3.2)	89(19.0)	127(27.1)	170(36.3)	67(14.3)
	12-14	8(1.88)	87(20.5)	107(25.2)	171(40.2)	52(12.2)
Residence	Urban	7(1.9)	51(14.0)	65(17.9)	184(50.5)	57(15.7)
	Rural	37(2.6)	290(22.3)	340(26.2)	436(33.6)	195(15.0)
	Tigray	4(1.9)	18(8.4)	44(20.5)	84(39.1)	65(30.2)
	Afar	2(1.4)	12(8.5)	9(6.3)	62(43.7)	57(40.1)
	Amhara	5(2.1)	76(32.3)	71(30.2)	56(23.8)	27(11.5)
	Oromiya	5(1.8)	75(26.9)	93(33.3)	95(34.1)	11(3.9)
	Somali	0(0.0)	12(9.6)	12(9.6)	43(34.4)	58(46.4)
Region	B/ Gumuz	6(6.2)	20(20.6)	43(44.3)	26(26.8)	2(2.1)
	SNNPR	18(8.3)	64(29.4)	61(27.9)	66(30.3)	9(4.1)
	Gambella	3(2.9)	23(22.1)	26(25.0)	45(43.3)	7(6.7)
	Harari	1(0.9)	22(19.8)	24(21.6)	59(53.2)	5(4.5)
	Addis Ababa	0(0.0)	6(26.1)	6(26.1)	7(30.4)	4(17.4)
	Dire Dawa	0(0.0)	13(11.5)	16(14.2)	77(68.1)	7(6.2)

3.14.2 Iodine status among women of reproductive age 15 to 49 years

The median Urinary iodine levels in non-pregnant women of reproductive age 15 to 49 years was 96.8 ug/L with the inter quartile range of 57.6 to 170.5.

More than one in two women (51.8 percent) had urinary iodine levels less than 100 µg/L. Table 26 shows the prevalence of iodine deficiency among women of reproductive age stratified by age, sex, region and place of residence. The current survey shows women leaving in rural setting had insufficient intake of iodine than women from urban settings. Among all women, deficiency was higher in Amhara regions compared to women from other regions. Excessive intake was high in Afar and Somali regional states, this two regions has also highest proportion of children age 5 to 14 years who had excess intake of iodine as indicated in Table 26. According to the WHO recommendation this low execration urinary iodine at a population level indicates insufficient intake iodine nutrient (WHO 2013b).

Table 26.Prevalence of iodine deficiency, women aged 15 to 49 years

		Severe Def. <20 µg/L	Mild Def. 20-49.9 µg/L	Moderate Def. 50-99.9 µg/L	Adequate 100-299.9 µg/L	Excess >300 µg/L
Variable		n(%)	n(%)	n(%)	n(%)	n(%)
National		58(3.4)	404(23.7)	422(24.7)	680(39.8)	143(8.4)
Age (years)	15-19	6(1.9	69(21.9)	90(28.6)	125(39.7)	25(7.9)
	20-29	18(2.8)	163(25.2)	149(22.9)	266(41.1)	52(8.0)
	30-39	26(5.0)	121(23.1)	129(24.7)	200(38.2)	47(9.0)
	40-49	8(3.6)	51(23.1)	54(24.4)	89(40.3)	19(8.6)
Residence	Urban	11(1.8)	117(18.9)	159(25.7)	274(44.3)	58(9.4)
	Rural	47(4.4)	283(26.4)	262(24.4)	398(37.1)	84(7.8)
Region	Tigray	17(9.9)	48(28.1)	36(21.1)	61(35.7)	9(5.3)
	Afar	1(1.2)	7(8.6)	3(3.7)	44(54.3)	26(32.1)
	Amhara	8(3.4)	89(37.4)	75(31.5)	50(21.0)	16(6.7)
	Oromiya	17(6.8)	56(22.5)	63(25.3)	105(42.2)	8(3.2)
	Somali	0(0.0)	7(6.6)	10(9.4)	53(50.0)	36(34.0)
	B /Gumuz	1(0.9)	37(31.4)	39(33.1)	36(30.5)	5(4.2)
	SNNPR	4(2.0)	46(22.7)	65(32.0)	80(39.4)	8(3.9)
	Gambella	3(2.7)	49(43.7)	24(21.4)	34(30.4)	2(1.8)
	Harari	1(0.9)	16(14.0)	25(21.9)	62(54.4)	10(8.8)
	A/Ababa	4(2.3)	35(19.8)	58(32.8)	70(39.6)	10(5.6)
	DireDawa	2(1.6)	10(8.1)	23(18.6)	77(62.1)	12(9.7)

3.14.3 Household Iodized salt coverage using rapid test kit

The iodine content in iodized salt has to be monitored from production to consumption level to ensure retention of adequate iodine. Salt measured by rapid test kit indicated iodine status of the salt qualitatively (Table 27). This study showed the national household iodized salt coverage was 89.2%. One out of ten household consumed non iodized salt. The highest non iodized salt consumption wasfound in SNNPR, Oromia, BenishangulGumuz and Afar regions. Nationally, only one in six household's had access for adequately iodized salt to meet their daily iodine requirement.

Table 27.Household iodized salt result by rapid test kit

Region	N	Non iodized (0 ppm)	Inadequate iodized (Iodine <15 ppm)	Adequately iodized (Iodine≥ 15 ppm)
Tigray	304	10.9	31.3	57.9
Afar	252	31.3	37.7	31.0
Amhara	415	12.8	47.5	39.8
Oromia	454	13.9	66.1	20.0
Somalia	205	15.1	48.3	36.6
B/Gumuz	230	19.6	51.7	28.7
SNNPR	391	28.9	55	16.1
Gambela	187	7.5	49.7	42.8
Harari	242	9.1	57.9	33.1
Aababa	317	6.3	52.7	41.0
Diredawa	235	10.6	50.2	39.1
National	3232	15.4	50.7	33.9

3.14.4 Coverage of iodized salt using titration method in Ethiopia

We analyzed salt samples from more than three thousand two hundred households and our finding indicated that only 26% of the total households were getting more than 15 ppm iodine in salt. Household Proportion of who had access for adequately iodized salt was low and relatively the highest was found in Tigray and Somali regions with 55.2% and 49.4% respectively. The lowest coverage of adequately iodized salt was observed in Gambela (9.5%), SNNPR (13.7%) and Amhara (15%) regions (Table 28).

Table 28.Household iodized salt coverage using titration method

Region	n	Inadequate iodized (Iodine <15 ppm)	Adequately iodized (Iodine≥ 15 ppm)
Tigray	344	44.8	55.2
Afar	193	83.4	16.6
Amhara	447	85	15.0
Oromia	382	76.7	23.3
Somali	257	50.6	49.4
BenshangulGumuz	240	79.6	20.4
SNNPR	300	86.3	13.7
Gambela	137	90.5	9.5
Harar	298	77.2	22.8
Dire Dawa	244	70.9	29.1
Addis Ababa	379	78.1	21.9
National	3221	74.2	25.8

3.14.5 Women's knowledge on goiter and its cause

In all regions more than half of the women had heard about goiter except Somali (45%) and Afar (46.7 %) regions respectively. Women in Amhara, Tigray, Oromia and Dire Dawa had heard about goiter 85.6%, 82.6%, 64.79% and 64.59% respectively. The knowledge about goiter causes varied across regions. More than 50% of women in Addis Ababa know that consuming non iodized salt was the cause of goiter and 11.5% of them reported that dirty drinking water is a cause of goiter. Women from Gambela, Amhara and Benshangulgumuz regions said goiter is caused by drinking dirty water 20.8%, 19.5% and 18.1% respectively. Addis Ababa, Dire Dawa and Tigray have better knowledge than other region about goiter cause. More than 65% of women from Afar, Somalia, Amhara, and SNNPR did not know cause of goiter and nationally 52.2 % of Ethiopian women didn't know causes of goiter (Table 29).

Table 29. Women knowledge about causes of goiter

Heard about Goiter					Maternal knowledge on causes of goiter							
Region	N	% heard	% not heard	% don't know	N	Evil Eye/Evil Spirit	Not Eating Enough Food	Drinking Dirty Water	Curse that come through family	Not eating iodized salt	Not eat iodine rich food	Other	Don't know
Tigray	228	81.6	4.8	13.6	168	1.2	0	17.3	2.4	25.6	14.9	1.8	36.9
Afar	167	46.7	20.4	32.9	75	0	0	17.3	0	5.3	4	2.7	70.7
Amhara	270	85.6	2.6	11.9	215	0.9	0	19.5	1.4	6.5	0.5	5.6	65.6
Oromia	300	64.7	4.7	30.7	187	3.2	3.7	17.1	0	15	2.7	1.1	57.2
Somalia	132	45.5	9.1	45.5	58	1.7	3.4	5.2	3.4	10.3	1.7	5.2	69
B/Gumuz	135	59.3	5.2	35.6	72	2.8	0	18.1	0	11.1	6.9	6.9	54.2
SNNPR	239	55.2	7.1	37.7	126	6.3	1.6	4.8	2.4	11.9	6.3	1.6	65.1
Gambela	151	51.7	11.3	37.1	77	0	1.3	20.8	0	6.5	5.2	5.2	61
Harari	138	62.3	13	24.6	80	1.3	1.3	6.3	1.3	36.3	10	7.5	36.3
Addis Ababa	221	78.3	3.6	18.1	165	0	0	11.5	0.6	51.5	5.5	4.2	26.7
Diredawa	152	65.8	8.6	25.7	97	0	0	6.2	0	36.1	6.2	5.2	46.4
National	2133	65.5	7.4	27.1	1320	1.7	1	13.9	1.1	20.6	5.7	3.9	52.2

3.14.6 Women's knowledge on prevention of iodine deficiency

This study showed progressive change on knowledge of mothers on how to prevent goiter in some regions. More than half of women in Tigray know that eating iodized salt can prevent goiter. Women of Addis Ababa, Dire Dawa Harari and SNNPR know that iodized salt prevent goiter 55.5%, 43.9%, 38.8% and 33.1% respectively. But still, most women from Amhara, Oromia, Afar, Somali and Gambela did not know how goiter can be prevented (Table 30).

Table 30.Women knowledge on Prevention of iodine deficiency

Women knowledge on Prevention of goiter							
Region	N	Eating sea foods like fish	Eating iodized salt	Drinking holy water/Tsebel	Tattooing/Niksa	Other	Don't Know
Tigray	178	0.6	53.4	0.6	5.1	6.2	34.3
Afar	78	0	11.5	0	0	6.4	82.1
Amhara	227	0	11.9	5.7	2.6	10.1	69.6
Oromia	189	0	19	1.1	0	6.9	73
Somalia	59	1.7	8.5	1.7	5.1	1.7	81.4
B/Gumuz	77	0	24.7	1.3	0	3.9	70.1
SNNPR	130	0.8	33.1	0	1.5	0	64.6
Gambela	76	0	17.1	0	0	10.5	72.4
Harari	80	2.5	38.8	0	1.3	3.8	53.8
Addis Ababa	170	0.6	55.3	1.8	0.6	5.3	36.5
Dire Dawa	98	0	43.9	1	0	6.1	49
National	1362	0.4	30.5	1.6	1.6	6	59.8

4 Conclusion and Recommendation

4.1 Conclusions

The finding of this study show that:

- The prevalence of anemia adjusted for altitude among preschool children was 34.4 %.
- In Ethiopia prevalence of anemia among women of reproductive age was nearly 18% and higher among rural women.
- The prevalence of deficiency of iron store (ferritin) and tissue iron (sTfR) adjusted for inflammation among preschool children was 17.8% and 29.6% respectively.
- Iron deficiency rate among school age children was estimated to be 9.1% and 19.5% as measured by serum ferritin and sTfR respectively.
- Similarly, iron deficiency adjusted for inflammation among women of reproductive age was reported to be 10.0% and 16.4% as measured by ferritin and sTfR respectively.
- The prevalence of subclinical vitamin A deficiency was 14% to 10.9% and 3.4% in the preschool age children school age children and women of reproductive age respectively.
- The national vitamin A supplementation coverage in the preschool age children was 63%.
- The national prevalence of zinc deficiency was 35% in the preschool age children and higher (40.3%) in children 12 to 23 month. In the school age the national prevalence was nearly 36%, while the prevalence in women of reproductive age was 34%.
- The prevalence of Vitamin B12, Serum and RBC folate deficiency in women or reproductive age was 15.1%, 17.3% and 32% respectively
- The prevalence of iodine deficiency among school age children whose mean urinary iodine concentration was below the cut-off (48%.)
- In the women of reproductive age, the prevalence of iodine deficiency was 52%.
- National salt coverage was 85%. About 26% of the total households were getting adequately iodized salt using titration method.
- Anemia is moderate public health problem in Ethiopia in preschool children and mild in women of reproductive age. In connection with this iron deficiency as measured by serum ferritin is mild public health problem in all target population in Ethiopia.
- Vitamin A is mild public health problem in women of reproductive age and moderate in all other group.
- Zinc deficiency in Ethiopia is moderate public health problem in all population.
- Iodine deficiency disorder is severe public health problem in Ethiopia.
- Inflammation among under five children (44 %), school children (31.6 %) and women (27.3%) were high

4.2 Recommendation

The following recommendations are made based on the key findings:

- Health promotion and disease prevention programs should be strengthens to overcome high prevalence of micronutrient and inflammation deficiency in Ethiopia.
- Consumption of vitamin A, zinc and iron rich food should be promoted by improving their availability through production, processing, preservation, pricing and marketing of such foods.
- Nationwide context specific nutrition education should be promoted and scaled out/up to reduce micronutrient deficiency.
- Nutrition intervention program should be directed to improving overall dietary diversity and bioavailability of micronutrient.
- As the survey indicated, iron deficiency reported by ferritin was mild public health problem in combination with national food consumption finding in Ethiopia; Food fortification with iron require further expert discussion.
- Food fortification and supplementation of micronutrient should be considered as mechanism of intervention to reduce deficiency of Vitamin A, zinc and Iodine.
- Industrialized scale salt processing and iodization should be aggressively promoted along with strong enforcement, monitoring and evaluation to improve universal slat iodization program (USI).

