MAMA SASHA

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SASHA
Sweetpotato Action for
Security and Health in Africa

Mama SASHA Baseline Survey
REPORT

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The distribution of women's knowledge score about health and nutrition is shown in figure 18. Mean (SD) score was of 24.9 (5.6); it was 25.1 (5.7) in Control and 24.8 (5.6) in Intervention. Again looking at the global knowledge score about health, nutrition, and orange-fleshed sweetpotato we find that the graph follows the normal curve though the tail is fatter at the upper end hence negatively skewed. We also observe a trend where the first half of the graph Interventions areas show dominance in having higher percentage at each score. This trend is reversed at the second half of the curve where the Control areas

Acronyms

ANC	Antenatal care
APHIA	AIDS, Population and Health Integrated Assistance program
ARDAP	Appropriate Rural Development Agriculture Programme
BMI	Body-mass-index
BP	Blood Pressure
CDC	Centers for Disease Intervention and Prevention, USA
CF	Complementary Foods
CHW	Community health worker
CIP	International Potato Center
CREADIS	Community Research in Environment and Development Initiatives
CRP	C-reactive Protein
CSPro	Census and Survey Processing System
DALYs	Disability-adjusted Life years
DBS	Dry Blood Spots
DDS	Dietary Diversity Score
DPT	Diphtheria-Pertussis-Tetanus
ERB	Ethics Review Board
FAO	Food and Agriculture Organization
FCS	Food Consumption Score
GPS	Global Positioning System
HAZ	Height-for-age Z-score
HIV	Human Immuno-deficiency Virus
HW	Health Worker
IEC	Information-Education-Communication

KARI	Kenya Agricultural Research Institute
KDHS	Kenya Demographic and Health Survey
KEMRI	Kenya Medical Research Institute
MoA	Ministry of Agriculture, Kenya
MoH	Ministry of Health, Kenya
NGO	Non-governmental Organization
OFSP	Orange-fleshed sweetpotato
OPV	Oral Polio Vaccine
PATH	Program for Appropriate Technology in Health
PCA	Principal Components Analysis
PoCP	Proof-of-concept project
SAS	Statistical Analysis Software
SASHA	Sweetpotato Action for Security and Health in Africa
SD	Standard Deviation
SPSS	Statistical Package for Social Scientists
SSA	Sub-Saharan Africa
TV	Television
USAID	US Agency for International Development
VAD	Vitamin A deficiency
WAZ	Weight-for-age Z-score
WFP	World Food Programme
WHO	World Health Organization
WHZ	Weight-for-height Z-score

Abstract

The Mama SASHA baseline survey is a key part of a project evaluation strategy aimed at assessing the impact of orange-fleshed sweetpotato (OFSP) on the health and nutritional status of women and children aged between 6and 23 months. Sub-Saharan Africa is one of the regions with the highest estimated prevalence rates of sub-clinical VAD and the risk is greatest among children less than five years of age and pregnant &lactating women. Introducing OFSP as an agriculture and local community action aims at improving and sustaining health and productivity. Past studies have shown potential of the OFSP to improve the vitamin A status of children less than2 years of age. The baseline survey was conducted from March to May 2011 in Bungoma and Busia counties of Western Province of Kenya. Busia County according to size related variables and were randomly assigned to the Control and Intervention areas. Specifically, the survey present data on; household demographic and socio economic characteristics, women knowledge and attitudes on vitamin A, nutrition, health care and sweetpotatoes, household farming & crop production, vitamin A rich-food consumption among the women and children aged 6-23 months, ANC and maternity utilization, nutritional status of the women and the children aged 6-23 months.

Survey results indicate that the prevalence of VAD among the children as indicated by level of the retinol binding protein (RBP) of less than 0.825µmol/L was approximately 18%.We found that 47% and 33% of the children had attained the minimum DDS and minimum acceptable diet (as defined by WHO), respectively. Analysis of the 7-day food frequency consumption shows that the following were the most consumed food groups: cereals and tubers, vegetables and milk. Pulses were the least consumed food group. Consumption of sweetpotatoes was also relatively low (average of 1.7 different days per week) particularly that of OFSP (average of 0.1 different days in a week). Assessment of the nutritional status of the children indicated that, stunting affected 25% of children, with 8% being severely stunted; underweight affected 14% of children, with 4% being severely underweight; while wasting affected 7% of the children, with 2% being severe wasting.Mean BMI among the non-pregnant women was $22kg/m^2$: three quarters of the women were within the normal BMI range($18.5-24.9kg/m^2$), 10% were underweight (<18.5 kg/m^2) and the remaining 15% were overweight (>25.0 kg/m^2).Nutritional levels of women and children were particularly low in Bunyala District. Almost all the households (92%) planted sweetpotatoes and the average land under sweetpotatoes per household was 0.1 hectares. Generally, women's knowledge concerning the value of deep orange fleshed sweetpotato variety was relatively low; 88% had no idea about the value of OFSP and only 9% knew about the vitamin A content of the variety.

1.   INTRODUCTION

1.1.   Background

People living in rural households in developing countries face a myriad of challenges in achieving healthy and productive lives. Achieving household food security often comes at the expense of not addressing complementary health and nutrition needs for those who need them the most—pregnant women, new-borns, and children less than five years of age.

Micronutrient deficiencies contribute to around 9% of global childhood disability-adjusted life years (DALYs), with vitamin A deficiency (VAD) responsible for 0.6 million deaths. Sub-Saharan Africa is one of the regions with the highest estimated prevalence rates of sub-clinical VAD (*Black et al, 2008*). Children less than five years of age and pregnant and lactating women are at greatest risk of VAD. A recent World Bank nutrition assessment concluded that the best opportunity for addressing malnutrition is during the period prior to conception until two years of age (*World Bank, 2006*). This is based on findings from the research community that children younger than two years are more vulnerable and at risk of developing malnutrition, and that they tend to respond more to Controls than older children. This is not surprising, because while children between the ages of 6 and 24 months experience maximum expected growth, they are also at the greatest risk of growth faltering due to inappropriate complementary feeding practices and high susceptibility to infectious diseases, especially diarrhoea. By maintaining children's growth at a higher level throughout this 6- to 24-month period, it is expected that not only short-term, but also long-term benefits for growth will be achieved.

Undernutrition often starts *in utero* (intrauterine growth retardation) and results in low birth weight, which is associated with a high risk of dying in the neonatal period. Therefore, it is important to improve maternal well-being through antenatal care Controls, including dietary advice and improved access to diversified foods. In poor rural communities, VAD can have multiple causes: inadequate vitamin A intake because the sources of vitamin A are lacking in the diet, inadequate absorption of vitamin A due to the presence of parasites or diarrhoea, or increased use of vitamin A to combat diseases such as measles and malaria. Supplementation and food fortification are among the direct biomedical nutrition Controls that are being promoted to address global malnutrition and the Millennium Development Goal to reduce underweight prevalence by 50 per cent by the year 2015. While direct nutrition Controls are important, improving and sustaining health and productivity require measures that include agriculture and local community action.

During the past decade, strong evidence has shown the potential impact of orange-fleshed sweetpotato (OFSP) on young child vitamin A status (*Jalal et al. 1998; Haskell et al. 2004; van*

Jaarsveld et al. 2005; Low et al. 2007; HarvestPlus, 2010). A South African study demonstrated that OFSP is bioavailable and efficacious in improving vitamin A status in children (Jaarsveld *et al.* 2005) and significant improvements in vitamin A intake and serum retinol concentrations (a proxy for vitamin A status) were obtained from an action-research study of an OFSP-based integrated agriculture-nutrition-market Control in a very resource poor setting in Central Mozambique (*Low et al. 2007*). A third study (*Haskell et al. 2004*) using the isotopic tracer deuterated retinol to estimate total vitamin A stores in 14 Bangladeshi men determined a conversion factor of 13:1 for orange-fleshed sweetpotato when it was cooked pureed with a small amount of oil.

OFSP as a staple food can supply significant amounts of vitamin A and energy simultaneously, thus helping to address both VAD and undernutrition. Since the poorest households typically obtain more than 60% of their energy needs from food staples, a strategy to increase both the production and consumption of OFSP is particularly suited to poor rural households that may not have access to fortified products sold in the market. OFSP cultivation complements vitamin A capsule distribution in SSA. The store of vitamin A created by capsules often is depleted 4 months after ingestion, requiring something to fill the gap. Children above 1 year often do not attend clinics as regularly as those below one year; hence have poorer capsule access if the vitamin A capsules are being distributed through routine services.

The integrated approach to date has introduced OFSP as a new source of vitamin A and energy; created demand for OFSP through improved nutrition knowledge; and expanded markets through linking farmers, traders, and consumers. Evaluations of a range of OFSP production and consumption promotion approaches have been completed or initiated (*Andrade et al. 2009*), yet two questions remain: (1) Will OFSP and associated vitamin A "passively" end up in infants and young children's diets and have a significant impact on this group most at risk of VAD, without specific Controls to increase access to primary health care services and to change young child feeding and care practices? (2) Can linking an agricultural-nutrition Control more explicitly to health services substantially increase impact on vitamin A intakes and VAD status that just health service access alone?   This study, known as Mama SASHA, addresses the second question and is the first time an integrated OFSP-based agriculture-nutrition-health Control is tested at the community level in sub-Saharan Africa. Moreover, no other Control to-date utilizing OFSP has focused explicitly on pregnant women. This group itself is at high risk of VAD and exposing pregnant women to strategies to improve young child care and nutrition prior to birth provides an excellent opportunity to significantly mitigate negative environmental and socio-economic factors that should affect infant survival and growth.

1.2. Justification of the baseline assessment

The Sweetpotato Action for Security and Health in Africa (SASHA) is a five-year multi-partner project led by the International Potato Centre (known by its Spanish acronym, CIP - Centro Internacional de la Papa) designed to improve the food security and livelihoods of poor families in Sub-Saharan Africa by exploiting the untapped potential of sweetpotato. CIP seeks to reduce poverty and achieve food security on a sustained basis in developing countries through scientific research and related activities on potato, sweetpotato, other root and tuber crops, and on the improved management of natural resources. The agriculture-health linkages proof-of-concept Mama SASHA project in Western Province of Kenya (PoCP Western), is one of the SASHA's research projects.

The overall goal of this action research is to *improve the health status of pregnant women and the nutritional status of children up to two years through an integrated OFSP and health service delivery strategy* through an existing health program (AphiaPlus) in Bungoma and Busia counties of Western Kenya. The specific objectives are:

1. To understand the costs and benefits of linking an integrated OFSP agricultural-nutritional Control to a health service delivery system serving pregnant women and its impact on the subsequent newborns as well as their mothers.

2. To strengthen aspects of existing information, education, and communication materials and methods to support sustainable OFSP production and consumption at both the health facility and community levels (improve the knowledge and practices of health workers, agricultural extension agents, and beneficiaries on OFSP and vitamin A rich foods).

3. To improve the evidence base of the health impacts on infants and their mothers and the use of health services by pregnant women derived from linking the dissemination of improved OFSP through community- and facility-based health services.

Mama SASHA is implemented in partnership with Programme for Appropriate Technology in Health (PATH), a leading organization in health, the Kenya Agriculture Research Institute (KARI), local agriculture and health government stakeholders in Western Province, and two local implementing Non-Governmental Organization (NGO) partners, i.e. the Community Research in Environment and Development Initiatives (CREADIS) and the Appropriate Rural Development Agriculture Programme (ARDAP).

The project is set within the context of the USAID/Kenya AIDS, Population and Health Integrated Assistance Program (APHIA II and now APHIA Plus), specifically in Bungoma and

Busia counties in Western Kenya. The Control is conducted at two levels, health facilities being randomly assigned to either Control or Intervention areas:

- Control areas:
    - o At health facility level, health workers (HWs) are trained in nutritional aspects of OFSP, vitamin A rich foods in general, nutrition for pregnant and lactating mothers and in additional aspects on breastfeeding and complementary child feeding practices; they provide pregnant women who come for antenatal and postnatal care with nutrition education and vouchers for OFSP vines.
    - o At community level, 1) community health workers (CHWs) are trained in the same topics as HWs , 2) pregnant women clubs are set up with monthly dialogue sessions, and 3) pregnant women are supplied with OFSP vines if they present the vouchers to secondary vine multipliers who were trained in OFSP rapid vine multiplication technique and OFSP production issues;
- Intervention areas: the activities are limited to the basic AphiaPlus training in which the standard training of CHWs and HWs does include nutrition modules that emphasize breastfeeding and the basic food groups. There are no agricultural activities. Such agricultural activity will be conducted in these Intervention areas after the evaluation period, should it prove effective.

The design for the **effectiveness evaluation** of the project is quasi-experimental, i.e. the comparison is between those who have participated in the Control compared to those in Intervention areas that had not received the Control. The first wave of the Control started in April 2010 on a small scale for one year and was considered a pilot, to refine and validate the design, and to answer acceptability and feasibility questions. The implementation of the second wave of Controls started in the long rainy season beginning in March 2011 and continuing into 2013.

1.3. Aim and Objectives

1.3.1. Aim

This baseline survey is a key component of the project evaluation strategy to assess the impact of the Control on health and nutrition status of pregnant women and their newborns up to 2 years of age. It aims at describing the knowledge and practices about OFSP agronomy and nutritional aspects and at establishing the health and nutrition status among the target population before the Control starts. The current document defines the objectives, describes the methods, reports the results of the baseline survey and provides recommendations for the design and the evaluation strategy of the Control.

1.3.2. General objective

This survey provides baseline data on OFSP knowledge, farming and consumption as well as health and nutrition status of pregnant women, children aged 6-23 months and their mothers in both Control and Intervention areas.

1.3.3. Specific objectives

The following specific objectives were addressed by the survey:
1. Determine the proportion of pregnant women and mothers who know one or more Information-Education-Communication (IEC) messages related to OFSP planting, plot management and harvesting;
2. Determine the proportion of pregnant women and mothers who know vitamin A rich foods;
3. Determine the proportion of pregnant women and mothers who know the contribution of OFSP to improved vitamin A intakes;
4. Determine the proportion of pregnant women and mothers who grow all types of sweetpotato (in normal cropping system and home gardens);
5. Determine the proportion of pregnant women and mothers who have had any previous exposure to OFSP;
6. Determine the proportion of pregnant women, mothers and children aged 6-23 months consuming sweetpotato (any type), OFSP and other vitamin A rich food;
7. Determine the proportion of pregnant women and mothers who know one or more Information-Education-Communication (IEC) messages related to nutrition and child feeding;
8. Describe the dominant attitudes held by pregnant women and mothers of young children towards certain dietary and child feeding practices;
9. Determine the proportion of mothers whose children (aged 6-23 months) have minimal acceptable diet;
10. Determine the proportion of pregnant women and mothers who attend antenatal clinics within the first trimester of pregnancy and the reasons for non-attendance by those who do not;
11. Determine the proportion of pregnant women and mothers who attend antenatal clinics ≥1 during pregnancy ;
12. Estimate the prevalence of vitamin A deficiency, underweight and stunting among children aged 6-23 months.
13. Analyze the relation between demographic indicators (type of household head, level of formal education, age group of mother), socio-economic status (asset levels and housing quality) and the prevalences/proportions presented above.

2.   METHODS

2.1. Study design

This was a community-based cross-sectional survey within the catchment areas served by health facilities offering ante-natal care services. The health facilities were randomly assigned to be Intervention or Control facilities.

2.2.   Study Site

This community-based cross-sectional survey was conducted from March to May 2011 in Bungoma and Busia counties of Western Province. Farming is the main economic activity in the province. Bungoma County is sugarcane-growing area, with one of the country's largest sugar factories, as well as numerous smallholder sugar mills. Maize is also grown for subsistence, alongside pearl millet and sorghum. Dairy farming is widely practiced, as well as poultry keeping. The area experiences high rainfall throughout the year, and is home to several large rivers, which are used for small-scale irrigation. The main economic activity in Busia County is trade with neighbouring Uganda, with Busia town - the county headquarters - being a cross-border centre. Away from town, the county economy is heavily reliant on fishing and agriculture, with cassava, millet, sweetpotatoes, beans, and maize being the principal food crops. There is no data on the prevalence of VAD, but it is likely important; in the neighbouring province of Nyanza the prevalence of VAD is about 23% among children aged 6-59 months (*Ruth et al., 2009*).

In Bungoma County, six health facilities were selected according to size-related variables (number of service providers, antenatal clinics (ANC) attendance numbers, and population served), coverage with community health workers (CHW) linked to AphiaPlus and location criteria; two health facilities were selected from Busia County. The first and second criteria aim at facilitating the project operational strategy. The later criterion aims at ensuring that health facilities under different models of Intervention are not so close that: 1) the voucher program in a neighbouring health facility diverts pregnant women from attending their local health facilities where there is no voucher program, and 2) the Intervention diffuses towards Control areas. The selected health facilities were randomly assigned to Control or Intervention areas (*table 1*).

Table 1*: Health facilities involved in wave 1 Control, by district and intensity model.*

Areas	Health facility	District/Location
Intervention areas	Ndalu health centre	Bungoma North/Ndalu
	Naitiri health centre	Bungoma North/Naitiri
	Sinoko dispensary	Bungoma East/Ndivisi
	Mihuu dispensary	Bungoma East/Chetambe
Control areas	Tongaren health centre	Bungoma North/Tongaren
	Makhonge health centre	Kimilili/Kamukuywa
	Budalangi health centre	Bunyala/Budalangi
	Mukhobola health centre	Bunyala/Mukhobola

The study setting was the catchment area of the selected health facilities. The total population is 232,256 and 129,895 inhabitants in Intervention and Control areas, respectively.

2.3.   Study Population

The study targeted three populations, i.e. pregnant women, children aged 6-23 months and their mothers.

2.4.   Sampling

2.4.1. Sample size calculation

We made assumptions on expected proportions at baseline and expected changes in both areas according to published data on surveys that took place in Nyanza province of Kenya, in Mozambique and Uganda (*Ruth et al., 2009; Low et al., 2007; Loechl & Oyunga-Ogubi, 2010; HarvestPlus, 2010*). The sample size calculation is made to allow for comparison of proportions both within areas (endline *versus* baseline), and comparisons across models at endline survey, using the equation below (*Gorstein et al., 2007*):

$$n = DEFF \times \frac{\left[Z_{\alpha/2}\sqrt{2\bar{p}\bar{q}} - Z_{1-\beta}\sqrt{p_1 q_1 + p_2 q_2}\right]^2}{(p_1 - p_2)^2}$$

where

$$\overline{p} = \frac{p_1 + p_2}{2} \text{ and } \overline{q} = 1 - \overline{p} \text{ when sample sizes are to be equal}$$

$q_1 = 1 - p_1$

$q_2 = 1 - p_2$

$Z_{\alpha/2}$ is the Z-value for the level of significance

$Z_{1-\beta}$ is the Z-value for the Power

Based on an alpha error of 5% and power of 90%, the current best estimates of samples sizes for each potential outcome were (see *table 2*):

- vitamin A status of children: 1,564;
- underweight children: 36,670;
- stunted children: 9,038;
- OFSP knowledge of women :   928;
- OFSP growing practices: 240; and
- OFSP consumption among women: 372.