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6 Annex. 1

HOUSEHOLD
ETHIOPIAN NATIONAL MICRONUTRIENT SURVEY 2014
Ethiopian Federal Ministry of Health, Ethiopian Public Health Institute

Household Bar CodeLabel

QUESTIONNAI

Household ID | | | | | |

EA (3 digit) HH(2digit)

Enrolment Informed Consent for HOUSEHOLD

Hello. My name is _____ and I am working with the Ethiopian Public Health Institute (EPHI). We are conducting a national micronutrient survey. We would very much appreciate your participation in this survey. This information will help the government to plan health and nutrition services.

First, I would like to sit down and ask you some questions about your household. We would like to ask your household a few questions about what people eat. This part of the survey usually takes about 30minutes to complete. We will interview other members of the household who are selected for the survey. Some members of your family may also be asked questions about their health and nutrition. We would like to take a small salt sample available in your home. We would also like to examine some of your HH members neck for goiter and eyes of for spots and we will also be asking to collect a sample of urine, stool, or blood.

The benefit to you for taking part in this survey is that some members of your family will get results for weight, height, malaria, anemia and urine testing, and be referred to the nearby health facility if needed. The other information you give us will not benefit you in a direct way. However, we will add the information you give us to that of other houses in Ethiopia, and will create a report. The report will contribute to the good of your community. What you say is important and valuable, and will help the Ministry of Health to improve their health and nutrition programs.

If you are not interested, you do not have to take part in this survey. If I ask you any question you don't want to answer, just let me know and I will go on to the next question. You may choose to stop the interview at any time. Refusing to answer will not affect your family's access to health services.

All of the answers you give will be confidential and will not be shared with others. This form with your answers will be kept under lock and key. We hope you will agree to answer the questions since your views are important.

If you have any question about this survey please call for survey coordinator (Dilnesaw Zerfu) at the mobile (0911421720). Do you have any questions for me?

May I begin the interview now?

…….

RESPONDENT AGREES TO BE INTERVIEWED……1

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED……..2 END

Participant's name (print)

……. …….

Survey staff conducting……Survey staff signature and date_____

HOUSEHOLD QUESTIONNAIRE

IDENTIFICATION
HH01. REGION NUMBER ☐☐
HH02. ZONE NUMBER ☐☐
HH03. WOREDA NUMBER ☐☐
HH04. KEBELE NUMBER ☐☐☐
HH05. CLUSTER ID NUMBER (EA NUMBER): ☐☐☐
HH06. HOUSEHOLD NUMBER: ☐☐
HH07 HH Head NAME _____
HH08 Total number of Persons in the House Hold ☐☐

SOCIO.DEMOGRAPHIC CHARACTERISTICS

Now we would like some information about the people who usually live in your household and guests of the household who stayed here last night

LINE NO	USUAL RESIDENT	RELATIONSHIP TO HH HEAD	SEX	How old is _____? (Answer in years or months): Note to interviewer: if person is >=22 years skip to residence and if unknown 888)	Dose (name) date of Birth is Known?	Date of Birth (If month cannot be determined within 3 months record 00, for months)	Where did you obtain the Date of Birth (DOB) information (age <5)	Residence	Occupation
	Please give me the names of all persons who usually live in your household and guests of the household who stayed here last night. Start listing with the head of the household. (After listing the names and recording the relationship and sex for each person, ask questions HL1A.C to be sure that the listing is complete)	What is the Relationship of (NAME) to the Head of the household? See codes below.	Is (NAME) Male or Female? M=1 F=2		0= No 1= Yes	What (name) is the date of birth? (write birth date Write Day / Month / Year.	1= Birth certificate 2= Child health card 3= Holy card 4= Local enent calendar 5= Recall 6= Index method (compare with other other child who have similar age with a known date of birth)	Does (Name) live here? 1= Usually 2= Stayed last night	
	HL1	HL2	HL3	*HL4*	HL5	HL6	HL7	HL8	HL9
01				*4*		4y and 1day to 4 y and 364 days			
02									
03									
04									
05									
06									
07									
08									

Code for question HL1

HL1A) Just to make sure that I have a complete listing, are there any other persons such as small children or infants that we have not listed? If yes, add name to table.

HL1B) Are there any other people who may not be members of your family, such as domestic servants, lodgers, or friends who usually live here and share the same cooking pot? If yes, add name to table.

HL1C) Are there any guest or temporary visitors staying here, or anyone else who stayed here last night, who have not been listed? If yes, add name to table.

***Add a new page if more people in the household**

Code question HL2

01 = HEAD, 02 = WIFE OR HUSBAND, 03 = SON OR DAUGHTER, 04 = SON OR DAUGHTER.IN.LAW, 05 = GRANDCHILD, 06 = PARENT, 07 = PARENT.IN.LAW, 08 = BROTHER OR SISTER, 09 = NIECE /NEPHEW BY BLOOD, 10 = OTHER RELATIVE , 11 = ADOPTED /FOSTER/STEPCHILD, 12 = NOT RELATED 88= DON'T KNOW

Information for HL4

Day: Enter 00 if day is unknown Month: , if month is known within 3 months enter the middle month; if month cannot be determined within a 3 month period, enter 00; If year is unknown enter 0000.

Information for question HL7

Ask; if the DOB of the child is recorded somewhere (birth certificate, child health card, holy book). Get confirmation from the parent as to whether this record is correct before recording it.

If the answer to one and two are no, then you will need to estimate the month and year of birth of the child using a local calendar of events following step by step guidelines..If an event calendar is unsuccessful, Use the index method (if there is any child in the household or compound of similar age with a known date of birth)

SOCIO.ECONOMIC CHARACTERISTICS

Any adult member of the household who is capable of providing information needed to fill in the Household Questionnaire can serve as the respondent. However, a female head of the household is most appropriate. If an adult is not available, do **not** interview a young child; instead, go on to the next household, and call back at the first household later.

NO	QUESTION	CODING CATEGORIES		Skip
H1	Who is being interviewed? (DON'T ASK)	LINE NUMBER ☐☐		
H2	What is the highest level of school the head of household completed?	None…… Primary …… Secondary …… Technical / vocational certificate …… Higher / university/ college …… Others (Spacify) _____ Don't know ……....	00 01 02 03 04 77 88	
H3	What is the religion of the head of the HH?	Orthodox……..... Roman catholic ……..... Protestant/other Christian…..……..... Muslim...…… No religion…….… Other (specify) _____ Don't know……..	01 02 03 04 05 77 88	
H4	What is the main source of drinking water for members of your household? (CIRCLE ONE ONLY)	<u>PIPED WATER</u> PIPED INTO DWELLING…… PIPED TO COMPOUND/PLOT……..... PUBLIC TAP/STANDPIPE…….. TUBE WELL OR BOREHOLE……. <u>DUG WELL</u> PROTECTED WELL……..... UNPROTECTED WELL……. <u>WATER FROM SPRING</u> PROTECTED SPRING…… UNPROTECTED SPRING…… RAINWATER…….. TANKER TRUCK…….. CART WITH SMALL TANK…… <u>SURFACE WATER</u> RIVER/DAM/LAKE/POND/STREAM/CANAL/IRRIGATION CHANNEL…… BOTTLED WATER……... OTHER *(SPECIFY)*_____ Don't know……..	 01 02 03 04 05 06 07 08 09 10 11 12 13 77 88	**01➡ H7** **02➡ H7**
H5	Where is that water source located?	In own Dwelling…….. In own Yard/Plot……. Elsewhere……..	01 02 03	**01➡ H7** **02➡ H7**
H6	How long does it take to go there, get drinking water, and come back? (Not include waiting time)	Minutes……. ☐☐☐		
H7	Do you do anything to	No ……..	00	**00➡ H9**

	the water to make it safer to drink?	Yes ……. 01 Don't know…… 88	**88➡ H9**
H8	What do you do to make the water safer to drink? Anything else? (RECORD ALL MENTIONED)	Boil…….. 01 Water purifying product/ water guard/ bishan gari / aquatabs/ Other bleach /chlorine/waha agar …… 02 Strain through a cloth……. 03 Ceramic filter…… 04 Let it stand and settle ……... 05 Other *(specify)*_____ don't 06 know …… 77 88	
H9	What is the main source of water used by your household for other purposes such as cooking and hand washing? (CIRCLE ONE ONLY)	Piped water piped into dwelling…… Piped to compound/plot……..... 01 Public tap/standpipe…….. 02 Tube well or borehole…… 03 Dug well 04 protected well…….. Unprotected well…… . 05 Water from spring 06 protected spring…… unprotected spring……. 07 Rainwater…….. 08 Tanker truck…….. 09 Cart with small tank…… 10 surface water (river/dam/lake/pond/stream/canal/irrigation 11 channel)…… Bottled water……... 12 Other *(specify)* _____don't 13 know…….. 77 88	
H10	What kind of latrine/toilet facility do members of your household usually use? (Observation)	Flush to piped sewer system……..... 01 Flush to septic tank……..... 02 Flush to pit latrine ……..... 03 Flush to somewhere else …… 04 Flush, don't know where…… 05 Ventilated improved pit latrine (vip)…..... 06 Pit latrine with slab…… 07 Pit latrine without slab/open pit ……... 08 Bucket toilet ……..... 09 No facility/bush/field …….. 10 Other *(specify)*_____ 77	
H11	Do you share this toilet facility with other households?	No ……... 00 Yes …… 01	**00➡H13**
H12	How many households use this toilet facility?	Number of households share the toilet ☐ Don't know…… 88	
H13	Check presence of hand wash facility in the household (OBSERVATION ONLY)	No ……... 00 Yes …… 01	
H14	Check presence of water at the specific place for hand washing. (OBSERVATION ONLY)	No ……... 00 Yes …… 01	

H15	Observe presence of soap or ASH (MULTIPLE RESPONSE ALLOWED) (OBSERVATION ONLY)	Soap/ Detergent (Bar, Liquid, Powder, Paste)……	01	
		Ash, Mud, Sand……	02	
		None …….....	03	
H16	Do you wash your hands after toilet?	No ……..	00	
		Yes usually ……	01	
		Yes some times …….	02	
H17	How dose your HH primarily dispose HH waste? (Multiple answer is possible)	Collectedbymunicipality…….……..	01	
		Buried…….…….....	02	
		Collectedbyprivateestablishment..…….....	03	
		Dumpedinstreet/openspace……..…….....	04	
		Disposedin thecompound……..……..….	05	
		Dumpedinriver……..….....	06	
		Burned…….....	07	
		Other(specify)…….……	08	
			77	
H18	What is the main material of the house floor? (OBSERVATION ONLY)	Natural floor		
		Earth/sand…….	01	
		Dung……...	02	
		Rudimentary floor		
		wood planks…….	03	
		Palm/bamboo ……	04	
		Finished floor		
		parquet or polished wood…….....	05	
		Vinyl or asphalt strips ……	06	
		ceramic tiles……	07	
		cement…….	08	
		Carpet…..…….	09	
		Other *(specify)*_____	77	
H19	What is the main material of the roof of the house: (OBSERVATION ONLY)	Natural roofing		
		No roof……	00	
		Grass / thatch …….	01	
		Dung / mud ……	02	
		Rudimentary roofing		
		Rustic mat/plastic sheets…….....	03	
		Reed/bamboo ……..	04	
		Wood ……..	05	
		Cardboard ……..……	06	
		Finished roofing		
		Corrugated iron…….. …….....	07	
		Wood planks …….....	08	
		Asbestos sheet ……	09	
		Cement concrete…….....	10	
		Tiles……	12	
		other *(specify)*_____	77	
H20	Main material of the (inside) walls of the house: (OBSERVATION ONLY)	Natural walls		
		No walls…….	00	
		Cane/palm/trunks/ bamboo……..……..	01	
		Dirt/mud/dung…….……	02	
		rudimentary walls		
		Stone with mud……..……	03	
		Wood/ bamboo with mud …….	04	
		Uncovered adobe…..…….	05	
		Plywood…….....	06	
		Cardboard…….……	07	
		Reused wood…….……	08	
		finished walls		
		cement…….	09	
		Stone with lime/cement…….……	10	

		Bricks……..	11	
		Cement blocks……..	12	
		Covered adobe……..	13	
		Wood planks/shingles…….	14	
		Other_____ *(specify)*	77	
H21	Does your household have: (ASK FOR EACH ITEM)		No Yes	
		Clock/watch …….	00 01	
		Electricity ……	00 01	
		Radio ……..	00 01	
		Television ……	00 01	
		Mobile telephone ……..	00 01	
		Fixed telephone ……. ……	00 01	
		Refrigerator ……..	00 01	
		Solar panel……	00 01	
H22	Does any member of this household own: (ASK FOR EACH ITEM)		No Yes	
		BICYCLE……	00 01	
		MOTORCYCLE/SCOOTER……	00 01	
		ANIMAL.DRAWN CART……	00 01	
		CAR/TRUCK……	00 01	
		BOAT WITH MOTOR……..	00 01	
H23	Where is the cooking usually done for this Household?	In the house ……..	01	**02 ➡H25**
		In a separate building……	02	**03➡H25**
		Outdoors… ……..	03	
H24	Do you have a separate room which is used as a kitchen?	No …….	00	
		Yes ……	01	
H25	What type of fuel does your household mainly use for cooking? (CHECK ONE ONLY)	Electricity. ……..	01	
		LPG/natural gas……..	02	
		Biogas……..	03	
		Kerosene……..	04	
		Charcoal……..	05	
		Wood……	06	
		Straw/shrubs/grass. ……..…….	07	
		Animal dung……..	08	
		No food cooked in household……..	09	
		Other, *(SPECIFY)* _____	77	
H26	How many rooms in this household are used for sleeping?	Rooms	☐☐	
H27	Does your household own this structure (house, flat, shack), do you rent it, or do you live here without pay?	Owns……	01	
		pays rent/lease……	02	
		no rent, with consent of owner……	03	
		no rent, squatting……	04	
		Don't know……..	88	
H28	Does any member of this household own any agricultural land?	No ……	00	**0➡ H30**
		Yes ……	01	
H29	How many Hectares of land (altogether) are owned by the members of this family?	Number (in local Unit of Measurement) ☐☐☐.☐ Specify the name of measurement _____ Number of Hectares ……. (Calculate Hectares if answer given is in local unit of measurement) ☐☐☐☐ If ≥1000 record 999.9 Unknown …… 888.8		
H30	Does this household own any livestock herds?	No ……	00	**0➡ H33**
		Yes ……	01	