Table 2*: Sample sizes according to hypotheses related to different indicators.*

Expected prevalence (P)				N per equal groups (1/1) groups for comparisons (α=0.05; 1-β=0.90) by χ2 test	
Baseline		*Endline*			
Intervention	*Control*	*Intervention*	*Control*	*in each area*	*total*
Vitamin A deficiency among children					
20	20	13	20	782	1,564
Underweight among children					
14	14	13	14	36,670	73,340
Stunting among children					
38	38	34	38	4,519	9,038
OFSP Knowledge among women					
50	50	75	60	464	928
OFSP growing a mong women					
5	5	70	45	120	240
OFSP food consumption among women					
5	5	50	30	186	372

The sample sizes of 1,564 mother-child pairs (782 in each area) and 918 pregnant women (464 in each area) were retained to allow comparisons for OFSP knowledge, growing practices and consumption, and VAD in children. The sample size was raised to *1,720 mother-child pairs (860 in each group) and 1,022 pregnant women (511 in each area)* to account for an expected 10% non-response rate.

According to the *Kenya Demographic and Health Survey (KDHS) 2009, the Kenyan Population Census 2009*, and our exploratory investigation in the area, we expected an average of 0.17 child aged 6-23 months per household, and 0.08 pregnant women per household. The number of households to select and visit was 1022/0.08, *i.e.* 12,775 (6388 in each area) to reach the required number of pregnant women. All mother-child pairs met in these households were also included.

2.4.2. Selection and recruitment of eligible participants

The sampling frame was constituted by all the villages of the catchment area of the health facilities with the number of households per villages, as per the *Census 2009* (with an average of 113 households per village). The sample was constructed to allow for separate estimates for key indicators for each area. The survey used a cluster sampling design. The sample points ("clusters") were selected by using "probability proportionate-to-size" cluster sampling based on the list of villages covered by the health facilities (*Lemeshow & Robinson, 1985*). A total of 104 sample points (52 in each group) were identified. Household was defined as a person or a group of persons, related or unrelated, who live together and who share a common source of food (*Kenyan DHS 2009*). As indicated in the *figure 1*, all pregnant women and all mother-child pairs were included.
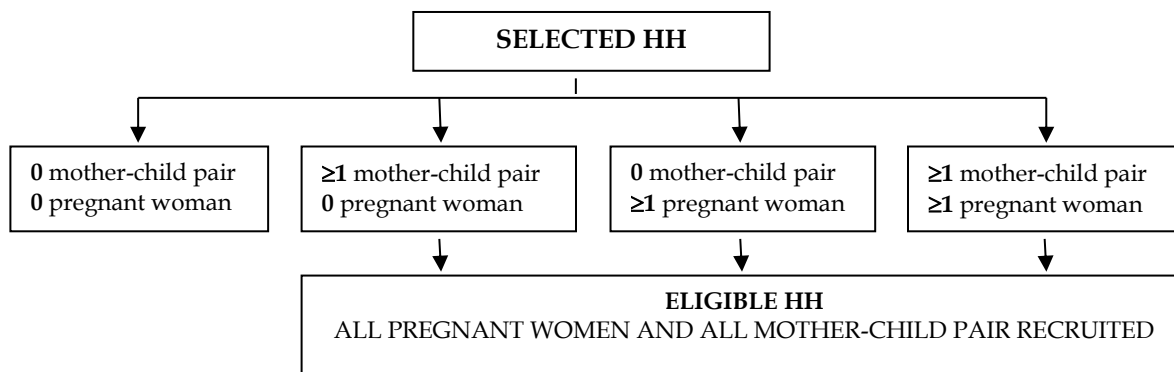
Figure 1: *Decision flow chart for inclusion in the baseline survey.*

2.5.   Data collection preparation, and fieldwork

2.5.1. Survey planning

The fieldwork was planned as two distinct phases:
- Households listing and selection
- Data collection

2.5.1.1. Phase I: Households listing

The listing exercise was aimed at:
- Enumerating households in randomly selected villages in the larger Bungoma and Busia counties (See Listing form in *annex 1*), and identifying households with eligible participants for the baseline survey;
- Taking written consent from the eligible participants;
- Providing consenting women with referrals i.e. appointments for Phase II;
- Identifying potential locations for Phase II activities.

The activities of Phase I include:

- **Identification of a village guide**: The village guide is an individual with a good working knowledge of surrounding villages. He/she was expected to help enumerators locate all households within a cluster as well as assist with identification of village elders and logistical information;
- **Enumeration of all households in the selected clusters**: One of the main activities carried out was household enumeration followed by household selection. Every household was numbered;
- **Identification of eligible households and consent seeking from potential participant**: To make efficient use of limited time, consent to participate in the interview, undergo anthropometric measurement and provide a blood sample was obtained during phase I after household selection. Enumerators obtained consent from selected households willing to participate in the study;
- **Distribution of referral form**: Once consent has been obtained, the enumerator issued a referral form to the participant indicating the date, time and location of interview, anthropometric measurement and blood sampling;
- **Key informant interviews**: Elders from each selected village were interviewed to collect information on access to market as well as agriculture and health services;
- **Shop survey**: the enumerators charged with doing key informant interviews carried out Information on the availability of fortified food products in 2-3 shops near/in each participating village. They made brief stops at the shops either before or after they have completed key informant interviews;
- **Preparation for phase II**:
  - Team leaders were expected to use this time to identify potential areas suitable to set up field units for data collection;
  - They also collected information to build a database of contacts of motorbikes or bus operators for the transport network needed during phase II.

    o   Team leaders and enumerators worked together to record travel times and distances between base hotel and villages and households to assist with planning during phase II.

2.5.1.2. Phase II: Data collection

The second phase of field activities involved interviewer administered surveys, anthropometric measurements and blood sampling. Phase II happened from 18th March 2011 until 21st May 2011.

2.5.2. Elaboration of data collection tool

Data collection tools consisted of a questionnaire (see *annex 2*), which includes 16 sections recording information about:
- Household identification and statement of agreement;
- Demographics of household members;
- Knowledge about nutrition and vitamin A;
- Attitudes towards certain dietary and child feeding practices;
- Health and nutrition practices;
- Frequency of consumption of vitamin a rich foods during past 7 days;
- Dietary diversity and young child diet diversity;
- Crop production;
- Sweetpotato production;
- Sweetpotato knowledge, preference and practice;
- Household assets;
- Household housing and water sourcing;
- Anthropometry and blood sampling;

2.5.3. Information and sensitization of selected communities

Sensitization of communities about the baseline survey and request for collaboration were done through the project start up community sensitization meetings. A total of 13 community sensitization meetings were conducted by implementation partners; they took place at division, location and sub-location levels around each of the Intervention health facilities. The meetings were organized to raise awareness and engage the communities for the project in Tongaren, Ndivisi and Central (Naitiri) divisions and their respective locations and sub-locations. Furthermore, meetings were held in Intervention areas to share specific information on baseline survey.

2.5.4. Recruitment of field workers, training and pre-testing

Potential enumerators were required to have a university degree and advertisement of available posts was done 2-3 days before the scheduled interview day. An interview panel conducted the interviews of 57 candidates on 11th February 2011. Each candidate was quoted on criteria such as highest education level, knowledge and experience in surveys, languages spoken, comfort with working in the field, sample of handwriting and general impression of the interviewer.

Training for households listing took place on Saturday 18th February 2011 for the 45 selected enumerators, including information on the Mama SASHA project and the baseline survey, basics of enumeration and GPS reading, recruitment and selection during the listing exercise, review the listing form and a practical session on GPS reading. A visit to a practice village near Kakamega to practice listing, filling out the form, taking GPS and doing the shop survey was done on Sunday 19th February 2011.

Based on their performance during the listing exercise 22 of the enumerators were selected to undergo further training and act as interviewers and anthropometrics for data collection. Training for data collection happened in three sessions:

- Laboratory technicians (9th-11th March, including a field test in a health facility near Kakamega). The lab technicians came from Kenya Medical Research Institute (KEMRI) based in nearby Kisian, where they are experienced in the collection, handling and storage of blood samples. They were trained by a nutritional biomarker specialist (Dean Garrett) for Macro International's Demographic and Health Survey and employed by PATH, Seattle;
- Interviewers were brought together to review all modules of the questionnaire with the facilitators (Kirimi Sindi, Mary Oyunga and Christine Kiria);
- Based on experience on nutritional surveys, 8 of the trained interviewers were selected for training on anthropometric measurements. The training included a session on theory and a session for practice and standardization in a village where each couple of measurers had to perform measurements on 20 mother-child pairs.

The survey tools and procedures were adapted after the trainings and pre-tests.

2.5.6. Logistics organization

(See Equipment checklist in *annex 3*)

2.5.7. Team composition and fieldwork

2.5.7.1. Teams

The survey involved 2 teams, each consisting of eight or seven interviewers, two anthropometry measurers, two lab technicians, an assistant-supervisor, a supervisor, and two drivers.

2.5.7.2. Interviews

Trained interviewers at a survey site set up in the village for the survey purpose did the interviews; data were recorded on the questionnaires, available in English, Kiswahili, and Luhya to conform to each interviewee's spoken language. The questionnaires were checked on field before being sent to the office by the supervisors and corrected in needed.

2.5.7.3. Anthropometric measurements

Data were collected with the aim of calculating three indices—namely, length-for-age, weight-for-length and weight-for-age—all of which take age and sex into consideration. Weight measurements were obtained using SECA® electronic UNISCALE. Height measurements were carried out using a measuring board. All children were measured lying down (recumbent length) on the board.

2.5.7.4. Blood sample collection

A technician, specifically trained in collection of blood samples obtained a finger prick sample of blood from children between 6 and 23 months of age that was stored on filter paper. For this dried blood spots (DBS) collection, the child's hand was first warmed. The finger was then cleaned with 70% alcohol and pierced with a sterile lancet. The first drop of blood was wiped with sterile gauze and the subsequent drops were spotted on a filter paper to make five circles on each filter paper labelled with participant identification number. The filter papers were dried for two to three hours in plastic boxes closed airtight and covered with black paper to prevent any potential photo oxidation of the sample. After the spots are completely dried, the filter papers were placed in zipper-locked polythene bags along with silica gel. Individual bags were placed in a polythene bag and sent within the following week to the laboratory to be stored in deep freezers at KEMRI (< -20°C) until analysis.

Due to delay in obtaining ethical approval, the interviews started in the first villages without blood sample collection. Hence, for half of the children, blood sample collection was delayed for one to two weeks after interviews and anthropometric measurements.

2.6. Ethical considerations

2.6.1. Privacy protection and confidentiality of data

Since we could not do the tests immediately, the samples were stored in freezers at KEMRI/CDC malaria laboratory in Kisian, where the tests were conducted. Blood data were analysed for groups and no individual response were identifiable. Survey forms and DBS samples were archived and would be accessible to only the research team for at least five years.

2.6.2. Potential harm/risk, potential benefit

No risk was expected for participating in the study. Blood sampling consisted of a finger prick to allow collection of about 5 drops of blood on filter paper. It was expected that there might be some discomfort associated with the finger prick. A team of well-trained and experienced lab technicians carried out the specimen collection. Transport fares to the central location for interview and measurement were paid to the participants, depending on the distance from the household to the location. All participants were given a flat rate of 100 Kshs to contribute to their travel costs to and from interview site.

Though we did not get the result of the child's blood test while in the field, we checked whether or not he/she has received a vitamin A capsule during the past six months on his/her health card. If the card indicated that no capsule has been received or if there is no health card available, we gave the mother a piece of paper referring the child to the nearest health facility for vitamin A supplementation. Although participants did not benefit directly from participating in the study, their participation was expected to make a major contribution to the information known about the effectiveness of the Intervention. Many of the pregnant women in the Intervention areas benefited the following few months from receiving OFSP vines and improved nutritional knowledge through training. In the future, participants and their surrounding communities may benefit because scientists, program planners and policy-makers will have evidence on interventions that support the production and consumption of nutrient rich foods that enhance vitamin A intakes, health and nutrition status.

2.6.3. Informed consent and assent

The women were informed on the purpose and procedures of the survey, risk and constraints due to participation, strict confidentiality of the personal data, possibility to refuse the consent without having to justify the refusal and the lack of interference with usual health care provision.

There were two consent forms: 1) One for the pregnant woman, and 2) one for the mother-child pair (mothers with children 6-23 months old) that specifically describes what procedures to be performed on the child and obtains consent from a guardian of the child. The enumerator

obtained a signed informed consent from the women, with parental or guardian assent for the child, before including the household and members in the survey. If a male household head was present, his was asked to sign as well although technically this was not required.

2.6.4. Approval by ethical review boards (ERB)

The protocol, questionnaire (available in English, Kiswahili and Luhya) and consent forms (available in English, Kiswahili and Luhya) were sent to the national ERB as well as to the PATH's ERB for review; the study was granted approval for implementation by both ERBs (*annex 4*).

2.7. Laboratory analysis

2.7.1 Selection and analysis of samples
Dried-blood-spot (DBS) samples were obtained from 1850 respondents. Laboratory analyses for the samples were carried out to obtain a baseline estimate of Vitamin A status as well as prevalence of vitamin A deficiency (VAD) among the study communities. The samples were analysed in singletons, with approximately 10% analysed in duplicates. All analyses were carried out at the KEMRI/CDC Malaria Laboratory in Kisian, Kenya.

In January 2012, a total of 922 DBS samples were selected using systematic sampling; 905 and 908 were analysed for retinol binding protein (RBP) an indicator of vitamin A status, and C-reactive protein (CRP) an indicator of sub-clinical inflammation status, respectively. The samples were listed by village to give the sampling frame, after which every other sample was selected starting with the second sample. This provided for proportional representation of villages according to the number of samples that were collected from each village. A total of 954 samples were analysed in February-March 2013 for both RBP and CRP.

2.7.1.1 Analysis of samples for RBP

Analysis of retinol-binding protein (RBP), an indicator of vitamin A status, was carried out using a rapid enzyme immunoassay technique for detection of RBP (Hixet *al,* 2004). In summary, RBP was quantified with the use of the SCANLISA RBP Assay (Scimedx Corporation). All reagents, with the exception of deionized water, were provided as part of the assay kit. The assay uses purified human RBP adsorbed to microtest strip wells to compete with natural RBP found in serum. The inter-assay and intra-assay precision of the assay is 8.9% and 6.7%, respectively and the quantitation limit is 7.7 µg/mL RBP (Scimedx Corp., SCANLISA RBP ELISA). To perform the assay, one ¼-inch punch was taken from the center of one DBS (two punches from two dried blood spots for assay in duplicate) into the appropriate deep microwell, and 150 µL of sample diluent (300 µL for duplicate assay) was added. Each ¼-inch punch contains approximately 6.1 µL of serum, thus giving a 1:25 dilution. Samples were vortexed for 20 seconds, centrifuged at

5,000 g for 2 minutes, and left to elute at 4° to 8°C for 18 to 20 hours. The next day, the samples and reagents were removed from the refrigerator and allowed to attain room temperature before analysis. The samples, calibrators, and Interventions were vortexed for 20 seconds and centrifuged at 5,000 g for 2 minutes, then 100 μL each of DBS dried blood spot eluate, calibrators, and Interventions were added to the appropriate individual test wells following a plate map. A monoclonal anti-RBP antibody conjugated to horseradish peroxidase was immediately added. The test was incubated at room temperature for 15 minutes and then washed with buffer. Enzyme substrate was added, followed by 10 minutes of incubation, and the reaction was stopped with acid. The test was read immediately at 405 nm using a microplate reader (Molecular Devices, Spectra-max Plus 384). The results were calculated based on the best-fit log-log calibration curve for each plate with the use of SoftMax Pro software.   Results were expressed as µg/mL of RBP and later converted to µmol/L by dividing µg/mL values by 21. Three operators carried out RBP analysis.

2.7.1.2 Analysis of samples for CRP

C - reactive protein (CRP), an indicator of subclinical inflammation, was assessed using the high sensitivity CRP ELISA technique (Immuno-Biological Laboratories, Inc.). In summary, CRP was quantified with the use of the high sensitivity CRP ELISA kit (Immuno-Biological Laboratories, Inc., Cat. No.: IB59126). All reagents, with the exception of deionized water, were provided as part of the assay kit. The assay uses a monoclonal antibody specific for CRP adsorbed to microtest strip wells and another monoclonal antibody specific for a different region of CRP is conjugated to horseradish peroxidase (HRP). The inter-assay variation is 7.8-9.9% and the intra-assay variation ranges from 5-15.2%. The quantitation limit is 10 ng/mL of CRP (Immuno-Biological, Inc). To perform the assay, one ¼-inch punch was taken from the center of one DBS into the appropriate deep microwell, and 150 µL of Calibrator A (contains 0ng/mL CRP) was added. Each ¼-inch punch contains approximately 6.1 µL of serum, thus giving a 1:25 dilution. Samples were vortexed for 20 seconds, centrifuged at 5,000 g for 2 minutes, and left to elute at 4° to 8°C for 18 to 20 hours. The next day, the samples and reagents were removed from the refrigerator and allowed to attain room temperature before analysis. The samples were vortexed for 20 seconds and centrifuged at 5,000 g for 2 minutes, then 20 µL each of DBS eluate, calibrators, and Interventions were added to the appropriate individual test wells following a plate map. 200µL of assay buffer added to each well using a multi-channel pipette and the plate was incubated at room temperature on a plate shaker rotating at 200 rpm. The plates were washed 3 times with wash buffer. A monoclonal anti-CRP antibody conjugated to horseradish peroxidase was immediately added. The plates were incubated at room temperature for 15 minutes on a plate shaker rotating at 200 rpm and then washed with wash buffer. Enzyme substrate was added, followed by 20 minutes of incubation, and the reaction was stopped with acid. The test was read immediately at 405 nm using a microplate reader (Molecular Devices, Spectra-max Plus 384). The results were calculated using a 4-parameter logistic calibration

curve for each plate with the use of SoftMax Pro software. Results were expressed as mg/L of CRP. Four operators carried out RBP analysis.

2.7.2 Validation of DBS as a sample matrix for RBP and CRP

Sixty matching volunteer serum and DBS samples were used to validate DBS as a sample matrix for quantitative analysis of RBP and CRP. Serum was diluted 1:25 for both RBP and CRP analysis, while DBS samples were eluted as previously reported for RBP and CRP. Matching DBS eluate and diluted serum were loaded onto the same microwell plates for RBP and CRP, respectively, in order to exclude potential variations arising from the use of different calibration curves when matching samples are analyzed on separate plates and were analysed as previously reported for RBP and CRP above.

2.8. Data entry and cleaning

Data entry of the 2,766 completed and checked questionnaires was done using the Census and Survey Processing System (CSPro) software. It involved selection and training of the data entry clerks in Kakamega as well as their supervision until the completion of data verification phase. Post-coding occurred prior to data entry and any discrepancies in the CSPro data entry module or changes made for data verification phase were noted and communicated to CIP office in Nairobi, where part of the data entry occurred. Data entry and verification was completed by the end of July, and then comparison and merging the data entered in the two locations (Kakamega and Nairobi) were done to obtain a full dataset. Data cleaning consisted mainly of ensuring that each study participant had a unique identification number and conducting consistency checks between variables in every section of the questionnaire. Inconsistencies noted were corrected.

2.9. Data analysis

2.9.1. Created indices and scores for analysis

2.9.1.1. Wealth index

Socio-economic position (SEP) concept usually incorporates physical resources, social resources, and status within a social hierarchy. It is important to measure SEP because it is likely to confound many relationships we tend to investigate. Traditionally SEP is estimated using measures of income or consumption expenditure based on the assumption that material living standards determine well-being. While consumption expenditure data is preferred to income because it is less variable, it is often difficult to measure consumption in low-income countries. The major problem is the reliance on recall data and respondents may be reluctant to divulge

information. In addition, spatial and geographic fluctuations in prices require complex adjustments of expenditure figures to reflect these price differences. Furthermore, collecting consumption expenditure data requires lengthy questionnaires that must be completed by skilled and trained interviewers and are very expensive. We therefore decided to use an asset-based approach to measure SEP. This is an approach that has been used by Demographic and health Surveys (DHS), which usually does not have income and expenditure data. In theory, an asset-based wealth index represents long-term SEP in a similar way to consumption expenditure; asset ownership is likely to be based at least partially on economic wealth and household assets are unlikely to change in response to short-term economic shocks. However, there is a continued debate about the appropriateness of asset-based index. However, in our study we did not collect the expenditure data and this is the best way to assess SEP.

Various methods have been used to generate the asset based wealth index. The most commonly used currently is the Principal Component Analysis (PCA). The method determines weights for components of a wealth index. PCA is a 'data reduction' procedure. It involves replacing a set of correlated variables with a set of uncorrelated 'principal components', which represent unobserved characteristics of the population. The principal components are linear combinations of the original variables; the weights are derived from the correlation matrix of the data or the covariance matrix if the data have been standardized prior to PCA. However, this method is designed to use continuous, normally-distributed data. Its application to the predominantly discrete data in a wealth index is not appropriate. The use of binary dummy variables for each category of categorical is fraught with problems. The linear dependence between the dummy variables may lead to incorrect estimates of the wealth index; the PCA method is affected by collinearity, with variation in the data arising both from the underlying concept of wealth and from the linear dependence between dummy variables of categorical variables. The other problem with this method is that it is not possible to compare the wealth index created across countries or even between the rural areas and the urban areas in the same data set. We therefore decided to create our own wealth index. We used ordinal variables. Although this method is preferred to PCA in terms of the data assumptions of PCA, it also requires a stronger assumption about the ordinal nature of the data.

We ranked the nature of the roofing material used in the main houses and assume that they are equally spaced from each other in terms of their relationships with SEP. We ranked roof materials in order from tiles, iron sheets and grass in that order. So the highest is given an ordinal value of three and the lowest grass as 1. Then to normalize it we divided the value by the highest value to range from 0 to 1. The wall material was divided into five: brick/stones (5), plastered (4), wood (3), iron sheet (2) and mud (1). Floor material we had four options and we coded them as earth (1), cement (2), wood (3), and tiles (4). If the household had a toilet, we used a discrete value of 0 or 1. But we further asked the question of the type of the toilet. We had four categories and we gave them four ordinal values with outdoor un-walled (1), pit latrine (2), compost or eco-

toilet (3), and flush toilet (4). For sources of water in dry periods we had 14 categories with piped water into the compound given a value of (7), piped water outside the compound (6), water hawker-cart or boda-boda (5), water tank and roof catchment (4), well and borehole (3), unprotected spring and protected spring (2),and pond dam/ sand dams lake, stream river (1). At the same time we asked the distances to the sources of water during the dry period in minutes. We them took the inverse of the distance with the lowest distance having a value of 1.

We also asked about cooking fuel used in the household. The questionnaire had 8 categories that we later aggregated into 6 categories. Animal dung was assigned (1), then firewood (2), charcoal (3), paraffin (4), solar power, biogas (5), and LPG gas and electricity (6). We asked the type of lighting in the main house. The first category was wood fuel (1), then tin lamp (2), lantern (3), pressure lamp (4), researchable lamps (5), solar power, and electricity (7). All these variables were normalized from 0 to 1. We then added modern household assets that are not considered as means of production. Each of these assets was coded as 0 or 1 depending on if the household had it or not. The assets used in the wealth index were radio/cassette player, TV, telephone/mobile, solar panels, gas cooker, bicycle, motorized water pump, motor cycle, car truck, tractor, and generator. We then added the cattle index. To normalize the number we divide the total number by the highest number of animals owned. The calculated index was then divided into quintiles from lowest (I) to highest (V), and analysis was done according to these categories.

2.9.1.2. Knowledge Score

Figure 2 below shows the composition of knowledge score.

Domaines of knowledge scores   **Combined knowledge scores**

OFSP, Orange-fleshed sweetpotato
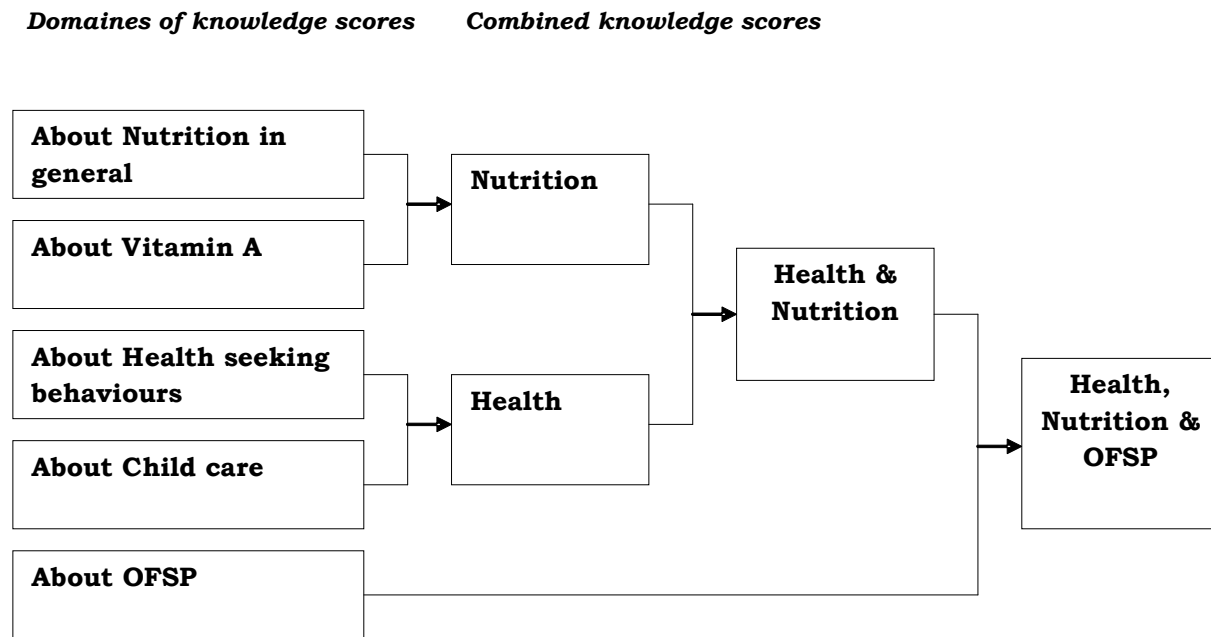
Figure 2: *Composition of knowledge scores*

The combined global score of knowledge included knowledge about nutrition in general, vitamin A, health seeking behaviours, childcare and OFSP. International recommendations were used to categorize knowledge as being good or not. The different elements considered for scoring are presented in *Table 3* below. The scoring system is presented in *annex 6*.

Table 3*: Variables considered in knowledge scores calculation.*

Knowledge scores	Variables considered for scoring
About nutrition	- What makes a child grow? - Can identify three food groups - Main energy foods - Main body-building foods - Main protective foods.
About vitamin A	- Ever heard of vitamin A? - Why is Vitamin A important? - Give three foods rich in Vitamin A.
About health seeking behaviours	- Most important things to ensure healthy pregnancy - Time to start attending ANC clinic - No. of times pregnant woman should attend ANC clinic - Services that occur at ANC visit
About child care	- Immediately after birth, the mother should - Feeding the baby colostrum after birth - Able to define exclusive breastfeeding - Age to introduce water - Age to introduce complementary foods - Age to introduce sweetpotato - Age to breastfeed baby until - A breastfed 6-8mo. old should be fed CFs - A breastfed 1 yr. old should be fed CFs
About Orange-fleshed sweetpotato	- What causes the holes in these sweetpotato - Identified the healthy plant as healthy - Identified the sick plant as sick - The problem is caused by - Which part of the SP vine is best to use for planting - Do you normally plant more than one cutting in one hole - Value of deep orange-fleshed SP variety

2.9.1.3. Food consumption score

The report also uses the Hellen Keller International (HKI) food frequency method to assess the community risk of Vitamin A deficiency. A food frequency method counts how often certain

foods are eaten over a period of time. Though the method is not as accurate as other techniques it can be used to predict whether or not a nutritional deficiency is a public health problem in the population. To calculate the score, we add all the number of days the child or the mother consumed vitamin A rich food that comes from animal source. Then add the number of days the child or mother consumed vitamin A rich food item that comes from a plant source. The consumption of the food items from plant sources is divided by 6. For the weighted consumption we add the total number of days the child or mother consumed vitamin A rich food item plus the adjusted consumption from the plant source. The community is considered to have vitamin A deficiency problem if: the mean frequency of consumption of animal sources of vitamin A is 4 days per week or less; or the mean frequency of total consumption of animal and plant sources of vitamin A (weighted by the food sources) is 6 days per week or less.

2.9.1.4. Dietary diversity indices and minimum acceptable diet

Dietary diversity index for households

Ten food groups were included in the dietary diversity index calculation for households: 1) Starchy staples, 2) Dark green leafy vegetables, 3) Other vitamin A rich fruits and vegetables, 4) Other fruits and vegetables, 5) Organ meat, 6) Meat and fish, 7) Eggs, 8) Legumes, nuts and seeds, 9) Milk and milk products, 10) Oils and fats (*FAO, 2011*). Each food group was quoted as 0 if not consumed during the past 24 h and 1 if consumed. The dietary diversity index was obtained by summing up the quotes for the 10 food groups. Therefore, the possible range of the dietary diversity index was from 0 to 10. The median value was used to categorize households into two equal groups of dietary diversity: high and low.

Dietary diversity index for children 6-23 months of age

The food groups used for tabulation of this indicator were: 1) Grains, roots and tubers, 2) Legumes and nuts, 3) Dairy products (milk, yogurt, and cheese), 4) Flesh foods (meat, fish, poultry and liver/organ meats), 5) Eggs, 6) Vitamin-A rich fruits and vegetables, and 7) Other fruits and vegetables. Each food group was quoted as 0 if not consumed during the past 24 h and 1 if consumed. The dietary diversity index was obtained by summing up the quotes for the 7 food groups. The possible range of the dietary diversity index was from 0 to 7. The cut-off of at least 4 of the above 7 food groups was used to define minimum dietary diversity (*WHO, 2008*).

Minimum meal frequency and minimum acceptable diet for children 6-23 months of age

Children with minimum meal frequency were those breastfed or not who received solid, semi-solid, or soft foods the minimum number of times or more. Minimum is defined as 2 times for

breastfed infants 6–8 months, 3 times for breastfed children 9–23 months and 4 times for non-breastfed children 6–23 months during the previous day.

Children with minimum acceptable diet were those who had at least the minimum dietary diversity and the minimum meal frequency during the previous day.

2.9.1.5. Anthropometric indices

For children 6-23 months of age

Length-for-age, weight-for-age and weight-for-length z-scores (HAZ, WAZ and WHZ) were computed using the Anthro software (WHO Anthro 2006, Geneva, Switzerland), considering the 2006 WHO reference population. Each of these indices provides different information about growth and body composition, which is used to assess nutritional status.

The length-for-age index is an indicator of linear growth retardation and cumulative growth deficits. Children whose length-for-age z-score is below minus two standard deviations (-2 SD) were considered short for their age (stunted) and were chronically malnourished. Children who were below minus three standard deviations (-3 SD) were considered severely stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness. Length-for-age, therefore, represents the long-term effects of malnutrition in a population and is not sensitive to recent, short-term changes in dietary intake.

The weight-for-length index measures body mass in relation to body length and describes current nutritional status. Children whose z-scores are below minus two standard deviations (-2 SD) were considered thin (wasted) and were acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition. Children whose weight-for-length was below minus three standard deviations (-3 SD) were considered severely wasted.

Weight-for-age is a composite index of length-for-age and weight-for-length. It takes into account both acute and chronic malnutrition. Children whose weight-for-age is below minus two standard deviations were classified as underweight. Children whose weight-for-age was below minus three standard deviations (-3 SD) were considered severely underweight.

For non-pregnant women

The body mass index (BMI) was calculated as weight (in kg) divided by height squared (in m^2). BMI below 18.5 kg/ m^2 defined underweight in women.

2.9.2. Software package and statistical analysis

Data were analysed by using the Statistical Package for Social Sciences statistical software package version 19.0 for Windows (SPSS Inc., Chicago IL, USA) and SAS 9.2 (SAS Institute Inc., Cary, NC). We visually checked the normal distribution of quantitative data by using normality plots. We compared different characteristics between Control and Intervention by using Student's t test to compare the means, Mann–Whitney's test to compare the medians, and Pearson's χ^2 test or Fischer's test to compare the proportions.

3. RESULTS

3.1. Descriptive statistics sample

3.1.1. Characteristics of participants

3.1.1.1. Pregnant women (N=980)

Table 4: *Characteristics of pregnant women, overall and by study areas*

	Overall (n=980)		By study areas				*p*
			Control (n=489)		Intervention (n=491)		
	n	*%*	*n*	*%*	*n*	*%*	
Age (years)[a]	26.4[1]	6.6[2]	26.0[1]	6.4[2]	26.9[1]	6.8[2]	*0.05*
≤25	508	52.6	261	53.9	247	51.2	*0.22*
Pregnancy age (months)[b]	5.9[1]	2.1[2]	5.4[1]	2.1[2]	5.8[1]	2.1[2]	*0.33*
First trimester	161	16.5	83	17.0	78	15.9	*0.19*
Second trimester	377	38.5	174	35.7	203	41.3	
Third trimester	440	45.0	230	47.2	210	42.8	
Currently enrolled in formal schooling	42	4.3	20	4.1	22	4.5	*0.43*
Years of formal education	8.0[1]	2.8[2]	7.9[1]	2.6[2]	8.1[1]	3.0[2]	*0.12*
Highest level of formal education completed None Primary Secondary College graduate	25 696 230 20 8	2.6 71.1 23.5 2.0 0.8	13 363 103 6 4	2.7 74.2 21.2 1.2 0.8	12 333 127 14 4	2.4 68 25.9 2.9 0.8	*0.13*
Marital status							*0.52*
Married monogamous	785	80.7	391	80.3	394	81.1	
Married polygamous	68	7.0	38	7.8	30	6.2	
Single	101	10.4	51	10.5	50	10.3	
Other	19	2.0	7	1.4	12	2.5	
Is currently involved in growing sweetpotatoes	804	82.6	392	80.5	412	84.8	*0.047*
Agriculture is principal activity	681	75.2	346	75.5	335	74.8	*0.42*
Has sold agriculture or livestock products last year	630	64.7	296	60.7	334	68.7	*0.005*
Has undertaken salaried employment last year	54	5.5	24	4.9	30	6.2	*0.24*
Has done casual labour last year	380	39.1	177	36.3	203	41.8	*0.048*
Has been involved in informal business last year	194	19.9	104	21.4	90	18.5	*0.15*
Has been involved in some other form of self-employment	220	22.6	98	20.1	122	25.1	*0.037*

[1]Mean [2] standard deviation. [a]missing values are 9 for Intervention and 5 for Control; [b]2 missing values among Control

A total of 980 pregnant women were surveyed; of which 489 were from the Control areas(participants) and the other 491 were from the Intervention areas. Majority of the women

sampled were in the second and the third trimester of their pregnancy (39% and 45% respectively). Only 17% were in the first trimester. There were no significant differences in stages of pregnancy between women in the Control and Intervention areas. Average age in years of women in the Control group was significantly lower than that of those in the Intervention group at 5 % level of significance (p value =0.05). About 4% of the pregnant women were still enrolled in formal school. Overall, the average years of formal training for the pregnant women was 8 years and it was comparable between both study groups. Furthermore, the proportion of uneducated women (no level of formal training) was approximately 3% and was comparable among the study groups. However, the proportion of women in the Intervention group who had more than primary school level of education (30%) was higher than that of the participants (23 %).

Approximately 83% of all the pregnant women were growing sweet potatoes; the proportion was significantly higher for the Intervention group (85%) compared to the Control group (81%). Of all the pregnant women surveyed, about three quarters practiced agriculture as their principal activity. This proportion was however not significantly different between the two groups (p value >0.1).