H31	If yes, how many animals? (IF NONE, WRITE 000, IF MORE THAN 1,OOO, WRITE 999)	Number of animals 1 Local cattle (Indigenous) ☐☐☐ 2 Milk cows or ox ☐☐☐ 3 Horse/donkey/mule ☐☐☐ 4 Goats ☐☐☐ 5 Sheep ☐☐☐ 6 Poultry ☐☐☐ 7 Camels ☐☐☐ 8 Pigs ☐☐☐ 77 Other_____	
H32	Does your household have a separate room outside the house for the livestock (any of the animals listed above)? (observation)	No …… 00 Yes…… 01	
THANK YOU FOR YOUR RESPONSES, we are almost finished with this questionnaire. Now I would like to ask you some questions about the food that your family purchases. We are interested in learning if your family purchases food in your house. (If the respondent is the person who purchases food most often, continue the interview with the original respondent. If another person in the household purchases food most often other than the respondent, ask to speak to that person and thank the respondent)			
H33	Who is the person in your household who purchases food for your family?	Write name of the respondent _____	
H34	Is this the same respondent?	No …… 00 Yes …… 01	**01➡ H36**
H35	Line number of the respondent for food section?	☐☐	

FOOD FORTIFICATION

WHEAT FLOUR FORTIFICATION			**SKIP**
We are going to start by asking a few questions about flour and products made from flour. First we are going to talk about flour.			
H36	**What types of flour do you usually purchase?** (ALLOW MULTIPLE RESPONSES)	None …… 00 Wheat flour …… 01 Maize flour …… 02 Sorghum flour …… 03 Teff flour …… 04 Other (specify) _____ 77	
H37	**Does your family normally bake your own bread at home using wheat flour?** (This could be a mixture of other grains with wheat)	No…… 00 Yes…… 01	
H38	**How often does your household get wheat flour that is ground at home or**	Never…… 00 More than once a week…… 01	

	at a mill house (local mill)?	Once a week …… Once every 2 weeks…… Once a month…… Don't know……	02 03 04 05 88	
H39	**How often does your household purchase wheat flour that was processed at a factory?**	Never…… More than once a week…… Once a week …… Once every 2 weeks…… Once a month…… Don't know……	00 01 02 03 04 05 88	
H40	**On average how many Kg of wheat flour does your household use weekly?** (PROBE. IF RESPONDENT CANNOT ESTIMATE HOW MUCH THEY CONSUME, READ ALL RESPONSE OPTIONS)	Don't eat wheat flour…… Less than 1/2 KG…… 1/2 to less than 1 KG…… 1 to less than 2 KG…… 2 to less than 3 KG…… More than 3 KG…… Don't know……	00 01 02 03 04 05 88	
H41	**Is there any wheat flour in your household today?**	No…… Yes…… Don't know……	00 01 88	**00 ➡H45**
H42	**What is the brand of wheat flour in the house?** (ASK to see the container of wheat flour. READ LABEL ON PACKAGE OR IF NO LABEL, ASK RESPONDENT IF S/HE KNOWS THE BRAND NAME.)	Brand name with label: _____ No label, but Brand name is known: (specify)_____ Don't know brand.....	01 02 88	
H43	**Where does the flour come from?** (COUNTRY OF ORIGIN) (READ ON PACKAGE LABEL)	Ethiopia …… Other: (specify) _____ Don't know ……	01 77 88	
H44	**Does the package of wheat flour state that the wheat flour is fortified?** (READ ON PACKAGE LABEL)	There is no package…… There is no label present on the packa Label present, says fortified …… Label present, does not say fortified ……	00 01 02 03	
Now we are going to just ask a couple of questions about products that are made with wheat flour.				
H45	**What type of products do you usually purchase that contain wheat flour? Examples would include:** (READ AND ALLOW MULTIPLE RESPONSES)	None …… Pasta/ Macaroni …… White bread …… Brown bread …… Endomi…… Enjira..... Other (specify) _____	00 01 02 03 04 05 06 77	**00 ➡H48**
H46	**How often does your household purchase wheat flour products such as bread or other food made from wheat flour?**	Never…… More than once a week…… Once a week …… Once every 2 weeks…… Once a month…… Less than once a month…… Don't know……	00 01 02 03 04 05 88	
H47	**How many days per week does your household consume food made from wheat flour?**	Days…… DON'T KNOW ……	☐☐ 88	

SALT FORTIFICATION

Now I would like to ask you some questions about salt that you eat with your food			
H48	**Where do you usually purchase your household salt?** (HOUSEHOLD SALT IS SALT THAT IS CURRENTLY USED FOR COOKING OR ADDED TO FOOD)	Do not use salt……. 00 Do not purchase salt …… 01 From a supermarket/ kiosk/ market…… 02 Other *(specify)*_____ 03 Don't know…….…….. 77 88	**00➡H61** **01➡H51**
H49	**In what form do you buy salt?** (MULTIPLE RESPONSES ALLOWED)	Loose (coars) ……..…….... 01 Packaged (fine)……....……..…… 02 Other *(specify)* …….. 77 Don't know……..... 88	
H50	**What brand of household salt do you purchase most often?**	Brand *(specify)* _____ 01 Brand of salt not known…….…….. 02	
H51	**How often do you obtain salt (from any source)?** (READ ALL RESPONSES)	Once a week……..…….. 01 Once every 2 weeks…… 02 Once a month……..…….. 03 Less than once per month…….. 04 Other *(specify)*_____ 77	
H52	**On average, how many grams of salt do you obtain?**	Grams ☐☐☐ Don't know = 888	
H53	**Do you know if the household salt that you currently use in your house has added iodine?**	No ……..…… 00 Yes …… 01 Don't know……... 88	
H54	**Do you look/ask for iodized salt when you purchase salt for your home?**	No ……..…… 00 Yes …… 01	
H55	**How do you usually store household salt?** (MULTIPLE CHOICES ALLOWED)	Container with lid……. 01 Container without lid…… 02 The same bag/packet in which salt is bought…. 03 Lying on the table/floor (uncovered)…… 04 Lying on the table/floor (covered)……. 05 Other (Specify)_____ 77	
H56	**At what time do you add salt to food when cooking?**	No salt added to food when cooking…… 00 When food is raw, before cooking…… 01 During cooking half way…… 02 After cooking, but before serving …… 03	
INTERVIEWER: Ask to see the package of salt			
H57	**What is the brand of salt in the house?** (Read label on package or if no label, ask respondent if s/he knows the brand name)	Brand name with label: _____ 01 No label, but Brand name is known: (specify)_____ 02 Don't know brand..... 88	
H58	**Does the package of salt say "iodized" or "fortified with iodine"?**	There is no package……..…… 00 Yes, label says fortified, or iodized…… 01 Lable present, but does not say fortified …….... 02	
INTERVIEWER: "We would like to take a sample of your salt for testing for added iodine in our laboratory". Collect a 20g sample (one coffee cup)			
H59	**Was a sample collected?**	No, no salt in household…… 00 Yes, 20 g collected……..…. 01 Yes, less than 20 g collected……..…… 02 No, refused to give sample……..... 99	
H60	**Sample lable/ID (Bar code)** [Affix label on sample collected]	_____	

H61	**Are you aware of any regulations regarding salt for human consumption?**	No …… 00 Yes …… 01	

OIL FORTIFICATION

Now I would like to ask you some questions about the oil/fat that you use			
H62	**What type of oil/ fats do you usually use when cooking?**	Do not use oil/fat…… 00 Animal fat/butter…… 01 Plant oil…….…… 02 Both (animal and plant)…….. 03 Other *(specify)*_____ 77	**0➡H69**
H63	**Does your family produce oil for your own consumption?**	No …… 00 Yes…… 01 Don't know…….. 88	1
H64	**How many milliliter of oil/fat does your household use daily? (on average)** (SHOW SPOONS/CUPS FOR DEMONSTRATING THE SIZES)	Milliliters ☐☐☐ Do not know ……888	
H65	**Where do you obtain your oil/fat?**	From Market/ supermarket/Kiosk/retailseller…… 01 Other *(specify)*_____ 77 Don't know…… 88	
INTERVIEWER: Ask to see the container of oil/fat.			
H66	**What is the brand of oil/fat in the house?** (If oil is available ask to see the oil/fat)	Brand name with label: _____ 01 No label, but Brand name is known:(specify)_____ 02 Don't know brand..... 88	
H67	**Does the package of oil/fat state that the oil/fat is fortified with vitamin A?** (If oil is available ask to see the oil/fat)	There is no package…… 00 Yes, label says fortified…… 01 No, label does not say fortified ……..... 02	
H68	**Does the package of oil/fat state that the oil/fat is fortified with vitamin D?**	There is no package…….. 00 Yes, label says fortified…….. 01 No, label does not say fortified ……..... 02	

The next questions are about whether you or others in your household were able to get enough food in the last 3 months.

H69	Were you worried that you or others in your household would not have enough food to eat because of a lack of money or other resources?	No ..... 00 Yes ..... 01 DK 88	**0➡H70**
H70	You or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	No ..... 00 Yes ..... 01 DK 88	
H71	You or others in your household ate only a few kinds of foods because of a lack of money or other resources?	No ..... 00 Yes ..... 01 DK 88	**0➡H71**
H72	You or others in your household had to skip a meal because there was not enough money or other resources to get food?	No ..... 00 Yes ..... 01 DK 88	
H73	You or others in your household ate less than you thought you should because of a lack of money or other resources	No ..... 00 Yes ..... 01 DK 88	**0➡H72**

H74	Your household ran out of food because of a lack of money or other resources?	No ..... 00 Yes ..... 01 DK 88	
H75	You or others in your household were hungry but did not eat because there was not enough money or other resources for food?	No ..... 00 Yes ..... 01 DK 88	**0➡H73**
H75 a	***For each <u>Yes</u> reply to FS7a, ask the following:*** Approximately how often did this happen?	Only once or twice …… ……01 In some months but not every month……02 Almost every month……03	**0➡H74**
H76	You or others in your household went without eating for a whole day because of a lack of money or other resources?	No ..... 00 01 Yes ..... 01 02 DK 88 03	
H76 a	***For each <u>Yes</u> reply to FS8a, ask the following:*** Approximately how often did this happen?	Only once or twice …… …..……01 In some months but not every month..02 Almost every month……03	
H77	**Have you or your household been involved in any food security program in the woreda? Such as;** • Productive saftynet package programe • Enhanced outreach strategy for under 5 • Relief • Income generation activities	No …….. 00 Yes ……...01 01	**0➡ 79**
H77a	**In which of the following food security programe has your HH been involoved?** **(CIRCLE ALL THAT APPLY)**	Productive saftynet package programe 01 Enhanced outreach strategy for under 5 02 Relief 03 Income generation activities 04 Other (specify) _____ 77	
H78	**Where has this week's food come from?** **(CIRCLE ALL THAT APPLY)**	Garden 01 Purchased 02 Wages in kind after working 03 Other (specify) _____ 77	
H79	**How long does your food store usually last after harvest?**	Do not harvest …… 00 Less than two months…… 01 Two to four months …… 02 Five to eight months…… 03 Nine to twelve months …… 04 Don't know …….. 88	
H80	Do you have access for irrigation facilities?	No 00 Yes 01	
H81	Do you have home garden?	No 00 Yes 01	
H82	Do you grow fruits?	No 00	**0➡ 84**

		Yes 01	
H82a	If yes, do you sell or consume mostly?	Yes, consumed…… 01 Yes, sell …… 02 Yes, consumed and sell…… 03 04	
H83	Do you grow vegetables?	No 00 Yes 01	**0➡ 85**
H83a	If yes, do you sell or consume mostly?	Yes, consumed…… 01 Yes, sell …… 02 Yes, consumed and sell…… 03 Don't Know …… 04 77	
H84	Which of the following bio fortified crops does your HH grow? **(CIRCLE ALL THAT APPLY)**	Quality protein maize …… 01 Orange flesh sweet potato …… 02 Biofortified Yellow/orange maize …… 03 Zinc and/or iron fortified legume and pulses 04 …… 77 Others (Specify) 88 …… DK ……	
H85	Which of the following bio fortified crops does your HH consumed? **(CIRCLE ALL THAT APPLY)**	Quality protein maize 01 Orange flesh sweet potato 02 Biofortified Yellow/orange maize 03 Zinc and/or iron fortified legume and pulses 04 77 Others (Specify) 88 DK	
H86	**Outcome of HH questionnaire**	Completed, 01 No HH member at home or no competent respondent at home at time of visit, 02 Entire household absent for extended period of time, 03 Dwelling vacant or address not a dwelling, Dwelling destroyed, Dwelling not found and 04 Other 05 _____ 06 _(please specify "other" in the interviewers' comment section at the end of this form. 77	

Thank you very much for spending time on this household interview. We would like to interview the caretaker of the youngest child next please.

INTERVIEWER'S OBSERVATIONS

TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS:_____

_____

_____

Household ID | | | | | |

EA (3 digit) HH(2digit)

Woman Bar CodeLabel

QUESTIONNAI

WOMEN OF REPRODUCTIVE AGE 15 to 49 YEAR OLDS
ETHIOPIAN NATIONAL MICRONUTRIENT SURVEY 2015

Ethiopian Federal Ministry of Health, Ethiopian Public Health Institute
Enrolment Informed Consent for Females 15 to 49 years old

Hello. My name is _____ and I am working with the Ethiopian Public Health Institute (EPHI). We are conducting a national Micronutrient survey. We would very much appreciate your participation in this survey. This information will help the government to plan health and nutrition services. The survey usually takes about 30 minutes to complete.

First, I would like to sit down and ask you some questions about what you eat, and we would also like to collect a small sample of your blood, stool and urine. We will also examine your neck for goiter and your eye for spots. We will also measure your mid upper arm circumference, height, and weight and ask questions related to what you are eating and your health habits.