In addition, the proportion of farmers involved in commercial agriculture (sold agriculture or livestock products) was significantly higher for the Intervention group (69%) compared to that of the Control group (61%) at 1 % level of significance. Similarly, a significantly higher number of pregnant women in the Intervention group were involved in casual labour and self-employment (42% and 25%, respectively) compared to that in the Control group (36% and 20%, respectively). Overall, only 20% and 6% of the pregnant women were involved in informal businesses and salaried employment, respectively, and these proportions were not significantly different between the two groups.
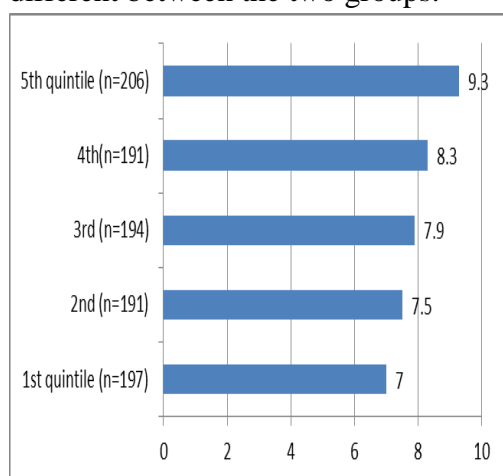
Figure 3*: Education levels of pregnant women by wealth status*

Years of formal education p value=0.000
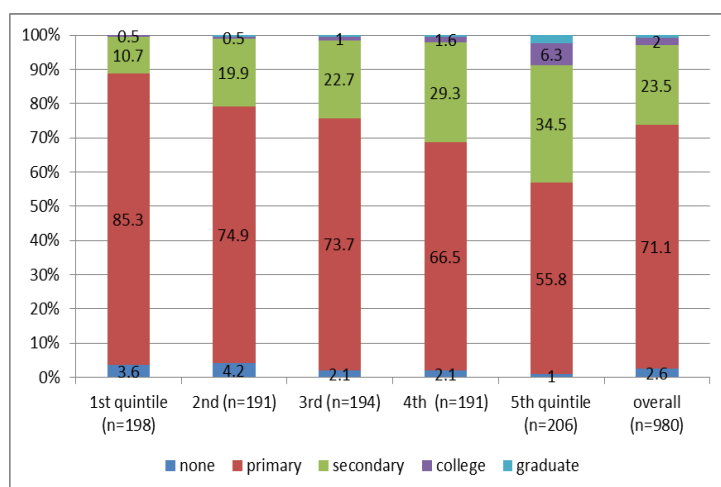
Figure 4*: Proportion of pregnant women with different education levels by wealth status*

For the whole sample, Figure 3 shows education levels of pregnant women varied significantly with the wealth status of the households. Women from wealthier households were more educated compared to those from poorer households, with the proportion of women with higher levels of education increasing with wealth; only 11% of the women in the lowest wealth quintile had more than Primary school level education compared to 43% of women in the highest wealth quintile. Similarly, 7% of the women in the highest wealth quintile (the highest in all the quintiles) had more than secondary school level of education compared to only less than 1% of those in the lowest quintile. Average years of formal training among the pregnant women also increased with the households' wealth status, from a minimum of 7 years for those in the lowest quintile to a maximum of 9 years for those in the highest wealth quintile.

Table 5*: Characteristics of pregnant women, by districts (N=980)*

	By districts							
	Kimilili (n=222)		Bunyala (n=64)		Bungoma North (n=624)		Bungoma East (n=70)	
	N	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Age (years)[a]	26.3	6.5	25.7	7.1	26.7	6.7	25.6	5.8
≤25	112	50.7	37	58.7	321	52.5	38	54.3
Pregnancy age (months)[b]	6.0	2.1	5.8	2.0	5.9	2.1	5.4	2.2
First trimester	40	18.1	9	14.1	95	15.2	17	24.3
Second trimester	72	32.6	28	43.8	249	40.0	28	40.0
Third trimester	109	49.3	27	42.2	279	44.8	25	35.7
Currently enrolled in formal schooling	8	3.6	2	3.1	32	5.2	0	0.0

Years of formal education	8.0[1]	2.4[2]	6.8	2.9	8.1	2.9	8.7	2.8
Highest level of formal education completed								
None	2	0.9	6	9.4	17	2.7	0	0.0
Primary	171	77	46	71.9	432	69.2	47	67.1
Secondary	43	19.4	12	18.8	157	25.2	18	25.7
College	5	2.3	0	0.0	11	1.8	4	5.7
graduate	1	0.5	0	0.0	6	1.0	1	1.4
Marital status								
Married monogamous	178	80.5	46	71.9	500	80.9	61	87.1
Married polygamous	21	9.5	6	9.4	37	6.0	4	5.7
Single	20	9.0	10	15.6	68	11.0	3	4.3
Other	2	0.9	2	3.1	13	2.1	2	2.9
Is currently involved in growing sweetpotatoes	181	81.9	47	73.4	517	83.7	59	84.3
Agriculture is principal activity	158	75.2	43	71.7	425	74.7	55	82.1
Has sold agriculture or livestock products last year	150	67.8	26	40.6	403	65.2	51	72.9
Has undertaken salaried employment last year	10	4.4	3	4.7	34	5.5	7	10.0
Has done casual labour last year	78	35.3	16	25.0	264	42.7	22	31.4
Has been involved in informal business last year	44	19.9	15	23.4	125	20.2	10	14.3
Has been involved in some other form of self-employment	53	24.0	13	20.3	138	22.3	16	22.9

[1] Mean [2](SD), [a] missing values are 1, 1 and 12 for Kimilili, Bunyala and Bungoma North, respectively; [b] 1 missing value in Kimilili and Bungoma North

Table 5 above presents the characteristics of pregnant women surveyed across the 4 districts for Kimilili, Bunyala, Bungoma North and Bungoma East. Of the 980 respondents, 64% were from Bungoma North, 23% from Kimilili, 7% from Bungoma East and the remaining 6% were from Bunyala district. In all the districts, majority of the women were in the second and third trimester of their pregnancy. The proportion of women in their first trimester was relatively low in all the districts ranging from 14% in Bunyala to 23% in Bungoma East. The mean age of the respondents was not very different across the districts and the range was between 25.6 years in Bungoma East and 26.7 years in Bungoma North.

3.1.1.2.   *Caretakers of children aged 6-23 months (N=1781)*

Table 6: *Characteristics of caretakers, overall and by study areas*

Status of caretaker	Overall (n=1781)		By study areas				
			Intervention (n=897)		Control (n=884)		*p*
	N	*%*	*n*	*%*	*n*	*%*	
The caretaker is the biological mother to the child	1699	95.9	842	94.6	857	97.3	*0.005*
Age (years)[a]	29.4[1]	8.6[2]	29.9[1]	8.8[2]	28.9[1]	8.4[2]	*0.017*
≤25	710	40.3	340	38.3	370	42.3	*0.048*
Currently enrolled in formal schooling	63	3.6	27	3.0	36	4.1	*0.14*
Years of formal education	7.9[1]	3.0[2]	7.8[1]	3.0[2]	8.0[1]	2.9[2]	*0.26*
Highest level of formal education completed None Primary Secondary College graduate	53 1229 446 31 20	3.0 69.1 25.1 1.7 1.1	30 611 215 17 11	3.4 69.1 24.3 1.9 1.2	23 618 231 14 9	2.6 69.1 25.8 1.6 1.0	*0.74*
Marital status Married monogamous Married polygamous Single Other	1382 149 165 70	78.3 8.4 9.3 4.0	718 67 67 37	80.8 7.5 7.5 4.2	664 82 98 33	75.7 9.4 11.2 3.8	*0.022*
Is currently involved in growing sweetpotatoes	1557	88.2	801	90.1	756	86.2	*0.007*
Agriculture is principal activity	1352	79.9	685	79.3	667	80.5	*0.29*
Has sold agriculture or livestock products last year	1305	73.8	677	76.1	628	71.6	*0.016*
Has undertaken salaried employment Last year	94	5.3	47	5.3	47	5.4	*0.52*
Has done casual labour last year	777	44.0	412	46.3	365	41.6	*0.025*
Has been I involved in informal business last year	257	14.6	123	13.8	134	15.3	*0.21*
Has been involved in some other form of self-employment last year	511	28.9	264	29.7	247	28.2	*0.26*

[1] Mean [2] (SD), [a] missing values are 10 for Intervention and 10 among Control

The proportion of respondents with education levels higher than primary level was highest in Bungoma East district at 33% and was least Bunyala District (19%). Similarly, the average years of formal education were highest among the women in Bungoma East and lowest among those in Bunyala (8.7 years versus 6.8 years). In addition, the proportion of uneducated women was highest in Bunyala and lowest in Bungoma East (9 % vs. 0% respectively). However, the number of pregnant women who were currently enrolled in formal schooling during the time of the survey was relatively low in all the districts ranging from 0 per cent in Bungoma East to 5 per cent in Bungoma North district.

The proportion of respondents whose main activity is agriculture was highest in Bungoma East district (82%) and lowest in Bunyala district (72%). This proportion was 75 % for both Kimilili and Bungoma North districts. Additionally, the proportion of farmers who were involved in commercial agriculture was highest in Bungoma East (73 per cent) and lowest in Bunyala (41 per cent). The proportion of women who were involved in the other income generating activities was not very different across the four districts

In this study, caretakers are defined as the person who is present in the household most of the time and takes care of the child on a daily basis. Table 7 above shows the characteristics of the caretakers of children aged 6-23 years based on a sample of 1781 respondents. From the table we find that 95% of them were actually mothers of the children. From the table we find that 884 were in the Control group and the other 897 were in the Intervention group. Approximately 95 per cent of all caretakers are the mother of the child. The average age for the whole group was approximately 29 years and was comparable across the study areas. In addition, the proportion of caretakers aged not more than 25 years was significantly higher in the Control area (42%) compared to that in the Intervention area (38%).Overall, the average years of formal education among the caretakers was 8 years that is comparable among the study groups. Approximately 3% of the caretakers, comparable across the study groups were uneducated. Majority of the caretakers in both study groups had up to primary level of education and only 28%of them, still comparable between the two study groups had education levels higher than at the primary level. Still, only a low of 4% of all the caretakers were currently involved in formal schooling during the time of the survey and it was almost the same for the two study groups. Approximately 87% of the caretakers were either monogamously or polygamous and this proportion was significantly higher for the Intervention group (88 %) compared to the Control group (85%).

Of all the interviewed caretakers, approximately 88% were growing sweet potatoes at the time of the survey. This proportion was significantly lower among the Control group (86%)in comparison to the Intervention group (90%) at a 1% level of significance. The proportion of the respondents whose main activity is agriculture was 81% for the Control group and 79% for the Intervention group and the difference was not significant. In addition, a significantly higher proportion of the Intervention group was involved in commercial agriculture (76%) compared to that of the Control group (71%) at 5 per cent level of significance. Similarly, a significantly higher proportion of the caretakers in the Intervention group were involved in casual labour (46%) compared to that of the invention group (41%) at 5% level of significance. Overall, the proportion of caretakers involved in salaried employment, informal businesses and in self-employment was approximately 5%, 15% and 29%, respectively. These proportions were however not statistically different between the two study groups.
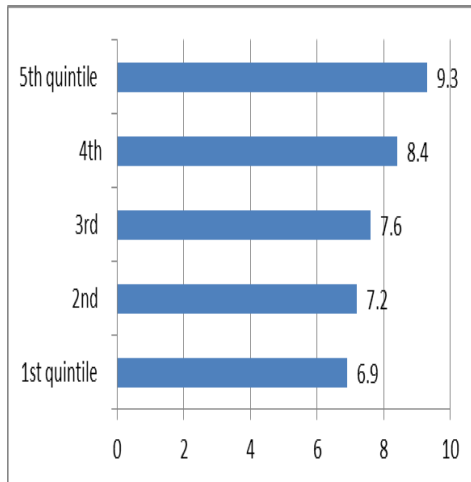
Average formal years of education   P value=0.000

Figure 5*: Education levels of caretakers by households' wealth status*
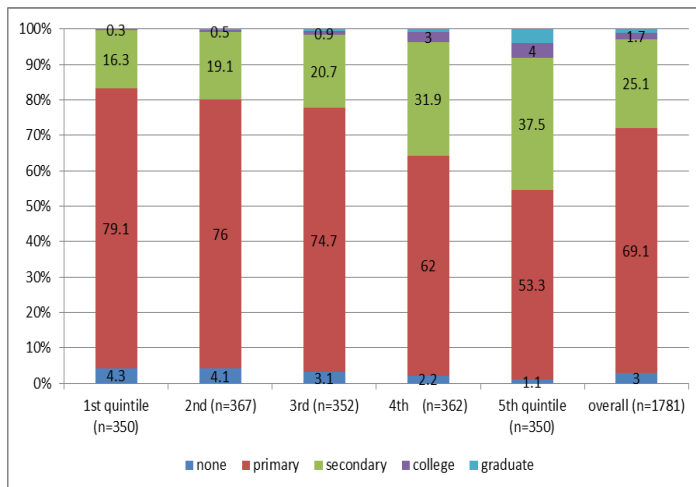
Figure 6: *Proportion of caretakers with different education levels by wealth status*

As shown in Figure 6 above, education levels of the caretakers of children aged between 6 and 23 months varied significantly with the wealth status of the households. Only 1% of the households whose wealth index is in the highest quintile were uneducated compared to 4% each of those whose wealth index was ranked in the 1st and 2nd quintile. In addition, the proportion of caretakers with more than primary level education increased with wealth; it was 17% for the households in the lowest wealth quintile and 46% for those in the highest quintile. Further still, the proportion of caretakers with college or graduate level education was highest for the households in the highest quintile (8%) and almost no caretakers had higher education levels in the lowest quintile group. Average years of formal education also increased with increase in

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wealth; the range was between a minimum of 7 years for those in the lowest quintile, to 9 years for those in the highest wealth quintile.

Table 7: *Characteristics of caretakers, by districts*

	By districts							
	Kimilili (n=398)		Bunyala (n=157)		Bungoma North (n=1082)		Bungoma East (n=144)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Status of caretaker								
Mother	389	98.0	153	97.5	1022	95.2	135	94.4
Age (years)[a]	28.5[1]	8.0[2]	26.8[1]	6.4[2]	30.0[1]	8.9[2]	30.1[1]	9.1[2]
≤25	171	43.5	81	51.6	403	37.8	54	37.8
Currently enrolled in formal schooling	17	4.3	3	4.3	40	3.7	3	2.1
Years of formal education	8.2[1]	2.9[2]	6.8[1]	3.1[2]	8.0[1]	3.0[2]	7.6[1]	3.0[2]
Highest level of formal education completed								
None								
Primary	5	1.3	12	7.6	30	2.8	6	4.2
Secondary	275	69.1	119	75.8	738	68.2	97	67.4
College	105	26.4	24	15.3	281	26.0	36	25.0
Graduate	5	1.3	2	1.3	21	1.9	3	2.1
	8	2.0	0	0	12	1.1	0	0.0
Marital status								
Married monogamous	307	77.5	106	67.5	854	79.8	115	80.4
Married polygamous	37	9.3	16	10.2	86	8.0	10	7.0
Single	39	9.8	29	18.5	87	8.1	10	7.0
Other	13	3.3	6	3.8	43	4.0	8	5.6
Is currently involved in growing sweetpotatoes	343	86.6	116	73.9	959	89.6	139	97.2
Agriculture is principal activity	305	81.6	111	77.6	815	78.6	121	87.1
Has sold agriculture or livestock products last year	294	74.2	86	54.7	817	76.3	108	75.5
Has undertaken salaried employment Last year	21	5.3	4	2.5	61	5.7	8	5.6
Has done casual labour last year	161	40.7	60	38.2	497	46.4	59	41.3
Has been I involved in informal business last year	53	13.4	28	17.8	158	14.8	18	12.6
Has been involved in some other form of self-employment last year	138	34.8	38	24.2	295	27.6	40	28.0

[1]Mean [2](SD), [a]missing values are 3, 16 and 1 for Kimilili, Bungoma North and Bungoma East, respectively.

Table 7 above shows summary statistics of the interviewed caretakers defined across the four districts. Of all the respondents,61% were from Bungoma North, 22% from Kimilili, 9% from Bunyala, and the remaining 8% from Bungoma East. Average age in years varied across the four districts ranging from 27 years in Bunyala District and 30 years in Bungoma East District. In addition, the proportion of respondent aged ≤ 25 years was lowest in Bungoma East (38%) and

highest in Bunyala district (52%).In all the four districts majority of the women were in a monogamous marriage and the proportion ranged from 68% in Bunyala to 80% in Bungoma East.

Average years of formal education were highest for the women in Kimilili (8.2) and were lowest for those in Bunyala (6.8). In addition, the proportion of uneducated caretakers was highest in Bunyala and lowest in Kimilili (7% vs. 1%, respectively). Furthermore, the proportion of caretakers who had higher than primary school levels of education was highest in Kimilili (30%) and lowest in Bunyala district (17%). Bungoma East had the highest proportion of respondents who were involved in growing sweet potatoes (97%) while the lowest was in the case of Bunyala district (74 %). Similarly, Bungoma East had the highest number of respondents who practiced agriculture as their principal activity (87%) while Bunyala district had the least of the same (78%).

The proportion of the caretakers involved in the income generating activities did not vary widely across the four districts. The only exception was for the proportion involved in commercial agriculture where the range was from 55% in Bunyala to 76% in Bungoma North district.

3.1.1.3. Children aged 6-23 months (N= 1989)

Table 8: *Characteristics of children aged 6-23 months, overall and by study areas.*

	Overall (n=1989)		By study areas				
			Intervention (n=997)		Control (n=992)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Age (months)	14.3^1	5.1^2	14.4^1	5.2^2	14.3^1	5.0^2	*0.80*
6-11	695	34.9	346	34.7	349	35.2	*0.43*
12-23	1292	65.1	651	65.3	643	64.8	
Sex							*0.14*
Female	960	48.3	469	47.0	491	49.5	
Male	1029	51.7	528	53.0	501	50.5	

[1] Mean [2] (SD)

Of the 1989childrenbetween6-23 months of age, approximately 65% of them were between 12-23 months and the proportion was not significantly different between the Intervention and the Control. The proportion of males (52%) was marginally higher than that of the females (48%) though this proportion was not significantly different between the two study groups.

Table 9: *Characteristics of children aged 6-23 months, by district.*

	By districts							
	Kimilili (n=451)		Bunyala (n=176)		Bungoma North (n=1208)		Bungoma East (n=154)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Age (months)	14.2^1	5.0^2	14.5^1	5.2^2	14.4^1	5.1^2	14.0^1	5.0^2

6-11	164	36.4	60	34.1	415	34.4	56	36.4
12-23	287	63.6	116	65.9	793	65.6	98	63.6
Sex							
Female	223	49.4	94	53.4	565	46.7	78	50.6
Male	228	50.6	82	46.6	643	53.3	76	49.4

[1] Mean [2] (SD)

In all the districts, majority of the children between 6-23 months of age were between 12- 23 months (at least 63%). The proportion of male and female was comparatively the same across all districts.

3.1.2. Household demographic and socioeconomic characteristics for the whole sample

3.1.2.1.   *Household size and characteristics of household head (N=2761)*

Table 10*: Household size and characteristics of household head, overall and by study areas.*

	Overall		By study areas				*p*
	(n=2761)		Control (n=1373)		Intervention (n=1388)		
	N	%	n	%	n	%	
Household size	5.4[1]	2.2[2]	5.4[1]	2.3[2]	5.4[1]	2.2[2]	*0.40*
1-3	1354	49.0	688	50.1	666	48.0	*0.26*
4-15	1407	51.0	685	49.9	722	52.0	
Age of household head (years)[a]	38.1[1]	12.1[2]	37.7[1]	11.9[2]	38.5[1]	12.4[2]	*0.08*
16-35	1386	50.9	707	52.9	679	49.6	*0.19*
36-93	1338	49.1	649	47.1	689	50.4	
Sex of household head							*0.82*
Female	226	8.2	114	8.3	112	8.1	
Male	2535	91.8	1259	91.7	1276	91.9	
Years of formal education	8.8[1]	3.4[2]	8.7[1]	3.4[2]	9.0[1]	3.4[2]	*0.04*
Highest level of formal education completed by household head							*0.10*
None	61	2.2	33	2.4	28	2.0	
Primary	1562	59.1	808	59.1	754	54.6	
Secondary	975	35.5	451	33.0	524	38.8	
College	72	2.6	35	2.6	37	2.7	
graduate	77	2.8	40	2.9	37	2.7	
Household head has agriculture as the principal activity	1373	49.7	696	50.7	677	48.8	*0.31*
Household head has sold agriculture or livestock product last year	1864	67.5	911	66.4	953	68.7	*0.19*
Household head has undertaken salaried employment last year	652	23.6	309	22.5	343	24.7	*0.17*
Household head has done casual labour last year	1258	45.6	600	43.7	658	47.4	*0.05*
Household head has been involved in informal business last year	388	14.1	205	14.9	183	13.2	*0.18*
Household head has been involved in some other form of self-employment last year	869	31.5	465	33.5	404	29.1	*0.007*

[1] Mean [2] (SD); [a] missing values are 20 among Intervention and 17 among Control.

Table 10 above presents summary statistics for household size and characteristics of the household head for all 2761 households; of which almost half were from the Control areas and the other half were from the Intervention areas. Average household size for the whole sample was five persons and it was approximately the same for the Intervention and Control areas. Moreover, in almost half of households the household size was four or more persons for both the Intervention group and the Control group. The average age for the whole sample was approximately 38 years. However, it was significantly higher among the Intervention group compared to the Control group at 10% level of significance. Approximately 92% of the households were male headed while the remaining 8% are female headed and was not very different between the two groups. For all the respondents, the average years of formal education of the household heads were 9 years and were almost the same among the study groups. Only 2% of the household heads were uneducated and this proportion was not significantly different among the study groups. The proportion who had higher than primary school level of education was 40%; it was slightly higher for the Intervention (42%) compared to the Control (39%).

The proportion of household heads whose principal activity was agriculture for the overall sample was 50% and was approximately the same between the study groups. Similarly, the proportion of household heads reported to be involved in commercial agriculture was also not significantly different between the Control and Intervention group. Overall, the proportion was 68%, among the Control and Intervention groups it was 66% and 69%, respectively. Still, the proportion of household heads who had undertaken salaried employment and who were involved in informal businesses was also not significantly different between the two groups. However, a significantly greater proportion of household heads from the Intervention areas was involved in casual labour compared to the Control whereas significantly more household heads from the Control areas compared to those from the Intervention arras were involved in self-employment.
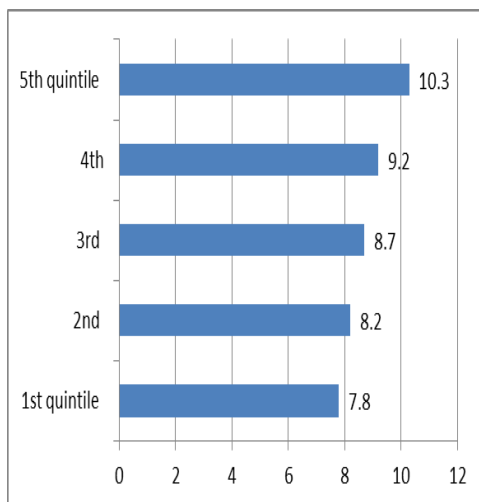
Figure 7: *Education levels of household heads by wealth status of the household (N=2761)*

Figure 8: *Proportion of household heads with different education levels by wealth status*

Just as with the pregnant mothers and the caretakers, the education levels of the household heads varied significantly with the wealth status of the households. Of the households with a wealth index in the highest quintile, less than 1% are uneducated while for those in the 1st and 2nd quintiles 4%, each were uneducated. Similarly, proportion of household heads with more than primary school education was lowest for those in the lowest quintile (28%) and was highest for those in the highest quintile (57%). The proportion of household heads who had either college level or graduate level education was also highest among the households in the highest wealth quintile (14%) and was least for those in the lowest quintile (2%). Average years of formal education for the household heads also increased with the increase in the households' wealth status, from a minimum of 8 years for those in the lowest quintile to a maximum of 10 years for those in the highest quintile.

Table 11: *Household size and characteristics of household head, by districts (N=2761)*

	By districts							
	Kimilili (n=620)		Bunyala (n=221)		Bungoma North (n=1706)		Bungoma East (n=214)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Household size	5.4^1	2.3^2	5.5^1	2.3^2	5.4^1	2.2^2	5.5^1	2.3^2
1-3	307	49.5	108	48.8	831	48.7	108	50.5
4-15	313	50.5	113	51.2	875	51.3	106	49.5
Age of household head (years)[b]	37.4^1	11.5^2	38.6^1	13.0^2	38.2^1	12.2^2	38.6^1	12.4^2
16-35	328	53.5	108	49.5	848	50.4	102	48.1
36-93	285	46.5	110	50.5	833	49.6	110	51.9
Sex of household head								
Female	37	6.0	28	12.7	146	8.6	15	7.0
Male	583	94.0	193	87.3	1560	91.4	199	93.0
Years of formal education	9.0^1	3.2^2	8.0^1	3.5^2	8.8^1	3.4^2	9.4^1	3.2^2
Highest level of formal education completed by household head								
None	8	1.3	14	6.3	36	2.1	3	1.4
Primary	333	54.2	140	63.3	992	58.3	97	46.2
Secondary	240	39.1	56	25.3	580	34.1	99	47.1
College	16	2.6	8	3.6	44	2.6	4	1.9
Graduate	17	2.8	3	1.4	50	2.9	7	3.3

Household head has agriculture as the principal activity	299	48.2	108	48.9	841	49.3	125	58.4
Household head has sold agriculture or livestock product last year	429	69.2	116	52.5	1178	69.1	141	65.9
Household head has undertaken salaried employment last year	154	24.8	27	12.2	407	23.9	64	29.9
Household head has done casual labour last year	260	41.9	91	41.2	806	47.2	101	47.2
Household head has been involved in informal business last year	96	15.5	30	13.6	234	13.7	28	13.1
Household head has been involved in some other form of self-employment last year	229	36.9	92	41.6	495	29.0	53	24.8

[1] Mean,[2] SD, [b] missing values are 7, 3, 25 and 2 in Kimilili, Bunyala, Bungoma North and Bungoma East respectively.

Table 11 above shows household size and the characteristics of household heads across the four districts. The average household size was approximately 5 persons for all the four districts. Similarly, the proportion of households with a household size of 4-15 persons was almost the same in all the districts with a narrow range of between 51%in Bungoma North and 50% in Bungoma East. Age of the household heads in all the four districts, ranged narrowly from a minimum of37 years reported in Kimilili district to a maximum of 39years, which was reported for Bunyala and Bungoma East districts. In addition, the proportion of household heads aged between 36 and 93 years was highest in Bungoma East District (52%) and lowest in Kimilili district (47%). Majority of the households across the four districts, ranging from 94% in Kimilili to 87% in Bunyala, were male headed. Education levels of the household heads were highest in Bungoma East and lowest in Bunyala. Proportion of household heads that had formal education higher than the primary level was highest in Bungoma East district (49%) and lowest in Bunyala District (30%). Similarly, the proportion of uneducated household heads was highest in Bunyala and least in Bungoma East (6% vs.1%, respectively).

3.1.2.2. Land holdings and area cultivated by household in the past year

Table 12: *Number of fields and areas cultivated by households the past year, overall and by study areas.*

	Overall (n=2761)		By study areas				
			Control (n=1373)		Intervention (n=1388)		*P*
	n	%	n	%	n	%	
cultivated fields in uplands[a]							*0.17*
no	318	11.6	169	12.4	149	10.8	
yes	2425	88.4	1191	87.6	1234	89.2	
Number of fields in lowlands[b]							*0.018*
no	1887	72.4	914	70.4	976	74.5	
yes	718	27.6	385	29.6	333	25.5	
Number of fields in the uplands	2.4[1]	1.7[2]	2.4	1.6	2.4	1.8	*0.881*
Number of fields in the lowlands	0.58[1]	1.1[2]	0.63	1.2	0.53	1.1	*0.03*
Area cultivated in uplands (acres) [c]	1.5[1]	1.9[2]	1.4	1.2	1.6	2.3	*0.002*

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Area cultivated in lowlands (acres) [d]	1.1[1]	1.4[2]	1.1	1.1	1.1	1.7	*0.84*
Total area cultivated (acres) [e]	2.5[1]	2.2[2]	2.5	2.1	2.6	2.4	*0.63*

[1]is the mean; [2] is the standard deviation. Missing values: [a] 13 in Control and 5 in Intervention; [b] 74 in Control and 82 in Intervention;[c] 25 in Control and 33 in Intervention; [d] 78 in Control and 92 in Intervention; [e]95 in Control and 104 and Intervention.

Of the four districts, Bungoma East had the largest proportion of household heads whose principal activity is agriculture (58%) while the lowest was reported in Kimilili district (48%). The proportion of respondents involved in commercial agriculture was highest in Kimilili District (69%) and lowest in Bunyala District (53%). In comparison to the other districts, Bungoma East had the highest proportion of respondents who had undertaken salaried employment and of those involved in casual labour (30% and 47%, respectively) while Bunyala district reported the lowest proportions of the same (12% and 41%, respectively). Similarly, the proportion of household heads who were involved in informal business was highest in Kimilili district and lowest in Bungoma East district ranging between 16% and 13% respectively. For the proportion of household heads involved in other forms of self-employment, the highest were reported in Bunyala district (42%) and the lowest were reported in Bungoma East district (25%).

A greater proportion of the fields cultivated by the households were in Uplands areas. Overall, the proportion of respondents who cultivated fields in the uplands was about 88% and was comparable across the study groups. The average number of fields in the uplands (mean± standard deviation) was 2.4 ±1.1 acres and was almost the same for both study groups. Average upland area under cultivation in acreage was significantly higher for the Intervention (1.6±2.3 acres) compared to the Control group (1.4±1.2 acres). On the other hand, most of the households (72%) did not cultivate any land in the lowlands; the proportion was significantly lower among the Control group (70%)compared to the Intervention group (74%). Similarly, the average number of fields cultivated in the lowland was significantly higher among the Control group compared to the Intervention group (0.6 vs. 0.5 fields, respectively). Average lowland area in acreage that was under cultivation was 1.1 ± 1.4 ha and was comparable between the two study areas..

Table 13*: Number of fields and areas cultivated by households the past year, by districts*

	By districts							
	Kimilili (n=620)		**Bunyala (n=221)**		**Bungoma North (n=1706)**		**Bungoma East (n=214)**	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
cultivated fields in uplands [a] no yes	66 551	10.7 89.3	36 179	16.7 83.3	197 1501	11.6 88.4	19 194	8.9 91.1
cultivated fields in lowlands[b]								

no	402	69.0	129	60.0	1211	75.5	145	71.1
yes	181	31.0	86	40.0	392	24.5	59	28.9
Number of fields in the uplands	2.5^1	1.6^2	2.3^1	1.6^2	2.5^1	1.7^2	1.9^1	1.3^2
Number of fields in the lowlands	0.66^1	1.2^2	0.84^1	1.3^2	0.53^1	1.1^2	0.50^1	1.1^2
Area cultivated in uplands (acres) [c]	1.4^1	1.1^2	1.3^1	1.2^2	1.5^1	2.0^2	1.9^1	2.6^2
Area cultivated in lowlands (acres) [d]	1.1^1	1.2^2	1.2^1	1.1^2	1.1^1	1.6^2	1.1^1	1.1^2
Total area cultivated (acres) [e]	2.6^1	2.3^2	2.2^1	1.6^2	2.4^1	1.9^2	3.3^1	3.9^2

[1]is the mean, [2] the standard deviation. Missing values: [a]3, 6, 8 and 1 in Kimilili, Bunyala, Bungoma North and Bungoma East, respectively; [b] 37, 6, 103 and 10 in Kimilili, Bunyala, Bungoma North and Bungoma East, respectively; [c] 8, 6, 39 and 5 in Kimilili, Bunyala, Bungoma North and Bungoma East, respectively; [d] 39, 7, 111 and 13 in Kimilili, Bunyala, Bungoma North and Bungoma East, respectively; [e] 43, 12, 131 and 13 in Kimilili, Bunyala, Bungoma North and Bungoma East, respectively.

3.1.2.3. *Housing characteristics*

Table 14: *Housing characteristics, overall and by study areas(N=2761)*

	Overall (n=2761)		Control (n=1373)		Intervention (n=1388)		*p*
	n	%	n	%	n	%	
Household is own by one of the members[1]	2651	96.1	1308	95.3	1343	96.8	*0.035*
Wall material of the households' main house[2]							*0.67*
Mud							
Brick, stone	2516	91.2	1248	91.0	1268	91.4	
	243	8.8	124	9.0	119	8.6	
Floor material of the households' main house[3]							*0.024*
Earth							
Cement, tiles	2500	90.7	1226	89.4	1274	91.9	
	257	9.3	145	10.6	112	8.1	
Roofing material of the households' main house[4]							*0.008*
Grass							
Iron sheet, tiles	426	15.4	237	17.3	189	13.6	
	2332	84.6	1134	82.7	1198	86.4	
Household main cooking fuel[5]							*0.13*
Firewood, charcoal	2738	99.2	1366	99.5	1372	99.0	
Other	21	0.8	7	0.5	14	1.0	
Household main type of lighting[6]							*0.23*
Tin lamp, lantern	2688	97.5	1341	97.9	1347	97.2	
Other	68	2.5	29	2.1	39	2.8	
Main source of drinking water during the wet season[7]							
Roof catchment	1348	49.1	721	52.7	627	45.4	*0.000*
Well	502	18.3	223	16.3	279	20.2	
Protected spring	413	15.0	153	11.2	260	18.8	
Borehole	228	8.3	149	10.9	79	5.7	
Stream/river	154	5.6	55	4.0	99	7.2	
Unprotected spring	37	1.3	26	1.9	11	0.8	
Piped water	30	1.0	24	1.7	6	0.5	
Others	36	1.4	17	1.3	19	1.4	
Main source of drinking water during the dry season[8]							

Well	892	32.5	446	32.5	446	32.5	*0.000*
Protected spring	831	30.3	348	25.4	483	35.2	
Stream/river	431	15.7	202	14.7	229	16.7	
Borehole	423	15.4	276	20.1	147	10.7	
Unprotected spring	77	2.8	48	3.5	29	2.1	
Piped water	46	1.6	39	2.8	7	0.5	
Roof catchment	2	0.1	0	0.0	2	0.1	
Others	46	1.6	9	1.0	37	2.2	

Missing values: [1] 1 in Control; [2] 1 in Control and 1 in Intervention; [3] 2 in Control and 2 in Intervention; [4] 2 in Control and 1 in Intervention; [5] 2 in Intervention; [6] 3 in Control and 2 in Intervention. [7] 5 in Control and 8 in Intervention; [8] 1 in Control and 16 in Intervention.

Of the four districts, Bungoma East had the highest proportion of households who cultivated fields in the uplands areas (91 per cent) while Bunyala district had the least of the same (83 per cent). Average number of fields cultivated in the uplands was highest in Kimilili and Bungoma North (2.5 fields, each) and was lowest in Bungoma East (1.9 fields). However, upland area in acres under cultivation was highest in Bungoma East (1.9 acres) and lowest in Bunyala (1.3 acres). On the other hand, Bunyala had the highest proportion of farmers who cultivated in the Lowlands while Bungoma North had the least (40% vs. 25%, respectively). In addition, the average number of fields cultivated in the lowlands was highest in Bunyala and lowest in Bungoma East. Average area of land cultivated in the lowlands was almost the same for the four districts (1.1 acres).

Table 14 above presents the housing characteristics of the respondents and by participation. Overall, at least one member of the household owned approximately 96% of the houses. This proportion was slightly higher among the Intervention group (97%) compared to that of the Control group (95%). For both study groups, the majority of the households' main houses (91%) were mud walled. Earth was the most common floor material for the main house for both, but was significantly higher among the households in the Intervention area (92%) compared to those in the Control areas (84%) at 5% level of significance. The other alternatives were either brick or stone. The most common roofing materials for the households' main house were either iron sheet or tiles (85%), while for the remaining 15% it was grass. This proportion was significantly higher among the Intervention group (86%) compared to the Control group (82%) at 1% level of significance.

Almost all the households across both study groups used either firewood or charcoal as their main cooking fuel. Most of the households (approximately 98%) used either tin lamp or lantern as their main source of lighting and the proportions were almost the same for both groups. Half of the households used roof catchment water during the rainy season; the proportion is significantly higher among the Control compared to the Intervention group (53% vs. 45%). Still a further 18% and 15% used water from the well and protected springs as their main source of water respectively. The proportion of households whose main source of drinking water during the wet season was either piped water or borehole was relatively low but it was significantly

higher among the Control group(13%) compared to the Intervention group (6%). Main sources of drinking water among the households during the dry season included; well (33%), protected spring (30%), stream or river (16%) and borehole (15%). Proportion that had access to piped water even during the wet season was also relatively low(2%). Significantly, more households in the Control areas had access to either piped water or water from a borehole compared to the Control (23% vs. 11%, respectively).