The benefit to you for taking part in this survey is that you will get your results for height, weight, mid upper arm circumference, malaria, blood in urine and anemia. The other information you give us will not benefit you in a direct way. However, we will add the information you give us to that of other houses in Ethiopia, and will create a report. The report will contribute to the good of your community. What you say is important and valuable, and will help the Ministry of Health to improve their health and nutrition programs.

If you are not interested, you do not have to take part in this survey. If I ask you any question you don't want to answer, just let me know and I will go on to the next question. You may choose to stop the interview at any time. Refusing to answer will not affect your family's access to health services.

All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. This form with your answers will be stored under lock and key. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important.

If you have any question about this survey please call our manager (Dilnesaw Zerfu) at the mobile (0911421720).
Do you have any questions for me?
May I begin the interview now?

…….
Participant's name (print)

……. …….
Survey staff conducting Survey staff signature and date

RESPONDENT AGREES TO BE INTERVIEWED……1
RESPONDENT DOES NOT AGREE TO BE INTERVIEWED……..2 END

IDENTIFICATION	
PG01. CLUSTER NUMBER: ☐☐☐	
PG02. HH NUMBER: ☐☐	
PG03. WOMEN LINE NUMBER: ☐☐	

Now I would like to ask you some health and food questions about yourself. Circle the correct answer

No.	QUESTION	CODING CATEGORIES	SKIP
W01	**HOW OLD ARE YOU?** (VERIFY THAT THE AGE IS THE SAME AGE AS WRITTEN ON THE HOUSEHOLD LISTING)	☐☐ Years	
W02	**Have you ever attended school?**	No…….. 00 Yes ……..…… 01	00➡W 04
W03	**What is the highest level of school you completed?**	Primary ……..…… 01 Secondary …….. 02 Technical / vocational certificate …... 03 Higher / university/ college ……. 04 Don't know ……..... . 88	
W04	**Now I would like you to read this sentence to me.** *SHOW CARD TO RESPONDENT.* *IF RESPONDENT CANNOT READ WHOLE SENTENCE, PROBE:* ***Can you read any part of this sentence to me?***	01 Cannot read at all …….. 02 Able to read only parts of sentence ... Able to read whole sentence……. 03 Blind/visually impaired……..… 04	
Now I would like to ask you some questions about your health. We will first ask about the last 6 months.			
W05	**Have you been diagnosed with anemia in the past six months?**	No…….. 00 Yes ……..…… 01 Don't know…… 88	
W06	**Did you take any drugs for intenstinal worms in the past six months?**	No…….. 00 Yes ……..…… 01 Don't know…… 88	
Now I would like to ask you about your health in the last 2 weeks.			

W07	**Have you been ill with diarrhoea in the past2 weeks**? *DEFINED AS 3 OR MORE LOOSE OR WATERY STOOLS IN A 24.HOUR PERIOD*	No……..... Yes ……..…… Don't know……	00 01 88	
W08	**Have you been ill with a cough or breathing problems in the past 2 weeks?**	No……..... Yes ……..…… Don't know……	00 01 88	00➡W 11 88➡W 11
W09	**When you had an illness with a cough, did you breathe faster than usual with short, rapid breaths or have difficulty breathing?**	No……..... Yes ……..…… Don't know……	00 01 88	00➡W 11 88➡W 11
W10	**Was the fast or difficult breathing due to a problem in the chest or to a blocked or runny nose?**	Chest only …..... Blocked or runny nose only . …….... Both ……..…….. Other (specify)_____ Don't know ……..……	01 02 03 77 88	
W11	**Have you been ill with a fever in the past 2 weeks?**	No……..... Yes ……..…… Don't know……	00 01 88	
W12	**Have you beenill with malaria in the past 2 weeks?**	No……..... Yes ……..…… Don't know……	00 01 88	
W13	**Have you had any hospitalization and /or clinic visits due to illness in the last 2 weeks?**	No……..... Yes ……..…… Don't know……	00 01 88	
Now we would like to ask you some questions about other topics				
W14	**Do you smoke? (do not include the powder and chew type)**	No……... Yes ……..……..	00 01	
W15	**During the last six months, did you take any multivitamin tablets for yourself?** *(SHOW TABLETS)* *ASK TO SEE THE TABLETS*	No……..... Yes …… Don't know……	00 01 88	**00➡W 16** **88➡W 16**
W15a	**How many days didyou take any of these products in the last week (7 days)**	Number of days…… ☐☐ (IF NONE, ENTER 00) (IF DON'T KNOW, ENTER 88)		
W16	**During the last six months, did you take any iron tablets, iron folic acid tablets for yourself?** *(SHOW TABLETS)* *ASK TO SEE THE TABLETS*	No……..... Yes …… Don't know……	00 01 88	**00➡W 17**

			88➡W 17
W16a	**How many days didyou take any of these products in the last week (7 days)**	Number of days…… ☐☐ (IF NONE, ENTER 00) (IF DON'T KNOW, ENTER 88)	
W17	**Are you currently lactating?**	No……..... 00 Yes …… 01	
W18	**Are you currently breastfeeding?**	No……..... 00 Yes …… 01	
W19	**Are you currently pregnant?**	No……..... 00 Yes …… 01 Don't know…… 88	00➡W 28 88➡W 28
Now we would like to ask you some questions about your current pregnancy			
W20	**How many months pregnant are you?** *PROBE: IF RESPONDENT REALLY DOESN'T KNOW, THEN ASK, "**What is the best estimate of the month you became pregnant"***	NUMBER OF MONTHS ☐☐ DON'T KNOW 88	
W21	**How many times have you attended antenatal care (ANC) during this current pregnancy? (RECORD NUMBER OF TIMES)**	NUMBER OF TIMES ☐☐ DON'T KNOW……..88	
W22	**During this pregnancy, were you given or did you buy any multivitamin tablet for yourself?** (SHOW TABLETS) ASK *TO SEE THE TABLETS*	No……... 00 Yes ……..…… 01 Don't know …….. 88	0➡W 24 88➡ W24
W23	**During this pregnancy, how often did you usually take these tablets?** *PROBE FOR BEST ESTIMATE; ONE RESPONSE ONLY*	None…… 00 Everyday……..…… 01 Every other day……. 02 Twice a week…….. 03 Once a week …… 04 Once every 2 weeks… 05 Once a month…….. 06 Other _____ 77 Don't know…….. 88	

W24	**During this pregnancy, were you given or did you buy any iron tablets, iron folic acid tablets for yourself?** (SHOW TABLETS) ASK *TO SEE THE TABLETS*	No…….. 00 Yes ……..……. 01 Don't know …….. 88	**00➡ W26** **88➡ W26**
W25	**During this pregnancy, how often did you usually take these tablets?** *PROBE FOR BEST ESTIMATE; ONE RESPONSE ONLY*	None…… 00 Everyday……..…… 01 Every other day……. 02 Twice a week…….. 03 Once a week …… 04 Once every 2 weeks… 05 Once a month…….. 06 Other _____ 77 Don't know…….. 88	
W26	**During this pregnancy, did you take any drugs for intestinal worms?**	No……..... 00 Yes ……. 01 Don't know…… 88	
W27	**During this pregnancy, did you take any drug to treat malaria or to prevent you from getting malaria?**	No……..... 00 Yes ……. 01 Don't know…… 88	

(*ASK ALL WOME***) Now I would like to ask you about past pregnancies and births that you may have had. Interviewer instruction to women who are currently pregnant. We are not asking about this current pregnancy, we are only asking about the past most recent pregnancy.**

W28	**Have you ever been pregnant before?** If 'No' probe by asking: **Were you ever pregnant, even if the pregnancy did not result in the birth of a live child?**	No……..... 00 Yes ……. 01 Don't now…… 88	**00➡ W43** **88➡ W43**
W29	**Did your most recent pregnancy result in a live birth? I mean, did the baby cry or show other signs of life?**	No……..... 00 Yes ……. 01	**00➡ W34**
W30	**When was the last time you gave birth (even if your child is no longer living)?**	_____/_____/____ day / mo / yr IF day is not known …… 88	

		If month not known ……..…88 If year not known ……8888	
W31	**INTERVIEWER NOTES: D*id the respondent's* last *live birth occur within the* last *3 years*)**	No……..... 00 Yes ……. 01	**00➡ W43**
W32	**Is this child still living?**	No……..... 00 Yes ……. 01	**01➡ 34**
W33	**How old was your child when s/he died?** I*f less than 1 hour, circle '1' for hours* AND *RECORD '00' hours.* I*f less than 24 hours, circle '1' and record number of completed hours, from 01 to 23.* *If the child died at 1 day, circle the 2 and record 01; similarly, if the child died at 1 month, circle the 3 and record 01, and so on.*	Hours ……..1 ☐☐ Days ……..……2 Months ……..…3	
W34	**During that last pregnancy** (that resulted in a live birth) **did you have difficulty with your vision during the day?**	No……..... 00 Yes ……. 01 Don't know…… 88	
W35	**During that last pregnancy** (that resulted in a live birth) **did you have difficulty with your vision at night** ("Dafent" night blindness in local language)?	No……..... 00 Yes ……. 01 Don't know……. 88	
W36	**During the time of your pregnancy, were you given or did you buy any iron tablets, iron folic acid tablets or multivitamin tablets for yourself?** *(SHOW TABLETS) ASK TO SEE THE TABLETS*	No……..... 00 Yes ……. 01 Don't know…… 88	00➡ **39** 88➡ **39**
W37	**During this pregnancy, how often did you usually take these tablets?** *PROBE FOR BEST ESTIMATE; ONE RESPONSE ONLY*	None…… 00 Everyday……..…… 01 Every other day……. 02 Twice a week……... 03 Once a week …… 04 Once every 2 weeks… 05 Once a month…….. 06 Other _____ 77 Don't know…….. 88	
W38	**During the entire pregnancy, for how many months did you take the tablets?**	Number of months ☐☐ Don't know ……..88	

	(PROBE FOR APPROXIMATE NUMBER OF MONTHS.)			
W39	**In the first two months after delivery, did you receive a vitamin A dose (like this)?** *SHOW THE CAPSULE*	No…….. Yes ……. Don't know……	00 01 88	
Now we want to ask you some questions about your most recent birth even if the child is no longer living. Interviewer notes: please ask the name of the most recent birth				
W40	**Was/Is *(NAME)* a male or female?**	Male…….. Female……	01 02	
W41	**Did you ever breastfeed *(NAME)*?**	No……..... Yes …….	00 01	
W42	**How long after birth did you first put *(NAME)* to the breast?** *If respondent reports she put the infant to the breast immediately after birth, circle '00'* For *'Immediately'.* If less *than 1 hour, circle '1' for hours* AND *RECORD'00' hours.* If *less than 24 hours, circle '1' and record number of completed hours, from 01 to 23.* *Otherwise, circle '2' and record number of completed days.*	Immediately..... 00 Or hours..... 1 Or Days..... 2		

Dietary Diversity Score Questions *ASK ALL WOMEN*

Next we would like to ask some questions about what you have eaten since yesterday.
Now I would like to ask you about liquids or foods that you eaten in YOUR HOME OR OUTSIDE HOME since yesterday during the day or night, since about this same time of day yesterday. I am interested in whether you had the item I mention, even if it was combined with other foods. For example, if you ate injera with stew made with mixed vegetable, you should reply yes to any food I ask about that was an ingredient in the injera/stew. We will ask you about foods eaten as small amount such as berbere separately.

No.	Food groups with Examples			
W43	Are you currently fasting?	No …… Yes ……	00 01	
W44	Bread, rice, pasta, noodles, or other foods made from grains other than teff, including thick grain.based porridge. For example, oats, maize, barley, wheat, sorghum, millet or other grains besides teff?	No …….. Teff…… Maize…… Wheat …….. Barley ……. Sorghum ……. Millet …… Oat …… Other (specify) _____	00 01 02 03 04 05 06 07 77	

W45	Pumpkin, yellow yams, butternut, carrot, squash or sweet potatoes that are yellow or orange inside?	No …… Yes …… Don't know ……	00 01 88	
W46	Any other food made from roots or tubers, like white potatoes, taro root, white yams, cassava or any other food made from roots?	No …… Yes …… Don't know ……	00 01 88	
W47	Any dark green leafy vegetables?	No …… Yes …… Don't know ……	00 01 88	
W48	Ripe mango, pawpaw, guavas?	No …… Yes …… Don't know ……	00 01 88	
W49	Any other fruits or vegetables like bananas, apples, green beans, avocados, tomatoes, oranges, pineapples, passion fruit?	No …… Yes …… Don't know ……	00 01 88	
W50	Liver, kidney, heart and other organ meats (offals)?	No …… Yes …… Don't know ……	00 01 88	
W51	Any meat such as beef, pork, lamb, goat, chicken or?	No …… Yes …… Don't know ……	00 01 88	
W52	Eggs?	No …… Yes …… Don't know ……	00 01 88	
W53	Fresh or dried fish, shell fish or other seafood?	No …… Yes …… Don't know ……	00 01 88	
W54	Any food made from beans, peas, lentils, or nuts?	No …… Yes …… Don't know ……	00 01 88	
W55	Milk, cheese, yoghurt or other food made from milk?	No …… Yes …… Don't know ……	00 01 88	
W56	Oil, fats or butter added to food or used for cooking	No …… Yes …… Don't know ……	00 01 88	
W57	Sugar, honey, sweetened soda or sugary foods such as chocolates, candies, cookies and cakes	No …… Yes …… Don't know ……	00 01 88	
W58	Spices(black pepper, salt)	No …… Yes …… Don't know ……	00 01 88	
W59	Condiments (berbere, hot sauce, other examples),	No …… Yes …… Don't know ……	00 01 88	

W60	Coffee, tea	No …… Yes …… Don't know ……	00 01 88	
W61	Alcoholic beverages OR local alcohol Example Tela, Areke, Borde…	No …… Yes …… Don't know ……	00 01 88	

CONSENT STATEMENT FOR ANTHROPOMETRY AND BIOCHEMICAL SAMPLE COLLECTION

As part of this survey, we are asking people all over the country to take an anemia and malaria test. We would also like to assess the vitamins and minerals in your body. Anemia is a serious health problem that usually results from poor nutrition, infection, or chronic disease. This survey will assist the government to develop programs to prevent and treat anemia.