Table 15: *Housing characteristics, by districts(N=2761)*

	By districts							
	Kimilili (n=398)		Bunyala (n=157)		Bungoma North (n=1082)		Bungoma East (n=144)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Household is own by one of the members[1]	588	94.8	219	99.1	1634	95.8	210	98.1
Wall material of the households' main house[2] Mud								
Brick, stone	571	92.1	201	91.0	1548	90.8	196	92.0
	49	7.9	20	9.0	157	9.2	17	8.0
Floor material of the households' main house[3]								
Earth	560	90.7	196	88.7	1546	90.8	198	93.0
Cement, tiles	60	9.3	25	11.3	157	9.2	15	7.0
Roofing material of the households' main house[4]								
Grass	47	7.6	121	54.8	228	13.4	30	14.1
Iron sheet, tiles	573	92.4	100	45.2	1476	86.6	183	85.9
Household main cooking fuel[5]								
Firewood, charcoal	617	99.5	219	99.1	1690	99.1	212	99.5
Other	3	0.5	2	0.9	15	0.9	1	0.5
Household main type of lighting[6]								
Tin lamp, lantern	603	97.7	215	97.3	1663	97.5	207	97.2
Other	14	2.3	6	2.7	42	2.5	6	2.8
Main source of drinking water during the wet season[7]								
Roof catchment	358	57.9	63	28.5	866	51.0	61	28.8
Well	99	16.0	19	8.6	342	20.2	42	19.2
Protected spring	94	15.2	12	5.4	267	15.7	40	18.9
Stream/river	29	4.7	2	0.9	86	5.1	37	17.5
Borehole	17	2.1	102	46.2	88	5.2	21	9.9
Unprotected spring	11	1.8	2	0.9	19	1.1	5	2.4
Piped water	5	0.8	16	7.3	7	0.5	2	0.9
Others	5	1.5	5	2.2	22	1.2	4	2.4
Main source of drinking water during the dry season[8]								
Protected spring	213	34.4	31	14.0	517	30.6	70	32.9
Well	194	31.3	21	9.5	633	37.4	44	20.7
Stream/river	108	17.4	5	2.3	264	15.6	54	25.4
Borehole	59	9.5	139	62.9	200	11.8	25	11.7
Unprotected spring	22	3.6	1	0.5	47	2.8	7	3.3
Piped water	13	2.1	23	10.4	7	0.5	3	1.4

Roof catchment	0	0.0	0	0.0	1	0.1	1	0.5
Others	9	1.7	1	0.4	28	1.2	8	4.1

In all the four districts, majority of the households (ranging from 95% in Kimilili to 99% in Bungoma East) lived in their own houses. In all the four districts, the proportion of households living in mud walled houses was at least 90% and was comparable across the four districts. In addition, for majority of the households the floor material of the households' main house was earth. The proportion was highest in Bungoma East District (93%) and lowest in Bunyala district(89%). Most of the households' main house has either iron sheets or tiles roofed, except for the case of Bunyala District where approximately 55% of the households' main houses were roofed using grass.

Almost all of the households (at least99%) used firewood or charcoal as their main cooking fuel in the four districts. Similarly, at least 97 % of the households use tin lamp or lantern as the main source of lighting across the four districts. Except for Bunyala district, roof catchment water, protected spring and well were the main sources of drinking water during the wet season. However, in Bunyala a greater proportion of the households, 46%, used borehole water as their main source of drinking water. Relatively few households used piped water during the wet season, 7% in Bunyala and less than 1% in the other districts. Similarly, during the dry season, major sources of water were almost the same in the Kimilili, Bungoma North and Bungoma East where most households' main source of drinking water was protected spring, well or stream. However, in Bunyala most households (62%) had access to borehole water during the dry season. Usage of piped water was still relatively low in the dry season and ranged from 10% in Bunyala to 1% in Bungoma North.

3.1.2.4.   *Household assets(N=2761)*

Table 16: *Household assets, overall and by study areas*

	Overall		By study areas				
	(n=2761)		**Control (n=1373)**		**Intervention (n=1388)**		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Storage facility for crop	688	24.9	301	21.9	387	27.9	*<0.001*
Water tank	219	7.9	104	7.6	115	8.3	*0.49*
Radio/ cassette player	2416	87.5	1196	87.1	1220	87.9	*0.53*
TV	510	18.5	244	17.8	266	19.2	*0.34*
Telephone/Mobile	1965	71.2	976	71.1	989	71.3	*0.92*
Solar panels	148	5.4	62	4.5	86	6.2	*0.05*
Gas cooker	48	1.7	28	2.0	20	1.4	*0.22*
Bicycle	1720	62.3	893	65.0	827	59.6	*0.003*
Wheelbarrow	310	11.2	169	12.3	141	10.2	*0.07*
Milking equipment	61	2.2	30	2.2	31	2.2	*0.93*
Chaff cutter	13	0.5	7	0.5	6	0.4	*0.76*

Sewing/knitting machine	168	6.1	78	5.7	90	6.5	0.37
Borehole or well	749	27.1	343	25.0	406	29.3	0.012
Posho mill	16	0.6	3	0.2	13	0.9	0.013
Sheller	1	0.0	0	0.0	1	0.1	0.50*
Other agro-processing equip	1	0.0	1	0.1	0	0.0	0.49*
Weighing machine	13	0.5	7	0.5	6	0.4	0.76
Saw	509	18.4	262	19.1	247	17.8	0.38
Spray pump (back pack)	324	11.7	147	10.7	177	12.8	0.09
Motorized water pump	3	0.1	2	0.1	1	0.1	0.55
Mechanical water pump	15	0.5	0.5	0.4	10	0.7	0.20
Drip irrigation equip	5	0.2	2	0.1	3	0.3	0.66
Other irrigation equip	6	0.2	3	0.2	3	0.2	0.98
Cart	133	4.8	54	3.9	79	5.7	0.031
Plough	451	16.3	168	12.2	283	20.4	<0.001
Harrow, tiller, ridger, weeder	86	3.1	50	3.6	36	2.6	0.11
Motor cycle	133	4.8	60	4.4	73	5.3	0.27
Car/truck	19	0.7	5	0.4	14	1.0	0.041
Tractor	3	0.1	0	0.0	3	0.2	0.12*
Generator	67	2.4	40	2.9	27	1.9	0.09
Watering can	138	5.0	55	4.0	83	6.0	0.017
Axes	1932	70.0	936	68.2	996	71.8	0.040
Watch/wall clock	943	34.2	447	32.6	496	35.7	0.07
Cows	1437	52.0	678	49.4	759	54.7	0.005
Sheep	601	21.8	289	21.0	312	22.5	0.36
Goats	264	9.6	147	10.7	117	8.4	0.042

* Binomial test

Table 17: *Household assets, by districts*

	By districts							
	Kimilili (n=398)		Bunyala (n=157)		Bungoma North (n=1082)		Bungoma East (n=144)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Storage facility for crop	159	25.6	13	5.9	459	26.9	57	26.6
Water tank	52	8.4	8	3.6	135	7.9	24	11.2
Radio/ cassette player	532	85.8	186	84.2	1516	88.9	182	85.0
TV	92	14.8	34	15.4	344	20.2	40	18.7
Telephone/Mobile	409	66.0	173	78.3	1227	71.9	156	72.9
Solar panels	14	2.3	7	3.2	120	7.0	7	3.3
Gas cooker	13	2.1	4	1.8	26	1.5	5	2.3
Bicycle	378	61.0	168	76	1055	61.8	119	55.6
Wheelbarrow	80	12.9	32	14.5	174	10.2	24	11.2
Milking equipment	17	2.7	1	0.5	36	2.1	7	3.3
Chaff cutter	4	0.6	1	0.5	7	0.4	1	0.5
Sewing/knitting machine	41	6.6	19	8.6	92	5.4	16	7.5
Borehole or well	170	27.4	13	5.9	509	29.8	57	26.6
Posho mill	1	0.2	0	0.0	15	0.9	0	0.0
Sheller	0	0.0	0	0.0	1	0.1	0	0.0
Other agro-processing equip	1	0.2	0	0.0	0	0.0	0	0.0
Weighing machine	2	0.3	0	0.0	9	0.5	2	0.9
Saw	122	19.7	48	21.7	305	17.9	34	15.9
Spray pump (back pack)	80	12.9	15	6.8	201	11.8	28	13.1
Motorized water pump	0	0.0	0	0.0	3	0.2	0	0.0
Mechanical water pump	2	0.2	1	0.5	12	0.7	0	0.0
Drip irrigation equip	1	0.2	1	0.5	2	0.1	1	0.5
Other irrigation equip	2	0.3	0	0.0	4	0.2	0	0.0
Cart	27	4.4	2	0.9	95	5.6	9	4.2
Plough	107	17.3	3	1.4	285	16.7	56	26.2
Harrow, tiller, ridger, weeder	16	2.6	10	4.5	58	3.4	2	0.9
Motor cycle	19	3.1	9	4.1	94	5.5	11	5.1
Car/truck	1	0.2	0	0.0	18	1.1	0	0.0
Tractor	0	0.0	0	0.0	3	0.2	0	0.0
Generator	14	2.3	6	2.7	45	2.6	2	0.9
Watering can	29	4.7	5	2.3	89	5.2	15	7.0
Axes	451	72.7	118	53.4	1223	71.7	140	65.4
Watch/wall clock	192	31.0	95	43.0	576	33.8	80	37.4
Cows	324	52.3	88	39.8	893	52.3	132	61.7
Sheep	137	22.1	22	10.0	405	23.7	37	17.3
Goats	58	9.4	65	29.4	115	6.7	26	12.1

Tables 16 and 17 show the proportion of households who owned various household assets including livestock. Overall, the majority of households own assets, such as radio/cassette player (88%), telephone/mobile (71%) and axes (70%), while fewer households own productive assets such as tractor, sheller, chaff cutter, and irrigation equipment, etc. The proportion of households who owned most of the assets was not significantly different among Control and Intervention areas. However, in the Intervention area, significantly more households owned a storage facility for crops (28%) and cattle (55%). In the Control area, more households owned a generator

compared to the Intervention area. Asset ownership was comparable across the four districts for most of the assets. However, for several assets such as storage facility for crop and borehole/ wells the proportion that owned them was comparatively very low in Bunyala District compared to other districts.

3.1.2.5.   *Household wealth index*
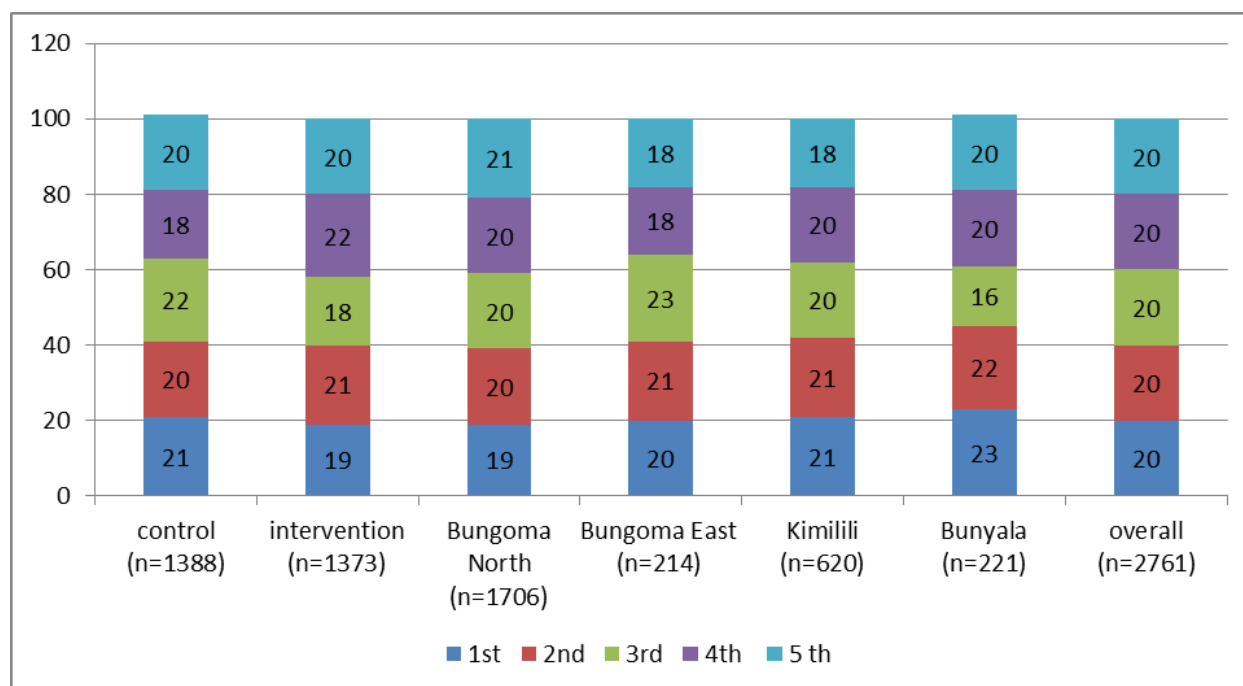
P value by study area=0.02, by districts=0.68

Figure 9: *Household wealth index in quintiles*

House wealth index was ranked in quintiles. After calculating the index as explained earlier then the score was divided into five equal groups called quintiles. Wealth quintiles are expressed in terms of quintiles of individuals in the whole sample. This approach to defining wealth quintiles gives information directly relevant to the principal question of interest, for example, the health status or access to services for the poor in the sample as a whole. It also facilitates comparisons across indicators for the same quintile, since the quintile denominators remain unchanged across indicators. The data shows that the index shows wealth distribution is comparable across the Intervention and Control because the two groups are almost evenly divided into the five categories.

3.1.3. Community access to market

3.1.3.1. Community characteristics

Table 18: *Village characteristics, overall and by study areas*

	Overall (n=104)		By study area				p
			Intervention (n=52)		Control (n=52)		
	n	*%*	*n*	*%*	*n*	*%*	
Type of road providing the main access to this village now (number)							*0.45*
Footpath or secondary earth road	44	45.4	21	43.8	23	46.9	
Primary earth, murram or tarmac road	53	54.6	27	56.3	26	53.1	
Main transport mode to the nearest market							*0.17*
Walking							
Other (bicycle, motorcycle, bus)	25	26.0	10	20.8	15	31.3	
	71	74.0	38	79.2	33	68.7	
Time taken to walk on foot to the nearest market to buy/sell crops or animal products (min)							*0.17*
≤30	59	60.8	32	66.7	27	55.1	
>30	38	39.2	16	33.3	22	44.9	
Month the short rainy season started last year							*0.68*
August							
September	17	17.5	7	14.6	10	14.6	
October	28	28.9	13	27.1	15	27.1	
Other	41	42.3	21	43.8	20	43.8	
	11	11.3	7	14.6	4	14.6	
Duration of the short rainy season							*0.91*
1 or less	9	9.3	5	10.4	4	8.2	
2	45	46.4	23	47.9	22	44.9	
3	40	41.2	19	39.6	21	42.9	
4 or more	3	3.1	1	2.1	2	4.1	
Month the long rainy season started last year							*0.09*
February							
March	15	15.5	3	6.3	12	24.5	
April	46	47.4	25	52.1	21	42.9	
Other	22	22.7	13	27.1	9	18.4	
	14	14.4	7	14.6	7	14.3	
Duration of the long *rainy* season(months)							*0.025*
1-2	13	13.4	11	22.9	2	4.1	
3-4	41	42.3	18	37.5	23	46.9	
5 or more	43	44.3	19	39.6	24	49.0	

[1] Mean (SD), missing values are 9 among Intervention and 5 among Control; [2] Mean (SD), 2 missing values among Control.

The proportion of households in the 4th rank was slightly higher for the Control group compared to the Intervention group (22% vs.18%, respectively). Conversely, that in the 3rd rank was slightly lower for the Control compared to that of the Intervention (18% vs. 22%, respectively).

3.1.3.2 Community involvement in agriculture, health and nutrition Control

Table 19: *Village involvement in agriculture, health, and nutrition Control*

	Overall (n=104)		By study areas				
			Control (n=48)		Intervention (n=49)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Village was covered by an agriculture Control during the past 12 months	51	52.6	26	54.2	25	51.0	*0.45*
The Control was based on[2]							
Extension for how to grow crops	49	96.1	25	96.2	24	96.0	*0.75**
Seeds provision	40	78.4	22	84.6	18	72.0	*0.22*
Assistance with fertilizer	27	52.9	16	61.5	11	44.0	*0.17*
Assistance with labour	5	9.8	3	11.5	2	8.0	*0.52**
Assistance with irrigation system	3	5.9	3	11.5	0	4.1	*0.12**
The crop promoted was sweetpotato[2]	2	3.9	2	7.7	0	0.0	*0.25**
Organization involved in Control[2]							
Agriculture extension office	33	64.7	19	73.1	14	56.0	*0.16*
*Other***	18	35.3	7	26.9	11	44.0	
Did you have vitamin A supplementation campaign covering your village during the past 12 months?	48	49.5	24	50.0	24	49.0	*0.54*
Did you have food fortification Control (sprinkles for example) covering your village during the past year	19	19.6	13	27.1	6	12.2	*0.056*
Did you have nutrition or health education meetings outside health facility in your village during the past 12 months	68	70.1	32	66.7	36	73.5	*0.30*
Did you have impregnated mosquito net distribution covering your village during the past 12 months?	50	51.5	29	60.4	21	42.9	*0.063*
Is there a committee at the village level that overseas health or nutrition issues for the community	59	60.8	27	56.3	32	65.3	*0.24*

* Fisher's test; ** include farmers groups, research institute, NGO.

There were a total 104 villages, half of which were subjected to the Control and the remaining half were set up as the Intervention area. Overall, in 45% of the villages, the type of road providing main access to the village was either a primary earth or a secondary earth road and for the other 55% of the villages the road type was primary earth, murram or tarmac road. The type of roads that provided main access to the villages was not significantly different between the participating villages and the non-participating villages.

The proportion of the villages where the main transport mode to the market is walking was only 26% for the overall sample. It was higher among the participating villages (31%) compared to the non-participating villages (21%) though the difference was not significant. Distance in walking minutes to the nearest market from the villages was also not significantly different between the two study groups. Overall, for 61% of the villages the maximum walking time to the market spent is at most 30 minutes.

Overall, about 53% of the villages were covered by an agricultural Control. The proportion was not statistically different between the Control and Intervention areas. In the Control areas, extension services on how to grow crops, seed provision, fertilizer subsidies, or technical assistance for labour or irrigation systems were provided. Overall, only 4% of the villages were covered by an agricultural Control that promoted sweetpotatoes and all of these villages were in the Control areas. A large proportion of the villages had their Control covered by agricultural extension offices.

Approximately half of the villages reported having had a vitamin A supplementation campaign that covered their village during the past 12 months prior to the time of survey. This proportion was almost the same for the Control areas and the Intervention areas. Overall, about 20% of the villages reported having had a food fortification Control during the past year prior to the survey. This proportion was significantly higher among villages in the Control areas (27%) compared to those in the Intervention areas (12%). In addition, approximately 70% of the villages reported having had nutrition or health education meetings outside a health facility in their own village. This proportion of villages was however not significantly different between the two groups though it was slightly higher among the Intervention villages.

Approximately, 52% of all the sampled villages reported to having had an impregnated mosquito net distribution during the past 12 months. This proportion was significantly higher in the Control area (60%) compared to that in the Intervention area (43%). About 61% of the total villages, comparable across the study groups, reported having a committee that oversees health or nutrition issues of the community.

3.1.4. Radio use for receiving information

Table 20: *Radio use for receiving information, overall and by study areas*

	Overall (n=2761)		Control (n=1373)		Intervention (n=1388)		p
	n	*%*	*n*	*%*	*n*	*%*	
Number of times listen to the radio last month							*0.11*
Everyday	1854	67.5	940	68.6	914	66.5	
3 to 4 times a week	197	7.2	91	6.6	106	7.7	
1 to 2 times a week	168	6.1	84	6.1	84	6.1	
Irregularly	281	10.2	123	9.0	158	11.5	
Did not listen to or don't know	245	8.9	132	9.6	113	8.2	
Type of station listened to most often[2]							*<0.001*
International or national level radio	1691	67.6	816	65.9	875	69.3	
Provincial level radio	733	29.3	347	28.0	386	30.6	
Community level radio	76	3.0	75	6.1	1	0.1	
Most listened to station[3]							
Mulembe	848	33.2	372	29.3	476	37.0	*0.000*
West FM	664	26.0	309	24.4	355	27.6	
Citizen radio	501	18.1	264	20.8	237	18.4	
KBC Kiswahili station	152	5.5	87	6.9	65	5.1	
Bulala	76	2.8	76	6.0	0	0.0	
Imani radio	61	2.2	27	2.1	34	2.6	
Radio jambo	35	1.3	16	1.3	19	1.5	
Q FM	63	2.3	36	2.8	27	2.1	
Ramogi	13	0.5	13	1.0	0	0.0	
Others	140	8.1	68	5.1	72	5.7	
Usual time of the day listening to the radio							
First thing in the morning							
Later in the morning	1160	46.4	571	46.1	589	46.7	*0.75*
In the afternoon	551	22.1	273	22.1	278	22.1	*0.99*
In the evening	1069	42.8	532	43.0	537	42.6	*0.85*
After dinner	1524	61.0	752	60.7	772	61.3	*0.78*
No specific time	1248	50.0	657	53.1	591	46.9	*0.002*
	306	12.2	155	12.5	151	12.0	*0.68*

[1]Missing values are 13 among Intervention and 3 among Control; [2] n=448 in Intervention and 436 in Control. [3] n=1285 for Intervention and n=1268 for the Control.

A greater proportion of the households, approximately 68%, reported to have been listening to the radio every day while only a small proportion (<9%) reported to not listening to radio at all. The other households reported to listening to the radio irregularly or between 1- 4 times a week. This proportion of radio listeners was not significantly different between the Control and Intervention groups.

Most popular stations in the area are Mulembe FM (33%), West FM (26%) and Citizen Radio (18%). The popular stations differ significantly between the study groups; a significantly higher proportion of households in the Intervention region listen to Mulembe FM and West FM

compared to those in the Control areas (37% vs.29% and 28% vs. 24%, respectively). Only households in the Intervention regions listen to Bulala FM (6%) and to Ramogi FM (1%).

Table 21: *Radio use for receiving information, by districts*

	By districts							
	Kimilili (n=620)		Bunyala (n=221)		Bungoma North (n=1706)		Bungoma East (n=214)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Number of times listen to the radio last month								
Everyday	412	66.6	149	67.4	1156	68.2	137	64.9
3 to 4 times a week	47	7.6	10	4.5	118	7.0	22	10.4
1 to 2 times a week	34	5.5	21	9.5	104	6.1	9	4.3
Irregularly	53	8.6	27	12.2	174	10.3	27	12.8
Did not listen to or don't know	73	11.8	14	6.3	142	8.4	16	7.6
Type of station listened to most often								
International or national level radio	357	65.4	125	60.4	1093	70.4	116	59.5
Provincial level radio	189	34.6	7	3.4	458	29.5	79	40.5
Community level radio	0	0.0	75	36.2	1	0.1	0	0.0
Most listened to station[2]								
Mulembe	213	37.6	1	0.5	580	36.7	54	27.6
West FM	178	31.4	5	2.4	408	25.8	73	37.2
Citizen radio	90	15.9	75	35.9	300	19.0	36	18.4
KBC Kiswahili station	34	6.0	23	11.0	88	5.6	7	3.6
Bulala	0	0.0	76	36.4	0	0.0	0	0.0
Imani radio	8	1.4	0	0.0	52	3.3	1	0.5
Radio jambo	4	0.7	0	0.0	28	1.8	3	1.4
Q FM	15	2.7	8	3.8	38	2.4	2	1.0
Ramogi	0	0.0	13	6.2	0	0.0	0	0.0
Others	24	4.3	8	3.8	88	5.4	20	10.3
Usual time of the day listening to the radio								
First thing in the morning								
Later in the morning	264	48.4	73	35.3	739	47.6	84	43.3
In the afternoon	109	20.0	59	28.5	354	22.8	29	14.9
In the evening	220	40.3	102	49.3	659	42.5	88	45.4
After dinner	334	61.2	105	50.7	968	62.4	117	60.3
No specific time	303	55.5	103	49.8	784	50.5	58	29.9
	64	11.7	35	16.9	176	11.3	31	16.0

[1]Missing values are 1 in Kimilili, 12 in Bungoma North and 3 in Bungoma East.[2]valid n=566 for Kimilili, 209 for Bunyala, 1582 for Bungoma North and 196 for Bungoma East.

In addition most of the households (68%) reported to have been listening mostly to either the international or national level radio stations compared to the stations at the provincial or even community level (29% and 3%, respectively). These proportions were significantly different between the two groups, with the more households from the Control areas (6%) reporting to be listening to the community levels radio stations compared to those in the Intervention areas (0.1%).

Furthermore, a greater proportion of the households (61%) reported to be mostly listening to the radio in the evenings. Still, at least 40% of the households reported to listening to the radio the

first thing in the morning or in the afternoon or even after dinner. About 22% of the households reported to be listening to the radio later in the morning. These proportions were not significantly different between the two groups apart from those who usually listen to the radio after dinner. This proportion was significantly higher among the Intervention group (53%) compared to Control area (47%).

The proportion of households that reported to listening to the radio daily ranged from 65% in Bungoma East district to 68% in Bungoma North district and that which did not listen to the radio at all ranged from 6% in Bunyala to 12% in Kimilili district. In all the four districts, most of the households, ranging from 60% in Bungoma East to 70% in Bungoma North, reported to listening mostly to the international or national level radios. Bunyala district was the only one which had households that reported to listening to the community level radio stations (36%) . Those that reported to listening to provincial level radio stations ranged between 3% in Bunyala to 41% in Bungoma East.

Except for Bunyala district, Mulembe and West FM are the most popular radio stations in the other districts. In Kimilili and Bungoma North districts, Mulembe was most popular (37% of the households in each district listen to it). In Bungoma East most households (37%) listened to West FM. However, in Bunyala District most popular radio stations are Bulala FM and Citizen Radio (proportion of households that listen to these stations was 36%, each). Only households in Bunyala District reported to be listening to Bulala FM and Ramogi FM.

In all the four districts most of the households, a high of 62% in Bungoma North and a low of 51 % in Bunyala, usually listen to the radio in the evening. Conversely, the proportion that reported to listening to the radio later in the morning was relatively low across the four districts and it ranged from 15% in Bungoma East to 29% in Bunyala district.

3.2 Knowledge and practices of the respondents

3.2.1. Knowledge about sweetpotato production

Table 22: *Women's knowledge about sweetpotato production, overall and by study areas*

	All (n=2761)		Control (n=1373)		Intervention (n=1388)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
What causes the holes in the sweetpotatoes							*0.78*
Sweetpotato weevil	432	15.8	209	15.4	223	16.2	
Insect, kind not specified	819	30.0	406	29.9	413	30.1	
Other	1483	54.2	745	54.8	738	53.7	
Have your sweetpotatoes ever suffered from the problem							
No							
Yes	426	15.9	213	16.0	213	15.9	*0.94*
The problem was	2246	84.1	1119	84.0	1127	84.1	
Occasional							
Major	1190	53.2	563	50.0	627	55.8	
The problem forced to harvest earlier	1048	46.8	552	49.5	496	44.2	*0.11*
No							
Yes	549	26.3	252	24.3	297	28.3	*0.038*
Methods Used to prevent/Intervention the problem	1541	76.7	787	75.7	754	71.7	
Choose varieties that resist attack							
Disinfect vines	8	0.4	5	0.5	3	0.3	
Hilling up	33	1.5	16	1.5	17	1.5	*0.36**
Select clean vines to plant	782	35.6	341	31.1	441	40.1	*0.86*
Rotate field	23	1.0	11	1.0	12	1.1	*<0.001*
Harvest early	126	5.7	68	6.2	58	5.3	*0.83*
	905	41.2	483	44.0	422	38.3	*0.35*
							0.007
Identified the healthy plant as healthy	2151	79.0	1100	81.2	1051	76.8	*0.005*
Identified the sick plant as *sick*	889	32.6	441	32.5	448	32.8	*0.88*
The problem is caused by							
Virus	19	2.2	10	2.3	9	2.1	*0.95*
Disease	199	23.0	98	22.8	101	23.2	
Other[1]	647	74.8	322	74.9	325	74.7	
Number of times sweetpotato is planted in the same plot before planting another crop or fallow							
Once	2068	81.4	1010	80.1	1058	82.7	*0.09*
More than once	473	18.6	251	19.9	222	17.3	
Which part of the SP vine is best to use for planting							
Top	1336	49.4	645	47.9	691	50.8	*0.12*
Other parts	1371	50.6	702	52.1	669	49.2	
Do you normally plant more than one cutting in one hole							*0.001*
No	650	24.1	287	21.4	363	26.8	

Yes	2047	75.9	1053	78.6	994	73.2	
Value of deep orange-fleshed SP variety						
Do not know	2402	88.5	1208	89.5	1194	87.5	*0.26*
Good health	80	2.9	38	2.8	42	3.1	
Vitamin A content	232	8.5	104	7.7	128	9.4	

[1]Infection/rot, Animal/pest, Lack of rain; * Fisher's test

In the survey, the respondents were asked to identify the cause of the damage on sweetpotato roots by weevil. About 16% of the respondent correctly identified the sweetpotato weevil as the cause of holes in sweetpotato roots (table 23 above). A further 30% stated the cause as an insect though they did not specify it while the remaining 54% either noted lack of rain or infection or animal/pest or did not know the cause. Majority of the women (84%) reported that their sweetpotatoes have at least suffered from the holes though this proportion was not significantly different between the two groups. Of these approximately, 53% perceived the problem as occasional while the other 47% perceived it a major problem. In addition, 77% of the women acknowledged that the problem forced them to harvest the crop earlier. This proportion was significantly higher among the Control (76%) compared to that of the Intervention group (72%) at 5 per cent level of significance.

As a preventive or Intervention measures, approximately 41% of the women harvested the crop early, 37% practiced hilling up and only 1% and 0.4 % of the women reported having selected clean vines to plant and choosing resistant varieties, respectively . A significantly higher proportion of women in the Control group reported having to harvest early as a Intervention measure (44%) compared to that of the Intervention group (38%). Conversely, a significantly greater proportion of the women in the Intervention group noted hilling up as a Intervention measure (40%) compared to that of the Control group (31%).

A high of 79% of all the women correctly identified a healthy plant. In addition, this proportion was significantly greater among the women in the Control group (81%) compared to those in the Intervention group (77%). However only 33% of the women correctly identified a sick (virus infected) plant and among them only 2% identified the cause correctly as a virus. About 23% identified the cause as a general disease.

Approximately 81% of all women, comparable across the study groups, practiced crop rotation while the remaining 19% planted sweetpotatoes more than one time on the same plot before rotating to another. Half of the women interviewed identified the top part of the sweetpotato vine was identified as the best to use for planting. This proportion was not significantly different between the two groups. In addition, approximately 24% of all the women reported planting more than one cutting in one hole. This proportion was however significantly greater among the

Intervention group (27%) compared to that of the Control group (21%) at 1% level of significance.

Generally, women's knowledge concerning the health and nutritional value of deep orange-fleshed sweetpotato variety was relatively low and was not significantly different between the two groups. Only 9% of all the women reported having any knowledge about the vitamin A content of the variety,3% reported that the variety provides good heath while the other larger majority, 88% had no idea about the value of this variety.

Table 23: *Women's knowledge about sweetpotato, by districts*

	By districts							
	Kimilili (n=620)		Bunyala (n=221)		Bungoma North (n=1706)		Bungoma East (n=214)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
What causes the holes in the sweetpotatoes								
Sweetpotato weevil	93	15.2	26	11.8	278	16.5	35	16.5
Insect, kind not specified	160	26.1	76	34.5	505	29.9	78	36.8
Other	360	58.7	118	53.6	906	53.6	99	46.7
Have your sweetpotatoes ever suffered from the problem								
No	98	16.3	32	15.1	261	15.8	35	16.8
Yes	504	83.7	180	84.9	1389	84.2	173	83.2
The problem was								
Occasional	257	51.1	69	38.5	759	54.9	105	60.7
Major	246	48.9	110	61.5	624	45.1	68	39.3
The problem forced to harvest earlier								
No	125	26.3	43	24.7	345	27.0	36	22.0
Yes	350	73.7	131	75.3	932	73.0	128	78.0
Methods Used to prevent/Intervention the problem								
Choose varieties that resist attack	2	0.1	0	0.0	4	0.3	2	1.2
Disinfect vines	6	1.2	4	2.2	16	1.2	4	1.2
Hilling up	160	32.3	28	15.6	533	39.2	61	36.7
Select clean vines to plant	3	0.6	3	0.6	17	1.3	2	1.2
Rotate field	32	6.5	17	9.5	72	5.3	5	3.0
Harvest early	226	45.7	80	44.7	542	39.9	57	34.3
Identified the healthy plant as h*ealthy*	494	81.0	173	78.3	1329	79.1	155	73.1
Identified the sick plant as s*ick*	193	31.6	66	29.9	570	33.9	60	28.3
The problem is caused by								
Virus	4	2.1	1	1.5	11	2.0	3	5.2
Disease	41	21.8	13	20.0	127	22.9	18	31.0
Other	143	76.1	51	78.5	416	75.1	37	63.8
Number of times sweetpotato is planted in the same plot before planting another crop or fallow								
Once	474	82.6	122	64.2	1309	82.7	163	83.6
More than once	100	17.4	68	35.8	273	17.3	32	16.4

Which part of the SP vine is best to use for planting								
Top	286	47.0	111	51.4	850	50.8	89	42.6
Other parts	323	53.0	105	48.6	823	49.2	120	57.4
Do you normally plant more than one cutting in one hole								
No	146	24.0	41	19.2	378	22.7	85	40.7
Yes	462	76.0	172	80.8	1289	77.3	124	59.3
Value of deep orange-fleshed SP variety								
Do not know	554	91.1	190	87.6	1472	87.7	186	88.2
Good health	17	2.8	7	3.2	52	3.1	4	1.9
Vitamin A content	37	6.1	20	9.2	154	9.2	21	10.0

The proportion of women who noted the sweet potato weevil as the cause of holes in sweet potatoes was comparatively low in the all the four districts ranging from 12% in Bunyala to 17% each in Bungoma North and Bungoma East. In all the four districts, most of the women noted the cause either as lack of rains, infections or animals/pests. Majority of the women in all the four districts ranging from 83% in Bungoma East to 85% in Bunyala acknowledged that their sweetpotatoes had at least suffered from the problem. Of these, a low of 39% in Bunyala and a high of 61% in Bungoma East perceived the problem as being occasional.

A greater proportion of the women (ranging from 73% in Bungoma North to 78% in Bungoma East) who reported having the problem of sweet potato holes acknowledged harvesting the crop early. In all the districts, the majority of the women ranging from 34% in Bungoma East to 46% in Kimilili resulted to harvesting early as a Intervention measures for the sweet potatoes holes. Further still, a range of between 16% in Bunyala to 39% in Bungoma North resulted in hilling up the crops. In addition, a range of between 3% in Bungoma East to10% in Bunyala practiced crop rotation as a Intervention measure against the weevil. Only few women (at most 1%) in all the districts reported choosing varieties that resist attack or selecting clean vines for planting as Intervention measures. The ability of the women to correctly identify a healthy plant ranged from 73% in Bungoma East to 81% in Kimilili district. However, the ability of the women to correctly identify a sick plant was relatively low ranging from 28% in Bungoma East to 34% in Bungoma North district. In addition the ability to correctly identify the cause as a virus was extremely low in all the districts ranging from 2% in Bunyala to 5% in Bungoma East.

The proportion of farmers who reported planting sweetpotatoes only once in the same plot before planting another crop(practiced crop rotation) was relatively high though it varied widely across the four districts with range of 64% in Bunyala and 84% in Bungoma East. Of all the four districts, Bunyala had the highest proportion of women who perceived the top part of the sweetpotato vine as the being the best to use for planting (51%) while Bungoma East had the least proportion of the same(43%). Similarly, majority of the women reported planting more than one sweetpotato cutting in one hole though the proportion varied widely across the four districts with a minimum of 59% in Bungoma East and a maximum of 81% in Bunyala.

The women's knowledge about the value of deep orange-fleshed SP variety was relatively low in all the four districts. The proportion of women who acknowledged not knowing about the value of deep orange-fleshed SP variety ranged from 88% in Bungoma East to 91% in Kimilili district. Conversely, only a very small proportion (≤10 per cent) in all the districts knew about the vitamin A content of the deep orange-fleshed SP variety.