We would like to measure your height, weight, mid upper arm circumference (MUAC), examine your neck for goiter and eyes for spots and we would also take a sample of your blood, urine and stool. The tests are safe. Some tests may cause you slight discomfort, such as a needle prick to take a blood sample. For the blood sample, the blood is taken from a vein in the arm with a needle. The equipment used in taking the blood is clean and completely safe. It has never been used before and will be thrown away after your test. We would also like you to collect a sample of your urine and stool in a cup. By giving us urine and stool to test, you will help the Ministry of Health learn more about parasites that make people sick in Ethiopia. While we are here, we will test the urine for blood and tell you your results.

We will also test your blood for anemia and malaria immediately, and tell you your results. We will also provide information on your weight, height and MUAC.

The benefit to you for taking part in this survey is that you will get results for weight, height, mid upper arm circumference, goiter, spots on the eye, malaria, anemia and urine testing for blood in urine, and referral to the nearby health facility if needed. The other information you give us will not benefit you in a direct way. However, we will add the information you give us to that of other houses in Ethiopia, and will create a report. The report will contribute to the good of your community. What you say is important and valuable, and will help the Ministry of Health to improve their health and nutrition programs.

The results will be kept strictly confidential and will not be shared with anyone outside our survey team.
We will refer you to the clinic if you have malaria, blood in the urine or severe anemia.
You can say yes to any of these tests, or you can say no. It is up to you to decide. Do you have any questions?
May we take your weight, height and mid upper arm circumference?
May we check your eyes and neck?
Will you provide a small amount of blood, urine and stool?

If the women is pregnant do not collect venous blood

Consent given for: 0= No or 1= Yes	**WL01**Blood ☐	**WL02** Urine ☐	**WL03** Stool ☐	**WL04** Anthro/goiter ☐

WL05 Anthropometrist Code: ☐☐	
WL06 Nurse/Phlebotomist Code ☐☐	
WL07 WEIGHT IN KILOGRAMS Refused = 777.7 Not measured = 000.0	KG ☐☐☐.☐
WL08 HEIGHT IN CENTIMETERS Refused = 777.7	CM ☐☐☐.☐

Not measured = 000.0	
WL09 MUAC (Mid upper arm circumference) In centimeter **Refused= 77.7** **Not measured = 00.0**	CM ☐☐ . ☐
WL10 Goiter status	Grade 0…..……01 Grade 1…..……02 Grade 2…..……03
Wl11 Bitot spot (examine the participant)	No…..……..……..00 Yes…..……..01
Wl12 Xerophtalamia (examine the participant)	No…..……..……..……00 Yes…..……..…01
WL13 BLUE TOP TUBE (METAL FREE) **Did not work =00.0** **Refused = 77.7** **Pregnant = 99.9**	☐☐ . ☐ ML.
WL15 PURPLE TOP TUBE (EDTA) **Did not work =00.0** **Refused = 77.7** **Pregnant = 99.9**	ML. ☐☐ . ☐
WL15 REDTOP TUBE (EDTA) **Did not work =00.0** **Refused = 77.7** **Pregnant = 99.9**	ML. ☐☐ . ☐
WL16 Date blood sample taken (Ethiopian calendar)	Date: _____/_____/_____ Day / Month / Year
WL17 TIMEBLOOD DRAW (Ethiopian time)	Blood draw ___ ___ : ___ ___ Hour Minute
WL18When did you eat your most recent meal (food)? (Ethiopian date and time)	_____/_____/_____ __ ___ : ___ ___ Date /Month/ Year Hour Minute
WL 19 Finger prick or venous sample taken	01 Finger prick 02 Venous
WL20 MALARIA RESULTS (RDT)	NEGATIVE…….... 00 POSITIVE P *falciparum*……..……..... 01 POSITIVE P *vivax*…..……..... 02 POSITIVE FOR BOTH P *falciparum and* P *vivax* ……..…….…… *03* INVALID…..…..... 04
WL21 HEMOGLOBIN RESULTS	g/dL ☐☐ . ☐

In order to determine if you have blood in the urine or worms we would like to collect a urine and stool sample. If you can provide this now, we appreciate it. If not now, we can come back to pick up the sample at a later time.
INSTRUCTIONS IF UNABLE TO PRODUCE AT WILL:
For stool:We will return tomorrow to pick up your stool. We would like the freshest stool you can give us. Please use one cup to collect the first stool you pass.
For urine: We will return tomorrow to pick up your urine.

WL22 Urine collected?	No…….....00y es …….....01

WL23 RESULTS (blood in urine) **Ask the women if she is Menstruating** (Don't test if the women is in Menstruation)	Negative…….....00p ositive ……..….....01 Women is Menstruating……..03
WL24 Stool collected?	No…….....00y es ……..….....01
WL25 Date stool sample taken (Ethiopian calendar)	Date: _____/_____/_____ Day / Month / Year
WL26 Time when stool passed by the respondent (as recorded on cup) (Ethiopian time)	___ ___ : ___ ___ Hour Minute
WL27 Time when stool collected from the respondent (Ethiopian time)	___ ___ : ___ ___ Hour Minute
WL28 TIMEBLOOD centrifuged (Ethiopian time)	___ ___ : ___ ___ Hour Minute

OBSERVATIONS

TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS:

_____

_____

Household ID | | | | | |

EA (3 digit) HH(2digit)

Men Bar CodeLabel

Men 15.54 YEARS
ETHIOPIA NATIONAL MICRONUTRIENT SURVEY 2014

Ethiopian Federal Ministry of Health, Ethiopian Public Health Institute
Enrolment Informed Consent for Men 15.54 years old

Hello. My name is _____ and I am working with the Ethiopian public health institute (EPHI). We are conducting a national Micronutrient survey. We would very much appreciate your participation in this survey. This information will help the government to plan health and nutrition services.

I would like to sit down and ask you some questions. This will take about 15 minutes. We will interview other members of the household who are selected for the survey later.

This form with your answers will be kept CONFIDENTIAL. When we report what we have found in these interviews, no one will know that you or your family members have participated. After asking questions about the household, I will ask other selected family members whether or not they agree to join in on this survey.

The benefit to you for taking part in this survey is that you will get your results for height, weight, malaria, and anemia. The other information you give us will not benefit you in a direct way. We will add the information you give us to that of other houses in Ethiopia, and will create a report. The report will contribute to the good of your community. What you say is important and valuable, and will help the Ministry of Health to improve their health and nutrition programs.

If you are not interested you do not have to take part in this survey. If I ask you any question you don't want to answer, just let me know and I will go on to the next question. You may choose to stop the interview at any time. Refusing to answer will not affect your family's access to health services.

All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. This form with your answers will be kept under lock and key. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important.

If you have any question about this survey please call our manager (Dilnesaw Zerfu) at the mobile (0911421720).

Do you have any questions for me?

May I begin the interview now? …….

RESPONDENT AGREES TO BE INTERVIEWED……1

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED……..2 END

Participant's name (print)

……. ……

Survey staff conducting Survey staff signature and date

Men 15.54 YEARS
ETHIOPIA NATIONAL MICRONUTRIENT SURVEY 2014

IDENTIFICATION	
MG01. CLUSTER NUMBER: ☐☐☐	
MG03. HH NUMBER: ☐☐	
MG05. MALE RESPONDENT LINE NUMBER: ☐☐	

Now I would like to ask you some questions aboutyourhealth.

M1	**HOW OLD ARE YOU?** (VERIFY THAT THE AGE IS THE SAME AGE AS WRITTEN ON THE HOUSEHOLD LISTING)	☐☐ Years	
M2	**Have you ever attended school?**	No……... 00 Yes ……..…… 01	**0➡m04**
M3	**What is the highest level of school you completed?**	None…….. 00 Primary …..…… 01 Secondary …….. 02 Technical / vocational certificate …… 03 Higher / university/ college 04	
M4	**Have youbeen diagnosed with anaemia in the previous 6 months?**	No……... 00 Yes ……..…… 01	
M5	**Have you been ill with diarrhoea in the past two weeks?** (DEFINED AS THREE(3) OR MORE LOOSE OR WATERY STOOLS IN A 24.HOUR PERIOD)	No……... 00 Yes ……..…… 01	
M6	**Have you been ill with a cough or breathing problems in the past two weeks?**	No……... 00 Yes ……..…… 01	**0➡M9**
M7	**When you had an illness with a cough, did you breathe faster than usual with short, rapid breaths or have difficulty breathing?**	No……... 00 Yes ……..…… 01	**0➡M9**
M8	**Was the fast or difficult breathing due to a problem in the chest or to a blocked or runny nose?**	Chest only ……..... 01 Nose only . …… 02 Both …… Other (Specify)_____ 03 Don't know …… 77 88	
M9	**Have you been ill with a fever in the past two weeks?**	No……... 00	

		Yes ……..……. 01	
M10	**Have you beenill with malaria in the past two weeks?**	No……... 00 Yes ……..……. 01	
M11	**Have you had any hospitalization and /or clinic visits due to illness in the last 2 weeks?**	No……... 00 Yes ……..……. 01	
M12	**At any time during the illness, did you take any drugs for the illness?**	No……... 00 Yes ……..……. 01	
M13	**What drugs did you take?** **Any other drugs?** *(record all mentioned)*	Sp/Fansidar…… 01 Chloroquine……. 02 Amodiaquine……... 03 Quinine …… 04 Artemisinine (ACT)…… 05 Al/Coartem…….. 06 Antibiotic …… 07 Antimotility……. 08 Zinc …… 09 Unknown injection… 10 Aspirin ……... 11 Acetaminophen..…….. 12 Ibuprofen …….. 13 Home remedy/ Herbal medicine …….. 14 Other (Specify)……. 77 Don't know ……. 88	

M13	**Do you smoke?**	No……... 00 Yes ……..……. 01	
M14	Record time: interview end (Ethiopian time)	___ ___ : ___ ___ Hour Minute	
M15	FINAL INTERVIEW RESULT:	COMPLETED NOT AT HOME PARENT REFUSED CHILD REFUSED PARTLY COMPLETED INCAPACITATED OTHER (SPECIFY)_____ ____	01 02 03 04 05 06 77

INTERVIEWER'S OBSERVATIONS

TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS ABOUT RESPONDENT:

_____

_____

_____

MENLab Bar CodeLabel

LAB

MEN LABORATORY/ANTHROMPOMETRY QUESTIONNAIRE

CONSENT STATEMENT FOR ANTHROPOMETRY AND BIOCHEMICAL SAMPLE COLLECTION

As part of this survey, we are asking people all over the country to take an anemia and malaria test. We would also like to assess the vitamins and minerals in your body by taking a sample to the lab in Addis Ababa, Anemia is a serious health problem that usually results from poor nutrition, infection, or chronic disease. This survey will assist the government to develop programs to prevent and treat anemia.

We would also like to measure your height and weight.

The equipment used in taking the blood is clean and completely safe. It has never been used before and will be thrown away after each test. The blood will be tested for anemia and malaria immediately, and the result told to you right away. The result will be kept strictly confidential and will not be shared with anyone other than members of our survey team. We will refer you to the clinic if you have severe anemia or malaria We would also like to collect a small amount of stool from you. We want to test the stool for intestinal parasites. We will take the stool back to Addis Ababa for testing. Testing is free. By giving us stool to test, you will help the Ministry of Health learn more about parasites that make people sick in Ethiopia. We will return tomorrow to pick up your stool. We would like the freshest stool you can give us. Please use one cup to collect the first stool you pass. If you will pass stool again before we return, please label the second cup, fill it with stool as instructed above, and give both cups to us.

Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide.

May we take your weight and height?

Will you provide a small amount of blood and stool?

Verbal consent given for: (Y OR N)	**ML01** Blood (Y ☐ N)	☐	**ML02** Stool	☐	**ML03** Anthro/goiter (Y OR N) ☐

May I begin the interview now?

Was consent for sample collection provided?

Interviewer Signature: _____

☐☐ Anthropometrist Code:

☐☐ **5** Phlebotomist Code

ML06 WEIGHT IN KILOGRAMS Refused = 777.7 Not measured = 000.0	☐☐☐ . ☐ KG

ML07 HEIGHT IN CENTIMETERS **Did not work =00.0** **Refused = 77.7**	☐☐☐ . ☐ CM
ML08 BLUE TOP TUBE (METAL) (About 7ml) **Did not work =00.0** **Refused = 77.7**	ML.
ML09PURPLE TOP TUBE (EDTA) (About 3ml) **Did not work =00.0** **Refused = 77.7**	☐ ML.
ML10 RED TOP TUBE (About 6ml)	☐ ML.
ML11 DATE OF BLOOD SAMPLE TAKEN (Ethiopian calendar)	Date: _____/_____/_____ Day / Month / Year
ML12 TIMEBLOOD DRAW (Ethiopian time)	Blood draw ___ ___ : ___ ___ Hour Minute
ML13When did you eat your most recent meal (food)? (Ethiopian date and time)	I dont know.....0 Date: _____/_____/_____ Day / Month / Year Last Meal Eaten ___ ___ : ___ ___ Hour Minute
ML14 FEVER in last 24 HR? (Since same time yesterday)	No…….....00Yes …….....01
ML15 MALARIA RESULTS (RDT)	NEGATIVE…….....00 POSITIVE P *falciparum*…..... 01 POSITIVE P *vivax*…..……..... 02 INVALID…..…..... 03
ML16 HEMOGLOBIN RESULTS (Value 1 to 20)	☐☐ . ☐ g/dL
ML 17 Finger prick or venous sample taken	Finger prick……00 Venous ……01

In order to determine if you have worms we would like to collect a stool sample. If you can provide this now, we appreciate it. If not now, we can come back to pick up the sample at a later time.

INSTRUCTIONS IF UNABLE TO PRODUCE AT WILL:

For stool:We will return later today or tomorrow to pick up your stool. We would like the freshest stool you can give us. Please use one cup to collect the first stool you pass.

ML18 Stool collected?	No…….....00yes …….....01
ML19) Date stool sample taken (Ethiopian calendar)	Date: _____/_____/_____ Day / Month / Year
ML20 Time when stool collected from the respondent (Ethiopian time)	___ ___ : ___ ___ Hour Minute
ML21 Date and time when stool passed by the respondent (as recorded on cup) (Ethiopian time)	Date: _____/_____/_____ and ___ ___ : ___ ___ Day / Month / Year Hour Minute

ML22 TIMEBLOOD centrifuged (Ethiopian time)	___ ___ : ___ ___ Hour Minute
ML23 Referral given? *Please check that man was referred for*	**Referral criteria**: *Anaemia:* Hb < 10 g/dL;…… ☐ *Malaria*: (RDT) positive…… ☐ ☐ Check if

Thank you for completing this interview.

Time ended interview:	☐☐ . ☐☐ **Hr.** **Min.**

INTERVIEWER'S OBSERVATIONS
TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS:

Household ID ☐☐☐☐☐

CLUSTER (3 digit) HH (2 digit)

Preschool Age Child Bar Code Label

PRESCHOOL CHILDREN 0.59 MONTHS
ETHIOPIAN NATIONAL MICRONUTRIENT SURVEY 2014

Ethiopian Federal Ministry of Health, Ethiopian Public Health Institute
Enrolment Informed Consent for Preschool Child Interview

As I mentioned earlier, we are trying to learn more about the health of children. Among all the preschool children 0.59 months old in Ethiopia your child(ren) have been chosen to participate in this survey. We would like to continue asking you questions about your preschool child(ren).
This information will help the government to plan health and nutrition services. The survey usually takes about 30 minutes to complete.
Among infants less than 6 months of age, we would like to just ask some questions about their health and what they eat.
Among children 6 to 59 months, we would like to find out more about how well they are and collect a sample of your child's blood and stool. We will also measure your child's height, weight and arm circumference and ask questions related to what they are eating and their health habits. Also we would like to examine your child eyes for spots.
If your child is 6 month old or older, the benefit to you for taking part in this survey is that you will get results for your child's weight, height, mid upper arm circumference, malaria, and anemia. The other information you give us will not benefit you in a direct way. However, we will add the information you give us to that of other houses in Ethiopia, and will create a report. The report will contribute to the good of your community. What you say is important and valuable, and will help the Ministry of Health to improve their health and nutrition programs.
If you are not interested, you do not have to take part in this survey. If I ask you any question you don't want to answer, just let me know and I will go on to the next question. You may choose to stop the interview at any time. Refusing to answer will not affect your family's access to health services.
All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. This form with your answers will be kept CONFIDENTIAL. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important.
If you have any question about this survey please call our manager (Dilnesaw Zerfu) at the mobile (0911421720).
Do you have any questions for me?
May I begin the interview now?

……

RESPONDENT AGREES FOR CHILD TO BE INTERVIEWED……1
RESPONDENT DOES NOT AGREE FOR CHILD TO BE INTERVIEWED……..2 END

IDENTIFICATION	
PG01. CLUSTER NUMBER: ☐☐☐	
PG02. HH NUMBER: ☐☐	
PG03. RESPONDENT LINE NUMBER: (SHOULD BE MOTHER/CAREGIVER) ☐☐	

PG04 CHILD LINE NUMBER	☐☐	

ASK FOR ALL PRESCHOOL CHILDREN 0.59 MONTHS

No.	QUESTION	CODING CATEGORIES	SKIP
P1	**WHAT IS THE BIRTH DATE OF THE CHILD? IN DAY/MONTH/ / YEAR (HOW MANY MONTHS OLD IS THIS CHILD?)** NOTE FOR INTERVIEWERS *(SCREENING QUESTION TO VERIFY THAT THE DATE OF BIRTH OF THE CHILD)*	Age in years ☐☐	**If <6mos ➞P13**
P2	DO YOU KNOW WHEN THE LAST VACCINATION CAMPAIGN HERE?	No…….. 00 Yes ……..……. 01	**00➞**P3
P2a	**WHEN WAS THE LAST VACCINATION CAMPAIGN HERE?** (WRITE MONTH AND YEAR)	_____/_____ mo / yr	
P3	**DO YOU HAVE A CHILD CLINIC/ VACCINATION CARD/ BOOK WITH (**CHILD'S NAME**) VACCINATIONS?** *(IF YES ASK:* MAY I SEE IT PLEASE?)	No…….. 00 Yes, not seen…… 01 Yes, seen…….. 02	
P4	**HAS YOUR CHILD RECEIVED A VITAMIN A CAPSULE?** *(SHOW VITAMIN A CAPSULES)*	No…….. 00 Yes ……..……. 01 Don't know …….. 88	**00➞**P5 88➞P5
P4a	**DOES VITAMIN A SUPPLEMENTATION DATE IS RECORDED?**	Date is not recorded……. 00 Date is recorded (specify)… 01 Don't know ……..…….. 88	**00➞**P5 88➞P5
P4b	**WRITE THE MOST RECENT DATE OF VITAMIN A CAPSULE GIVEN**	_____/_____/____ day / mo / yr	
P4c	SOURCE OF THE DATE (INFORMATION)	From clinic card/Book……. 01 Mothers/family Recall …… 02	
P5	**HAS YOUR CHILD RECEIVED MEASLES VACCINE?**	No…….. 00 Yes ……..……. 01 Don't know …….. 88	**00➞**P6 88➞P6

P5a	**DOES MEASLES SUPPLEMENTATION DATE IS RECORDED?**	Date is not recorded……. 00 Date is recorded (specify)… 01 Don't know 88	**00➡**P6 88➡P6
P5b	WRITE THE MOST RECENT DATE OF MEASLES VACCINATION	_____/_____/____ day / mo / yr	
P5c	SOURCE OF THE DATE (INFORMATION)	From clinic card/Book…… **01** Mothers/family Recall …… **02**	
P6	**HAS YOUR CHILD RECEIVED POLIO VACCINE?**	No……... 00 Yes ……..……. 01 Don't know …….. 88	**00➡**P7 88➡P7
P6a	**DOES MEASLES SUPPLEMENTATION DATE IS RECORDED?**	Date is not recorded……. 00 Date is recorded (specify)… 01 Don't know ……..… 88	**00➡**P7 88➡P7
P6b	WRITE THE MOST RECENT DATE OF POLIO VACCINATION	Polio _____/_____/____ day / mo / yr	
P6c	SOURCE OF THE DATE (INFORMATION)	From clinic card/Book…. 01 Mothers/family Recall …… 02	
P7	**During the last six months, did** (child's name) **take any multivitamin tablets, multivitamins or syrups?** (SHOW TABLETS AND SYRUP) ASK *TO SEE THE TABLETS* AND SYRUPS	No…… 00 Yes……..… 01 Don't know…….. 88	**00➡P9** **88➡P9**
P8	**How many days did** (child's name) **take any of these products in the last week (7 days)**	Number of days…… ☐☐ (If none, enter 00) (If don't know, enter 88)	
P9	**During the last six months, did (**child's name**) take any iron tablets/syrups?** (SHOW TABLETS AND SYRUP) ASK *TO SEE THE TABLETS* AND SYRUPS	No……... 00 Yes ……..……. 01 Don't know …….. 88	**00➡P11** **88➡P11**
P10	**How many days did (**child's name**) take iron tablets/syrups in the last week (7 days)?**	Number of days…… ☐☐ (If none, enter 00) (If don't know, enter 88)	

P11	**Does (**child's name**) eat soil or earth from any source (for example, walls of mud houses, the market or the yard)?**	No……... 00 Yes ……..……. 01 Don't know …….. 88	**00➡P13** **88➡P13**
P12	**Over the last week (last 7 days), how many days did (**child's name**) eat soil or earth from any source (for example, walls of mud houses, the market or the yard)?**	Number of days…… ☐☐ (If none, enter 00) (If don't know, enter 88)	
(ASK FOR ALL PRESCHOOL CHILDREN 0.59 MONTHS) CHILD HEALTH QUESTIONS: Now I would like to ask you some questions about **(child'sname)** health.			

P13	**Has (**child's name**) been diagnosed with anaemia in the past 6 months?**	No……... 00 Yes ……..……. 01 Don't know…….. 88	**00➡**14 88➡14
P13a	If yes ask **did (**child's name**) take any tablet or syrup?**	No……... 00 Yes ……..……. 01 Don't know…….. 88	
P14	**Did (**child's name**) take any drugs for intestinal worms in the past 6 months?**	No……... 00 Yes ……..……. 01 Don't know…….. 88	
P15	**Has (**child's name**) been ill with diarrhoea in the past 2 weeks?** (DEFINED AS 3 OR MORE LOOSE OR WATERY STOOLS IN A 24.HOUR PERIOD)	No……... 00 Yes ……..……. 01 Don't know…….. 88	**00➡P17** **88➡**P17
P16	**Was he/she given any of the following to drink at any time sincehe/she started having the diarrhea:** A) fluid made from a special ORS packet like LEMLEM? (SHOW EXAMPLE) B) homemade fluid of salt, sugar, and water?	No……... 00 Yes ……..…… 01 Don't know…….. 88	
P17	**Has (**child's name**) been ill with a cough or breathing problems (in the past 2 weeks)**	No……... 00 Yes ……..……. 01 Don't know…….. 88	**0➡P20** **88➡**P20
P18	**When (**child's name**)had an illness with a cough, did he/she breathe faster than usual with short, rapid breaths or have difficulty breathing**?	No……... 00 Yes ……..……. 01 Don't know…….. 88	**0➡P20** **88➡**P20
P19	**Was the fast or difficult breathing due to a problem in the chest or a blocked or runny nose?**	Chest only ……... 01 Nose only . ……... 02 Both ……. 03 Other Specify_____ 77 Don't know …….. 88	**88➡P20**
P20	**When (**child's name**)had an illness with a cough, did he/she breathe faster than usual with short, rapid breaths or have difficulty breathing**? Delete	No……... 00 Yes ……..……. 01 Don't know…….. 88	**0➡P20** **88➡**P20
P20	**Has** (child's name)**been ill with a fever in the past 2 weeks?**	No……... 00 Yes ……..……. 01 Don't know…….. 88	
P21	**Has** (child's name) **been ill with malaria in the past 2 weeks?**	No……... 00 Yes ……..……. 01 Don't know…….. 88	
P22	**Has (**child's name**) had any hospitalization and /or clinic visits due to illness in the last 2 weeks?**	No……. 00 Yes ……..……. 01 Don't know…….. 88	**0➡P24** **88➡**P24

P23	**Where did you seek health care assistance when (**child's name**) was sick for the last 2 weeks** *Anywhere else?* *PROBE FOR ALL SOURCES* *MULTIPLE RESPONSES ALLOWED*	No assistance sought 00 PUBLIC SECTOR Govt hospital/Clinic…. 01 Govt health center…… 02 Govt health post….. 03 Govt mobile clinic…. 04 Other public facility…. Specify: _____ PRIVATE MEDICAL SECTOR Pvt hospital/clinic…… Pvt pharmacy…..... 05 Pvt doctor…… 06 Pvt mobile clinic…… Pvt other ……. Specify:_____ OTHER SOURCES Market/Shop……. 07 Traditional healers …… 08 Other Specify_____ 77	
P24	**At any time during the illness, did (child's name) take any drugs for the illness in the last 2 weeks?**	No……..... 00 Yes ……..……. 01 Don't know …….. 88	

NOTE TO INTERVIEWER: IF CHILD IS 24 MONTHS OF AGE OR OLDER, GO TO ANTHROPEMETRY AND LAB MODULE.

<u>Child feeding (Breast feeding and complementary feeding) (0 TO <24 months)</u>

Next we would like to ask you questions about what your child eats.

P25	**Has (**child's name**) ever been breastfed?**	No……..... 00 Yes ……..……. 01 Don't know …….. 88		**0→P34** **delete** **1→P27** **Add 88→P34**
P26	IF NO,WHYWASN"T(NAME)BREASTFED?	Motherill/weak……1 Child ill/weak……...2 Childdied……3 Nipple/breastproblem……4 Insufficientmilk……5 Motherworking……6 Child refused……..…… 7 Other(specify)……..……77		**All→P34**

P27	**How long after birth did you first put (**child's name**) to the breast?** IF RESPONDENT REPORTS SHE PUT THE INFANT TO THE BREAST IMMEDIATELY AFTER BIRTH, CIRCLE '00' FOR 'IMMEDIATELY'. IF LESS THAN 1 HOUR, CIRCLE '1' FOR HOURS ANDRECORD'00' HOURS. IF LESS THAN 24 HOURS, CIRCLE '1' AND RECORD NUMBER OF COMPLETED HOURS, FROM 01 TO 23. OTHERWISE, CIRCLE '2' AND RECORD NUMBER OF COMPLETED DAYS.	IMMEDIATELY..... 00 HOURS…..... 01 ☐☐ DAYS..... 02 ☐☐		
P28	Whatdidyoudowiththe firstmilk (colostrum)? ***Colostrums****is thefirst yellowmilk"inger"*	Givetochild……..……1 Throwaway……2 Other (specify)_____ 77 Don't know ……..88		
P29	Inthefirstthreedays after delivery, was (name)givenanythingto drink other thanbreastmilk?	No……..... 00 Yes ……..…… 01 Don't know …….. 88		**0→P31** **88→P31**
P30	What was (name)giventodrink? (morethanone answer is possible)	Milk(otherthanbreastmilk)…… 01 Holy/Plainwater…… 02 Sugar with water orglucose……. 03 Fruitjuice…… 04 Infantformula…… 05 Tea/Infusion…… 06 Honey…… 07 Rawbutter…… 08 Ersho…… 09 Abishwater…….. 10 Other,specify_____ 77		
P31	**Is the child still breast feeding?**	No……... 00 Yes ……..…… 01		**0→P34**
P32	**Was (**child's name**) breastfed yesterday during the day or at night? That is since this time yesterday until now? (to emphasize 24 hours)**	No……... 00 Yes ……..…… 01 Don't know …….. 88		**0→P34**
P33	**How many times did (**child's name**) drink breast milk yesterday during the day or at night? That is since this time yesterday until now? (**to emphasize 24 hours**)**	Number of times ☐☐ Don't know……..….88		
Next I would like to ask you about some liquids that ***(NAME)*** may have had yesterday during the day or at night Did ***(NAME)*** have any ***(***ITEM FROM LIST***)***? Note to interviewer: R*ead the list of liquids one by one starting from water and mark yes or no* accordingly.				
P34	Plain water?	No……... 00 Yes ……..…… 01 Don't know …….. 88		

P35	Infant formula (for example S26, Bay luck, Nestle,……..)	No……... Yes ……..……. Don't know ……...	00 01 88	**00→P36** **88→P36**
P35a	IF YES: How many times since yesterday, during the day or at night, did (NAME) drink infant formula? NUMBER OF TIMES DAY OR NIGHT IF 7 OR MORE TIMES, RECORD '07'. DRANK FORMULA	Number of times ☐☐ Don't know……..88		
P36	Milk such as tinned, powdered, or fresh animal milk?	No……... Yes ……..……. Don't know ……...	00 01 88	**00→P37** **88→P37**
P36a	IF YES: How many times since yesterday, during the day or at night, did (NAME) drink milk? NUMBER OF TIMES DAY OR NIGHT IF 7 OR MORE TIMES, RECORD '07'. DRANK MILK	Number of times ☐☐ Don't know…….88		
P37	Juice or juice drinks?	No……... Yes ……..……. Don't know ……...	00 01 88	
P38	Clear broth? (Such as meat broth or vegetable broth)	No……... Yes ……..……. Don't know ……...	00 01 88	
P39	Yogurt?	No……... Yes ……..……. Don't know ……...	00 01 88	**00→P40** **88→P40**
P39a	IF YES: How many times since yesterday, during the day or at night, did (NAME) eat yogurt? NUMBER OF TIMES DAY OR NIGHT IF 7 OR MORE TIMES, RECORD '07'. ATE YOGURT	Number of times ☐☐ Don't know…….88		
P40	Thin porridge/Gruel?	No……... Yes ……..……. Don't know ……...	00 01 88	
P41	Any other liquids such as [**list other water.based liquids available in the local setting**]? For Example Abishe (Fenugreek)	No……... Yes ……..……. Don't know ……...	00 01 88	
P42	Any other liquids?	No……... Yes ……..……. Don't know ……...	00 01 88	

Now I would like to ask you about (other) liquids or foods that ***(NAME)*** ate yesterday during the day or at night. I am interested in whether your child had the item even if it was combined with other foods. For example, if ***(NAME)*** ate a millet porridge made with a mixed vegetable sauce, you should reply yes to any food I ask about that was an ingredient in the porridge or sauce. Please do not include any food used in a small amount for seasoning or condiments (like chilies, spices, herbs, or fish powder), I will ask you about those foods separately.

Yesterday during the day or at night, did *(Child's name)* **drink/eat:**

P43	Did your child eat foods made out of any of the following	No ……..	00	

	cereals, such as bread, pasta, thick.grained porridge, injera or kita? (Multiple response is allowed and Read each food type from the list)	Teff…… Maize…… Wheat …….. Barley …… Sorghum ……..……. Millet …… Oat …… Other (specify) _____	01 02 03 04 05 06 07 77	
P44	Pumpkin, carrots, squash or orange flash sweet potatoes that are yellow or orange inside?	No……... Yes ……..……. Don't know ……...	00 01 88	
P45	White potatoes, white yams, bulla, kocho, manioc, cassava, white sweet potato, or any other foods made from roots?	No……... Yes ……..……. Don't know ……...	00 01 88	
P46	Any dark green, leafy vegetables like kale, spinach, or amaranth leaves, pumpkin leafy?	No……... Yes ……..……. Don't know ……...	00 01 88	
P47	Ripe mangoes or papayas?	No……... Yes ……..……. Don't know ……...	00 01 88	
P48	Any other fruits or vegetables, avocado, banana, guava, lemon, bamboo shoot, bean, cabbage, tomato?	No……... Yes ……..……. Don't know ……...	00 01 88	
P49	Liver, kidney, heart or other organ meats?	No……... Yes ……..……. Don't know ……...	00 01 88	
P50	Any meat, such as beef, pork, lamb, goat, chicken, or duck?	No……... Yes ……..……. Don't know ……...	00 01 88	
P51	Egg?	No……... Yes ……..……. Don't know ……...	00 01 88	
P52	Fresh or dried fish or shellfish?	No……... Yes ……..……. Don't know ……...	00 01 88	
P53	Any foods made from beans, peas, lentils, or nuts?	No……... Yes ……..……. Don't know ……...	00 01 88	
P54	Cheese or other food made from milk?	No……... Yes ……..……. Don't know ……...	00 01 88	
P55	Any oils, fats, or butter, or foods made with any of these?	No……... Yes ……..……. Don't know ……...	00 01 88	

P56	Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits	No…….. Yes ……..……. Don't know ……..	00 01 88	
P57	Condiments for flavor, such as berbere, chilies, spices, herbs, or flavoring powders?	No…….. Yes ……..……. Don't know ……..	00 01 88	
P58	Foods made with red palm oil, red palm nut, or red palm nut pulp sauce?	No…….. Yes ……..……. Don't know ……..	00 01 88	
P59	Any commercially fortified baby food, like Fafa, Cerilak, Cerifam, Mother's Choice?	No…….. Yes ……..……. Don't know ……..	00 01 88	
P60	**Did (**child's name**) eat any solid, semi.solid, or soft foods yesterday during the day or at night?**	No…….. Yes ……..……. Don't know ……..	00 01 88	**00➡P62** **88➡P62**
P61	**How many times did (**child's name**) eat solid, semi.solid, or soft foods other than liquids yesterday during the day or at night?** (ASK THE RESPSONDENT THIS QUESTION AND RECORD THE ANSWER.)	Number of times….. ☐☐ Don't know……...88		
P62	**Did (**child's name**) drink anything from a bottle with a nipple yesterday during the day or night?**	No…….. Yes ……..……. Don't know ……..	00 01 88	
P63	**How old was** (child's name)**when he/she was introduced to solid, semi. solid or soft solid food (complementary feeding) for the first time?** Example of solid foods include: meat, fish; Semi solid foods include: porridge, rice, lentils; Soft solid foods include: bananas (VERIFY THE AGE IN MONTHS COMPLETE)	Not yet introduced…… 00 ☐☐ Months (complete) Don't know…….....88		
P64	**Is the mother/caretaker of this child fasting?**	No…….. Yes ……..……. Don't know ……..	00 01 88	
P65	Record time: End of Interview (Ethiopian time)	__ __ : __ __		

P66: FINAL INTERVIEW RESULT:	RESULT CODES: 1 COMPLETED 2 NOT AT HOME 3 REFUSED 4 PARTLY COMPLETED 5 INCAPACITATED 6 OTHER (SPECIFY)

	_____._____

IF CHILD IS GREATER THAN 6 MONTHS OF AGE ASK TO OBTAIN CONCENT AND CONTINUE WITH SAMPLE COLLECTION)

IF CHILD IS LESS THAN 6 MONTH OF AGE THANK THE RESPONDENT AND MOVE TO NEXT QUESTIONNAIRE.

CONSENT STATEMENT FOR ANTHROPOMETRY AND BIOCHEMICAL SAMPLE COLLECTION

As part of this survey, we are asking people all over the country to take an anemia and malaria test. We would also like to assess the vitamins and minerals in your 6 to 59 month old child's body. We are not collecting samples or measuring children under 6 months of age. Anemia is a serious health problem that usually results from poor nutrition, infection, or chronic disease. This survey will assist the government to develop programs to prevent and treat anemia.

We would like to measure your child's height, weight, and check him/her for oedema, mid upper arm circumference (MUAC). We would also like to take a sample of his/her blood and stool. We need also to check your eyes for spots. The tests are safe. Some tests may cause your child slight discomfort, such as taking a blood sample. For the blood sample, your child will have blood drawn from a vein in the arm with a needle. The equipment used in taking the blood is clean and completely safe. It has never been used before and will be thrown away after each test. We would also like you to collect a sample of stool from the same child in a cup. By giving us his/her stool to test, you will help the Ministry of Health learn more about parasites that make people sick in Ethiopia.

Your child's blood will be tested for anemia and malaria immediately, and the result told to you right away. We will also provide information on your child's weight, height and mid upper arm circumference.

The benefit to you for taking part in this survey is that your child will get results for weight, height, malaria, and anemia, and referral to the nearby health facility if needed. The other information you give us will not benefit you in a direct way. However, we will add the information you give us to that of other houses in Ethiopia, and will create a report. The report will contribute to the good of your community. What you say is important and valuable, and will help the Ministry of Health to improve their health and nutrition programs.

The result will be kept strictly confidential and will not be shared with anyone other than members of our survey team. We will refer your child to the clinic if s/he has severe anemia, malaria or oedema.

You can say yes to any of these tests, or you can say no. It is up to you to decide. Do you have any questions?

May we take your child's weight, height and MUAC (anthropometry)?

Will you provide a small amount of blood and stool?

Consent given for: **PL01** Blood ☐ **PL02** Stool ☐ **PL03** Anthropometry ☐ (Y OR N)	
PL04 Anthropometrist Code: ☐☐	Anthropometrist Name:_____
PL05 Code for Laboratory Technician: ☐☐	Lab Tech Name _____
PL06 WEIGHT IN KILOGRAMS Refused = 777.7 Not measured = 000.0	KG. ☐☐☐.☐
PL07 LENGTH (for children 6 to <24 month) / HEIGHT (≥ 24 month) IN CENTIMETERS Refused = 777.7 Not measured = 000.0	CM. ☐☐☐.☐

PL08 MUAC (Mid upper arm circumference) In centimeter **Refused = 77.7** **Not measured = 00.0**	☐☐ . ☐
PL09 Edema	No…….. 00 Yes, left only ……..…… 01 Yes, right only…….…. 02 Yes, both legs……..... 03 Not measured (Specify) _____ 04
PL10 Does your child have difficulty with his/her vision during the day? **ONLY ASK CHILDREN 24 MONTHS OR OLDER**	No……..... Yes …… Don't know……
PL11 Does your child have difficulty with his/her vision at night ("Dafent" night blindness in local language)?	No……..... Yes …… Don't know…….
PL12 Bitot Spot	No…..……..…….……00 Yes…..……..……01
PL13 Xerophtalamia	No…..……..…….…00 Yes…..……..……..…01
PL14 BLUE TOP TUBE (METAL FREE) Not collected =00.0 Refused = 77.7	ML. ☐☐ . ☐
PL15 PURPLE TOP TUBE (EDTA) Not collected =00.0 Refused = 77.7	ML. ☐☐ . ☐
PL16 RED TOP TUBE (EDTA) Not collected =00.0 Refused = 77.7	ML. ☐☐ . ☐
PL17 Date blood sample taken (Ethiopian Day/Month/Year)	Date: _____/_____/_____ Day / Month / Year
PL18 TIMEBLOOD DRAW (Ethiopian time)	Blood draw ___ ___ : ___ ___ Hour Minute
PL19When did you eat your most recent meal (food)? (Ethiopian time)	___ ___ : ___ ___ Hour Minute
PL20 MALARIA RESULTS (RDK)	NEGATIVE…….....0 POSITIVE P FALCIPARUM ……..……...1 Positive P VIVAX……..…2 INVALID…….....3
PL21 FEVER in last 24 HR?	NO……..……....0 YES …….....……....1
PL22 HEMOGLOBIN RESULTS	g/dL ☐☐ . ☐
In order to determine if you have blood in the urine or worms we would like to collect a stool sample from your child. If you can provide this now, we appreciate it. If not now, we can come back to pick up the sample at a later time. *INSTRUCTIONS IF UNABLE TO PRODUCE AT WILL*: **For stool**:We will return tomorrow to pick up your stool. We would like the freshest stool you can give us. Please use one cup to collect the first stool you pass.	

PL23 STOOL COLLECTED?	NO……..0 YES ……..……...1
PL24 Date stool sample taken (Ethiopian Day/Month/Year)	Date: _____/_____/_____ Day / Month / Year
PL25 TIME: STOOL COLLECTED (Ethiopian time)	___ ___ : ___ ___ Hour Minute
PL26 TIME: STOOL PASSED ,Ethiopian time (as recorded on cup)	___ ___ : ___ ___ Hour Minute
PL27 Time Blood centrifuged (Ethiopian time)	___ ___ : ___ ___ Hour Minute

Thank you for completing this interview.

INTERVIEWER'S OBSERVATIONS

TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS ABOUT RESPONDENT:

_____
_____
_____
_____
_____
_____

Schoolchild Bar CodeLabel

QUESTIONNAI

Household ID | | | | | |

EA (3 digit) HH(2digit)

SCHOOL AGE CHILDREN (SAC) 6.14 YEAR OLDS
ETHIOPIAN NATIONAL MICRONUTRIENT SURVEY 2014

Ethiopian Federal Ministry of Health, Ethiopian Public Health Institute
Enrolment Informed Consent for School Age Child Interview

As I mentioned earlier, we are trying to learn more about the health and nutritional status of children. Among all the school age children 6.14 years old in Ethiopia, your child(ren) have been chosen to participate in this survey. We would like to continue asking you questions about your school age child(ren).

This information will help the government to plan health and nutrition services. This questionnaire usually takes about 30 minutes to complete.

We would like to find out more about how well they are nourished and why they may be poorly nourished by collecting a small sample of your child's blood, stool and urine. We will also measure your child's height and weight and examine your child neck for goiter.

The benefit to you for taking part in this survey is that you will get results for your child's height, weight, malaria, blood in urine and anemia. The other information you give us will not benefit you in a direct way. However, we will add the information you give us to that of other households in Ethiopia, and will create a report. The report will contribute to the good of your community. What you say is important and valuable, and will help the Ministry of Health to improve their health and nutrition programs.

If you are not interested, you do not have to take part in this survey. If I ask you any question you don't want to answer, just let me know and I will go on to the next question. You may choose to stop the interview at any time. Refusing to answer will not affect your family's access to health services.

All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. This form with your answers will be kept CONFIDENTIAL. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important.

If you have any question about this survey please call our manager (Dilnesaw Zerfu) at the mobile (0911421720).

Do you have any questions for me?

May I begin the interview now?

RESPONDENT AGREES TO BE INTERVIEWED FOR THE CHILD……1
RESPONDENT DOES NOT AGREE TO BE INTERVIEWED FOR THE CHILD
……..2 END

IF THE CHILD IS BETWEEN 5 AND 10 YEARS OF AGE, PROCEED WITH THE QUESTIONNAIRE ON PAGE 3. IF THE CHILD IS 11 YEARS OF AGE OR OLDER PROCEED WITH ASSENT FORM ON PAGE 2:

Assent forms for school children (11.14 years)

For older school aged children, we would like to explain the survey and ask for their cooperation in answering these questions directly. May we speak with (child's name from Household Questionnaire)?

Hello. My name is _____ and I am working with the Ethiopian public Health Institute (EPHI) We are conducting a national Micronutrient survey. We would very much appreciate your participation in this survey. This information will help the government to plan health and nutrition services.

Among all schoolchildren in Ethiopia you have been chosen to participate in this survey, and your parents have said that it is ok. The survey will take about 30 minutes of your time. If you decide to be in the survey, we will ask you questions about what you eat and whether you have been sick. We will also ask to check your blood and examine your neck for goiter. If you agree, the team member will collect it from your arm with a small needle. It is possible that the needle may hurt a little bit, but this hurt will go away after a short time. It is also possible that your skin may be dark for a day or two. This, too, will go away. The team member will also give you two special cups. We will ask you to pee in one cup and provide a small amount of stool in the other cup.

You will not directly benefit from the survey. The information you give may help others. You do not have to be in the survey. You can decide and it is ok to change your mind. At the end of the survey we will only share the results about groups of children, not individuals. Only you and your family will know what you say or what your results are. If you have any questions after the survey is over, talk to your parents.

Do you have any questions now about being in the survey?

…….
Participant's name (print)

……. …….
Survey staff conducting Survey staff signature and date

RESPONDENT AGREES TO BE INTERVIEWED……1
RESPONDENT DOES NOT AGREE TO BE INTERVIEWED……..2 END

SCHOOL AGE CHILDREN 5 to 14 YEARS
ETHIOPIA NATIONAL MICRONUTRIENT SURVEY 2013

IDENTIFICATION		
SG01. CLUSTER NUMBER:	☐☐☐	
SG02. HH NUMBER:	☐☐	
SG03. RESPONDENT LINE NUMBER: (SHOULD BE MOTHER/CAREGIVER)	☐☐	
SG04 SCHOOL CHILD LINE NUMBER	☐☐	

In general for children 6.10 years of age: get parental report (ask the questions of the caretaker and enter the child's name into the parentheses)
For children 11.14 years of age who are present and can provide information: get self.report (ask questions directly of the child and enter "you" or "yourself" into the parentheses)

No.	QUESTION	CODING CATEGORIES	SKIP

S1	**HOW MANY YEARS OLD IS THIS CHILD?** (VERIFY THAT THE AGE IS THE SAME AGE AS WRITTEN ON THE HOUSEHOLD LISTING)	☐☐ Years	
S2	**Have you/** child's name **ever attended school?**	No…….. 00 Yes ……..…… 01	**00 ➡**S5
S3	**Did (Name) attend school at any time during this school year?**	No…….. 00 Yes ……..…… 01	**00 ➡**S5
S4	During this school year, what grade is (Name) attending?	☐☐	
S5	**During the last six months, did** (Name) **take any multivitamin tablets?** (SHOW TABLETS) ASK *TO SEE THE TABLETS*	No…….. 00 Yes …… 01 Don't know …….. 88	**00➡S7** **88➡S7**
S6	**How many days did (**you/child's name**) take multivitamin tablets, in the last week (7 days)?**	Number of days ☐☐ Don't know ……..88	
S7	**During the last six months, did** (you/child's name) **take any iron tablets or iron syrups?** (SHOW TABLETS AND SYRUP) ASK *TO SEE THE TABLETS* AND SYRUPS	No…….. 00 Yes …… 01 Don't know …….. 88	**00➡S9** **88➡S9**
S8	**How many days did (**you/child's name**) take iron tablets/syrup in the last week (7 days)?**	Number of days (If none, enter 00) ☐☐ Don't know ……..88	
S9	**Do (you)/Does (Child name) eat soil or earth from any source (for example, walls of mud houses, the market or the yard)?**	No…….. 00 Yes …… 01 Don't know …….. 88	**0➡S10** **8➡S10**
S9	**How many times in the last week (last 7 days) did** (you/child's name) **eat dirt or soil from any source** (for example, walls of mud house, the market or the yard)?	Number of times ☐☐ (IF DON'T KNOW, ENTER 88)	
Child Health questions, Now I would like to ask you some questions aboutyour **(child's)** health.			
S10	**Do (you)/Does**(child's name) **have any problem seeing in the day time?**	No…….. 00 Yes …… 01 Don't know …….. 88	
S11	**Do (you)/Does**(child's name) **have any problem seeing in the night time** ("dafent" night blindness in local language)**?**	No…….. 00 Yes …… 01 Don't know …….. 88	

S12	**Do (you)/Does** (child's name)**have difficulty with your/his/her vision?**	No……..	00	
		Yes ……	01	
		Don't know ……..	88	
S13	**Have you/has** (child's name) **been diagnosed with anaemia in the past 6 months?**	No……..	00	
		Yes ……	01	
		Don't know ……..	88	
S14	**Have you/has** (child's name)**taken any drugs for intenstinal worms in the past 6 months?**	No……..	00	
		Yes ……	01	
		Don't know ……..	88	
S15	**Have you/has** (child's name)**been ill with diarrhoea in the past 2 weeks?** (DEFINED AS THREE OR MORE LOOSE OR WATERY STOOLS IN A 24.HOUR PERIOD)	No……..	00	
		Yes ……	01	
		Don't know ……..	88	
S16	**Have you/Has** (child's name)**been ill with a cough or breathing problems in the past 2 weeks?**	No……..	00	**0➡S19**
		Yes ……	01	
		Don't know ……..	88	**88 ➡S19**
S17	**When you/When** (child's name)**had an illness with a cough, did he/she breathe faster than usual with short, rapid breaths or have difficulty breathing?**	No……..	00	**0➡S19**
		Yes ……	01	
		Don't know ……..	88	**88➡S19**
S18	**Was the fast or difficult breathing due to a problem in the chest or to a blocked or runny nose?**	Chest only …….....	01	
		Blocked or runny Nose only . ……		
		Both ……	02	
		Other ……..... Specify_____	03	
		Don't know ……	77	
			88	
S19	**Have you/Has** (child's name) **been ill with a fever in the past 2 weeks?**	No……..	00	
		Yes ……	01	
		Don't know ……..	88	
S20	**Have you/Has** (child's name)**been ill with malaria in the past 2 weeks?**	No……..	00	
		Yes ……	01	
		Don't know ……..	88	
S21	**Has** (child's name)**had any hospitalization and /or clinic visits due to illness in the last 2 weeks?**	No……..	00	
		Yes ……	01	
		Don't know ……..	88	
S22	**At any time during the illness, did** (child's name)**take any drugs for the illness in the last 2 weeks?**	No……..	00	
		Yes ……	01	
		Don't know ……..	88	
S23	Interview was conducted mainly with the child or with the caretaker/parent of the child	Child.....	01	
		caretaker/parent.....	02	
S24	Record time: End of Interview (Ethiopian time)	___ ___ : ___ ___		

S25: FINAL INTERVIEW RESULT:	RESULT CODES: 1 COMPLETED 2 NOT AT HOME 3 PARENT REFUSED 4 CHILD REFUSED 5 PARTLY COMPLETED 6 INCAPACITATED 7 OTHER (SPECIFY) _____

CONSENT STATEMENT FOR ANTHROPOMETRY AND BIOCHEMICAL SAMPLE COLLECTION (ask caretakers)

As part of this survey, we are asking people all over the country to take an anemia and malaria test. We would also like to assess the vitamins and minerals in your school age child's body. Anemia is a serious health problem that usually results from poor nutrition, infection, or chronic disease. This survey will assist the government to develop programs to prevent and treat anemia.

We would like to measure your child's height, weight and take a sample of his/her blood and stool. We will also examine your child neck for goiter. The tests are safe. Some tests may cause your child slight discomfort, such as taking a blood sample. For the blood sample, your child will have blood drawn from a vein in the arm with a needle. The equipment used in taking the blood is clean and completely safe. It has never been used before and will be thrown away after each test. We would also like you to collect a sample of urine and stool from the same child in a cup. By giving us urine and stool to test, you will help the Ministry of Health learn more about parasites that make people sick in Ethiopia. While we are here, we will test the urine for blood in urine and tell you your result.

Your child's blood will be tested for anemia and malaria immediately, and the result told to you right away. We will also provide information on your child's weight and height.

The benefit to you for taking part in this survey is that some members of your family will get results for weight, height, malaria, anemia and urine testing, and referral to the nearby health facility if needed. The other information you give us will not benefit you in a direct way. However, we will add the information you give us to that of other houses in Ethiopia, and will create a report. The report will contribute to the good of your community. What you say is important and valuable, and will help the Ministry of Health to improve their health and nutrition programs. The result will be kept strictly confidential and will not be shared with anyone other than members of our survey team. We will refer your child to the clinic if s/he has severe anemia, malaria or blood in urine.

You can say yes to any of these tests, or you can say no. It is up to you to decide. Do you have any questions?

May we take your weight, height and MUAC (anthropometry)?

Will you provide a small amount of blood, urine and stool?

May we take your child's weight and height (anthropometry)?

Will you provide a small amount of your child's blood, urine and stool?

Verbal consent given for: 0= No OR 1= yes	**SL01**Blood	**SL02** Urine	**SL03** Stool	**SL04** Anthro/Goiter
	☐	☐	☐	☐

Assent forms for school children (11.14 years)

As part of this survey, we are asking people all over the country to take an anemia and malaria test. We would also like to assess the vitamins and minerals in your body.

We would like to measure your height and weight and take a sample of your blood, urine and stool. We will also examine your neck for goiter. The tests are safe. Some tests may cause slight discomfort, such as taking a blood sample. For the blood sample, we will have blood drawn from a vein in the arm with a needle. The equipment used in taking the blood is clean and completely safe. It has never been used before and will be thrown away after each test. We would also like you to collect a sample of urine and stool from you in a cup. By giving us urine and stool to test, you will help the Ministry of Health learn more about parastes that make people sick in Ethiopia. While we are here, we will test the urine for blood in urine, which is a worm that can be treated at the health clinic, and give you the results.

Your blood will be tested for anemia, malaria immediately and blood in urine, and the result told to you right away. We will also provide information on your weight and height. The result will be kept strictly confidential and will not

be shared with anyone other than members of our survey team. We will refer you to the clinic if you have severe anemia, malaria or blood in Urine. You can say yes to any of these tests, or you can say no. It is up to you to decide. Do you have any questions? May we take your weight and height (anthropometry)? Will you provide a small amount of blood, urine and stool?	
SL05 Anthropometrist Code: ☐☐	
SL06 Phlebotomist Code ☐☐	
SL07 WEIGHT IN KILOGRAMS Refused = 777.7 Not measured = 000.0	KG ☐☐☐.☐
SL08 HEIGHT IN CENTIMETERS Refused = 777.7 Not measured = 000.0	CM ☐☐☐.☐
SL09Goiter status	Grade 0…..……01 Grade 1…..……02 Grade 2…..……03 Refused ……88
SL10 BLUE TOP TUBE (METAL FREE) **Did not work =00.0** **Refused = 77.7**	ML. ☐☐.☐
SL11 PURPLE TOP TUBE (EDTA) **Did not work =00.0** **Refused = 77.7**	ML. ☐☐.☐
SL12 REDTOP TUBE (EDTA) **Did not work =00.0** **Refused = 77.7**	ML. ☐☐.☐
SL13 DATE BLOOD SAMPLE TAKEN (Ethiopian calendar)	Date: _____/_____/_____ Day / Month / Year
SL14 TIMEBLOOD DRAW (Ethiopian time)	Blood draw ___ ___ : ___ ___ Hour Minute
SL15 When did you eat your most recent meal (food)? (Ethiopian time)	Last Meal Eaten ___ ___ : ___ ___ Hour Minute
SL16 FEVER in last 24 HR? (Since same time yesterday)	No…….....00Yes ……..…….....01
SL17 MALARIA RESULTS (RDK)	NEGATIVE…….....00 POSITIVE P *falciparum*.……....01 POSITIVE P *vivax*…...……...02 INVALID…..….....03
SL18 HEMOGLOBIN RESULTS	g/dL ☐☐.☐
SL 19 Finger prick or venous sample taken	Finger prick…….……00 Venous ……01

In order to determine if you have blood in urine or worms we would like to collect a urine and stool sample. If you can provide this now, we appreciate it. If not now, we can come back to pick up the sample at a later time.

INSTRUCTIONS IF UNABLE TO PRODUCE AT WILL:

For stool:We will return tomorrow to pick up your stool. We would like the freshest stool you can give us. Please use one cup to collect the first stool you pass. If you pass stool again before we return, please label the second cup, fill it with stool as instructed above, and give both cups to us.

For urine: We will return tomorrow to pick up your urine. We would like the freshest urine you can give us. Please use one cup to collect the first urine you pass. If you urinate again before we return, please label the second cup, fill it with urine as instructed above, and give both cups to us.

SL20 Urine collected?	No…….....00yes ……..…….....01
SL21 Blood in urine RESULTS	Negative…….....00positive ……..….....01
SL22 Stool collected?	No…….....00yes……..… ….....01
SL23 Date and time when stool passed by the respondent (as recorded on cup) (Ethiopian time)	Date: __/_____/_____ and ___ ___ : ___ ___ Day / Month /Year Hour Minute
SL24 Date stool sample taken (Ethiopian calendar)	Date: _____/_____/_____ Day / Month / Year
SL25 Time when stool collected from the respondent (Ethiopian time)	___ ___ : ___ ___ Hour Minute
SL26 TIMEBLOOD centrifuged (Ethiopian time)	___ ___ : ___ ___ Hour Minute

Thank the respondent and tell them that the lab team will be arriving later.

INTERVIEWER'S OBSERVATIONS

TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS:

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