3.2.2 Knowledge about nutrition

Table 24: *Women's knowledge about nutrition, overall and by study areas* (N=2761)

	Overall (n=2761)		By study areas				
			Control (n=1373)		Intervention (n=1388)		p
	n	%	n	%	n	%	
What makes a child grow?							
Eating sufficient amounts of food	526	19.1	257	18.7	269	19.4	0.87
Eating different kinds of food	1734	62.8	873	63.6	861	62.0	0.47
Child does not get sick often	325	11.8	155	11.3	170	12.2	0.52
Can identify 3 food groups, yes	2053	74.4	988	72.0	1065	76.7	0.004
Energy-giving foods	1178	42.7	561	40.9	617	44.5	0.56
Body-building foods	1116	40.4	536	39.0	580	41.8	0.14
Protective foods	1116	40.4	528	38.5	588	42.4	0.036
Main sources of energy[a]							
Cereals, sweetpotatoes, cassava	2479	89.9	1242	90.6	1237	89.2	0.24
Orange-fleshed sweetpotato	21	0.8	3	0.2	18	1.3	0.001
Fats (margarines, butter, etc.)	32	1.2	17	1.2	15	1.1	0.69
Beans, groundnuts	1137	41.2	545	39.8	592	42.7	0.11
Eggs, milk, meat and fish	687	24.9	349	25.5	338	24.4	0.51
Fruits and vegetables	643	23.3	337	24.6	306	22.1	0.12
Main body-building foods[b]							
Cereals, sweetpotatoes, cassava	1356	49.3	694	50.7	662	47.9	0.14
Orange-fleshed sweetpotato	11	0.4	5	0.4	6	0.4	0.77
Fats (margarines, butter, etc.)	58	2.1	32	2.3	26	1.9	0.40
Beans, groundnuts	1111	40.4	541	39.5	570	41.3	0.34
Eggs, milk, meat and fish	1721	62.6	860	62.8	861	62.3	0.79
Fruits and vegetables	1057	38.4	518	37.8	539	39.0	0.52
Main protective foods[c]							
Cereals, sweetpotatoes, cassava	786	29.3	384	28.9	401	29.8	0.60
Orange-fleshed sweetpotato	26	1.0	6	0.5	20	1.5	0.007
Fats (margarines, butter, etc.)	75	2.8	35	2.6	40	3.0	0.60
Beans, groundnuts	584	21.8	259	19.5	325	24.1	0.004
Eggs, milk, meat and fish	933	34.8	473	35.6	460	34.1	0.41
Fruits and vegetables	2099	78.3	1046	78.6	1053	78.0	0.68

[a] Main sources of energy-giving foods missing for n=2 for Intervention and Control groups each; valid cases n=2757; [b] Main sources of body-building foods missing for n=7 in Intervention and n=4 in Control groups; valid n=2750; [c] Main sources of protective foods missing for n=38 in Intervention and n=43 in Control groups; valid n=2680.

Table 24 above shows women's knowledge about nutrition overall and by Control and Intervention group. About 2761 women were interviewed of which 1373 were in the Control area and the other 1388 were in the Intervention area. A high of 63% of the women were aware that eating different kinds of food was important for child growth, while a low of 12% and 19% of the women thought that child growth was related to not getting sick often and eating sufficient quantity of food, respectively. These proportions were not significantly different between the Intervention and the Control.

Women's knowledge regarding nutrition was highly variable across categories. Overall 74% of the women were able to identify three food groups; however, only 40% of the women were correctly aware that energy-giving foods, body-building foods, and protective foods were the three main food groups. However, the proportion of women in the Intervention group who were able to identify the protective foods was slightly higher (and significant) compared to that of the Control groups (42% vs. 39%).

Cereals, sweetpotatoes and cassava were recognized by a large majority (90%) of the women as main sources of energy, Beans and groundnuts (41%), eggs, milk, meat and fish (25 %), and fruits and vegetables (23%) followed them. Though only a relatively small proportion (0.8%) of the women identified the orange-fleshed sweetpotato as a main source of energy, it was significantly higher for women in the Intervention group compared to those in the Control group (1.3% vs. 0.2 %, respectively)

Almost 63% of the women recognized eggs, milk, meat and fish as the main sources of body-building foods. However, cereals, sweetpotatoes, cassava, beans, and groundnuts were also reported as the main sources of body-building foods by 49%. Still, 38 per cent, of the women overall said that fruits and vegetables were the main body-building foods, which highlights a gap in knowledge as these are low-protein sources of food.

Table 25: *Women's knowledge about nutrition, by districts*

	By districts							
	Kimilili (n=620)		Bunyala (n=221)		Bungoma North (n=1706)		Bungoma East (n=214)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
What makes a child grow?								
Eating sufficient amounts of food	97	15.6	49	22.2	316	18.5	64	29.9

	n	%	n	%	n	%	n	%
Eating different kinds of food	402	64.8	135	61.1	1082	63.4	115	53.7
Child does not get sick often	65	10.5	29	13.1	200	11.7	31	14.5
Can identify three food groups, yes	451	72.7	148	67.0	1282	75.1	172	80.4
Energy-giving foods[1]	262	42.3	72	32.6	732	42.9	112	52.3
Body-building foods[1]	248	40.0	70	31.7	705	41.3	93	43.5
Protective foods[1]	241	38.9	68	30.8	717	42.0	90	42.1
Main sources of energy foods[a]								
Cereals, sweetpotatoes, cassava	566	91.3	193	88.1	1529	89.7	191	89.3
Orange-fleshed sweetpotato	1	0.2	0	0.0	11	0.6	9	4.2
Fats (margarines, butter, etc.)	6	1.0	4	1.8	20	1.2	2	0.9
Beans, groundnuts	256	41.3	70	32.0	707	41.5	104	48.6
Eggs, milk, meat and fish	151	24.4	87	39.7	405	23.8	44	20.6
Fruits and vegetables	142	22.9	79	36.1	380	22.3	42	19.6
Main body-building foods[b]								
Cereals, sweetpotatoes, cassava	320	51.7	102	46.6	828	48.8	106	49.5
Orange-fleshed sweetpotato	1	0.2	1	0.5	7	0.4	2	0.9
Fats (margarines, butter, etc.)	21	3.4	5	2.3	26	1.5	6	2.8
Beans, groundnuts	237	38.3	81	37.0	706	41.6	87	40.7
Eggs, milk, meat and fish	384	62.0	153	69.9	1056	62.2	128	59.8
Fruits and vegetables	213	34.4	104	47.5	647	38.1	93	43.5
Main protective foods[c]								
Cereals, sweetpotatoes, cassava	194	32.2	38	17.5	492	29.8	62	29.5
Orange-fleshed sweetpotato	3	0.5	0	0.0	17	1.0	6	2.9
Fats (margarines, butter, etc.)	13	2.2	5	2.3	48	2.9	9	4.3
Beans, groundnuts	129	21.4	36	16.6	363	22.0	56	26.7
Eggs, milk, meat and fish	231	38.4	83	38.2	555	33.6	64	30.5
Fruits and vegetables	456	75.7	188	86.6	1284	77.8	171	81.4

[1] Out of those who can identify the three food groups; [a] Main sources of energy-giving foods missing for n=2 cases in Bungoma North and Bunyala districts each, valid cases n=2757; [b] Main sources of body-building foods missing for n=8, n=1, and n=2 cases in Bungoma North, Kimilili, and Bunyala districts, respectively; valid n=2750; [c] Main sources of protective foods missing for n=55, n=4, n=18, and n=4 cases in Bungoma North, Bungoma East Kimilili and Bunyala districts, respectively; valid n=2680.

The majority of women (78%), that is comparable across the study areas, recognized fruits and vegetables as the main sources of protective foods. However, 29% recognized cereals, sweetpotatoes and cassava as sources of protective foods. In addition, 22% stated that beans and groundnuts as main protective foods; this proportion was significantly higher for the Intervention group compared to the Control group (24% vs. 20%). Only 1% of the women recognized OFSP as a main protective food and this was significantly lower for the Control group compared to the Intervention group.

The majority of women in all districts agreed that eating different kinds of foods was important for child growth, a range of 54% in Bungoma East and 65% in Kimilili. A substantial proportion of women (range from 16% in Kimilili to 30% in Bungoma East) also recognized that eating sufficient quantities of food is important for child growth.

The ability to identify the three food groups was relatively high in all the districts and ranged from 67% in Bunyala to 80% in Bungoma East. However, in each district, approximately 40% of the women were able to identify energy-giving foods, body-building foods and protective foods as the three food groups. In all the districts women were relatively more knowledgeable about the energy giving foods and least knowledgeable on the body building foods. At least 88% of all women, in all districts, recognized cereals, sweetpotatoes and cassava as the main sources of energy-giving foods. Approximately 60% reported eggs, milk, meat and fish as the main body-building foods, and 80% of the women agreed that fruits and vegetables were the main protective foods.

3.2.3 Knowledge about vitamin A

Almost all women (90%) had heard of vitamin A prior to the survey. A slightly higher proportion of women in the Intervention group (91%) compared to the Control group (89%) had heard of vitamin A. About 38% of the women had heard of vitamin A over 10 years ago, and smaller proportions of women reported hearing of vitamin A for the first time in more recent years. In fact, more than half of the women had heard of it at least 5 years ago. These proportions were almost the same between the two study groups.

About 44% of the women identified prevention of diseases as an important role of vitamin A, while only 7% recognized its importance as that of protecting the eyes. Majority of the women, 39%, were able to list at least one source of vitamin A rich food, while an additional 32% of the women listed two foods rich in vitamin A. Only 11% of the women were able to list three foods rich in vitamin A and still a substantial proportion, 18%, of the women were unable to give any correct source of vitamin A rich foods.

Table 26: *Women's knowledge about vitamin A, overall and by study areas*

	Overall (n=2761)		By study areas				
			Control (n=1373)		Intervention (n=1388)		*p*
	n	*%*	*N*	*%*	*n*	*%*	
Ever heard of vitamin A, yes	2484	90.0	1222	89.0	1262	90.9	*0.09*
If yes, how long ago?[a]							
Over 10 years ago	939	38.0	455	37.4	484	38.6	*0.35*
5-10 years ago	524	21.2	270	22.2	254	20.3	
2-5 years ago	453	18.3	235	19.3	218	17.4	
Last year	279	11.3	128	10.5	151	12.1	
Just recently	274	11.1	128	10.5	146	11.7	
Why is Vitamin A important?[b]							
Prevents disease	1083	43.7	527	43.3	556	44.2	*0.21*
Protects the eyes	182	7.4	89	7.3	93	7.4	*0.98*

Any other correct fact	1076	43.4	558	45.8	518	41.1	*0.05*

Give three foods rich in Vitamin A[c]							
None correct	443	18.2	222	18.5	221	17.9	*0.33*
1 correct	934	38.5	476	39.8	458	37.2	
2 correct	784	32.3	378	31.6	406	33.0	
All 3 correct	268	11.0	121	10.1	147	11.9	

Learned Vitamin A rich foods from[d]							
Health Unit	1617	65.4	802	66.0	815	64.8	*0.54*
School	1376	55.6	665	54.7	711	56.5	*0.36*
Community health worker/Extension agent	269	10.9	110	9.0	159	12.6	*0.004*
Radio in Kiswahili	260	10.5	126	10.4	107	8.5	*0.11*
Female relative	239	9.7	127	10.4	112	8.9	*0.19*
Female friend	138	5.6	62	5.1	76	6.0	*0.30*
Male relative	102	4.1	42	3.5	60	4.8	*0.10*
Religious leader	74	3.0	31	2.5	43	3.4	*0.20*
Sign in market/elsewhere	54	2.2	32	2.6	22	1.7	*0.13*
Radio in English	34	1.4	18	1.5	16	1.3	*0.65*
Radio in local language	27	1.1	10	0.8	17	1.4	*0.20*
Local Leader	23	0.9	7	0.6	16	1.3	*0.07*
Male friend	11	0.4	3	0.2	8	0.6	*0.09*
Other	183	7.4	83	6.8	100	7.9	*0.28*

[a] n=14 do not remember the year first heard of Vitamin A; n=9 in Intervention and n=5 in Control group; valid n=2469. [b] Of those who have heard of vitamin A, missing information for n=3 in Intervention and n=4 in Control model.; valid n=2477; [c] Of those who have hear of vitamin A, n=55 do not know any vitamin A rich foods; n=30 from Intervention and n=25 from Control sites; valid n=2429; [d] Of those who have hear of vitamin A, missing information for n=4 and n=6 for Intervention and Control groups, respectively; valid n=2474.

Health unit and schools were the primary sources of information regarding vitamin A rich foods for larger proportions of the women(65% and 56%, respectively). Approximately 10% of the women also cited radio programs in Kiswahili and community health workers as important sources of information on vitamin A rich foods. A significantly greater proportion of women in the Intervention (13%) versus Control group (9%) cited community health workers as a source of vitamin A information. Relatively less proportions (<10%) of the women cited having learnt about the vitamin A foods either from local leaders, friends or relatives.

Table 27: *Women's knowledge about vitamin A, by districts*

	By districts							
	Kimilili (n=620)		**Bunyala (n=221)**		**Bungoma North (n=1706)**		**Bungoma East (n=214)**	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Ever heard of vitamin A, yes	559	90.2	190	86.0	1537	90.1	198	92.5
If yes, how long ago?[a]								
Over 10 years ago	198	35.7	64	33.7	607	39.8	70	35.5
5-10 years ago	122	22.0	43	22.6	315	20.6	44	22.3
2-5 years ago	107	19.3	32	16.8	287	18.8	27	13.7
Last year	64	11.5	27	14.2	166	10.9	22	11.2
Just recently	64	11.5	24	12.6	152	10.0	34	11.2
Why is Vitamin A important?[b]								

Prevents disease	231	41.5	75	39.5	672	43.9	105	53.0
Protects the eyes	47	8.4	7	3.7	113	7.4	15	7.6
Any other correct fact	241	43.3	93	48.9	667	43.5	75	37.9
Give three foods rich in Vitamin A[c]							
None correct	111	20.0	33	18.0	268	17.9	31	16.1
1 correct	218	39.4	84	45.9	575	38.3	57	29.7
2 correct	179	32.3	55	30.1	479	31.9	71	37.0
All 3 correct	46	8.3	11	6.0	178	11.9	33	17.2
Learned Vitamin A rich foods from[d]							
Health Unit	351	63.0	135	72.6	996	64.9	135	68.5
School	300	53.9	95	51.1	878	57.2	103	52.3
Radio in Kiswahili	57	10.2	13	7.0	138	9.0	25	12.7
Female relative	55	9.9	15	8.1	155	10.1	14	7.1
Community health /Extension workers	54	9.7	22	11.8	160	10.4	33	16.8
Male relative	27	4.8	3	1.6	64	4.2	8	4.1
Female friend	25	4.5	15	8.1	81	5.3	17	8.6
Religious leader	20	3.6	3	1.6	45	2.9	6	3.0
Sign in market/elsewhere	17	3.1	4	2.2	22	1.4	11	5.6
Radio in English	11	2.0	3	1.6	14	0.9	6	3.0
Radio in local language	4	0.7	1	0.5	18	1.2	4	2.0
Local Leader	4	0.7	2	1.1	13	0.8	4	2.0
Male friend	3	0.5	0	0.0	5	0.3	3	1.5
Other	30	5.4	22	11.8	115	7.5	16	8.1

[a] n=15 do not remember the year first heard of Vitamin A, of which n=10, n=1, and n=4 are in Bungoma North, Bungoma East and Kimilili districts, respectively; valid n=2469; [b] Of those who have heard of vitamin A, missing information for n=5 in Bungoma North and n=2 in Kimilili districts.; valid n=2477; [c] Of those who have hear of vitamin A, n=55 do not know any vitamin A rich foods; n=37 from Bungoma North, n=6 from Bungoma East, n=5 from Kimilili, and n=7 from Bunyala district. Valid n=2429; [d] Of those who have hear of vitamin A, missing information for n=10; n=3, n=1, n=2 and n=4 for Bungoma North, Bungoma East, Kimilili, and Bunyala districts, respectively; valid n=2474.

Women's knowledge regarding vitamin A was comparable across districts. Most women were aware of vitamin A, about of 93% in Bungoma East and a low of 86% in Bunyala. Approximately a third of the women in all the districts first heard of the vitamin over 10 years prior to the time of the survey. While majority of them, ranging from 60% in Bungoma North to 66% in Kimilili, had not heard of vitamin A 10 years ago. However, at least 55% of the women in the four districts had heard about the vitamin at least 5 years prior to the time of the survey.

The highest proportion of women who recognized that vitamin A is important for disease prevention was in Bungoma East (53%) while the lowest was in Bunyala (40%). Similarly, a high of 17% of the women in Bungoma East were able to list three foods rich in vitamin A compared to a low of 6% of women in Bunyala. Health unit (63%) and school (51%) are the most common primary sources information about vitamin A. Most of the women in all districts reported that (at least 63% and 51%, respectively)In addition, a high of 17% of the women in Bungoma East cited community health workers as a source of vitamin A information, compared to a low of 8% in Kimilili. In all the districts, only a relatively low proportion of women (<10%) cited the primary source as local leaders, friends or relatives.

3.2.4. Knowledge about health seeking behaviours

Knowledge of health seeking behaviour was high for all women. Overall, 83% and 76% of the women noted that eating good quality food frequently and attending ANC clinics, respectively, were among the most important steps to ensure healthy pregnancy. Using nets or anti-malarial drugs to prevent malaria and checking HIV status were also identified as important steps towards healthy pregnancy by 30% and 19%, respectively. Around 81% noted that avoiding stress and limiting exercise among other actions contribute to a healthy pregnancy as well. The proportion who identified strategies such as avoiding alcohol, not smoking or taking iron tablets /syrup was relatively low, <10%. There were no differences in knowledge of health seeking behaviour between study groups. This is with the exception of malaria prevention strategies, for which a significantly greater proportion of women in the Control group(33%) recognized their importance compared to that of the Intervention group (27%).

About 79% of the respondents said that attending ANC clinics should commence within the first four months of pregnancy, while a quarter of the women noted that ANC attendance should begin as soon as pregnancy is suspected. Over 40% of the women believed that pregnant women should attend ANC clinics 3 or 4 times, while an additional 37% of women cited 5 or 6 times as the ideal number of ANC visits during pregnancy. Less than 1% of women believed that ANC clinic should be attended less than 3 times during pregnancy and 8% of women overall thought that pregnant women should attend ANC clinics at least 9 times. A significantly higher proportion of women in the Control group believed in more ANC visits compared to the Intervention group. Furthermore, the average reported ideal number of ANC visits was slightly though significantly higher for the Control group(5.3 times) compared to the Intervention group (5.1 times).

The most commonly reported ANC health service by women was general health check-up, including having blood pressure measurement (75%). A majority of women reported receiving medication and vaccines (63%) and having their weight measured (56%), as services that occur at the ANC visit. Relatively few women (12%) noted receiving nutritional advice during the ANC visit. There were no differences in the services received at ANC visits by women in the Control and Intervention areas.

Table 28: *Women's knowledge of health seeking behaviours, overall and by study areas*

	Overall (n=2761)		By study areas				
			Control (n=1373)		Intervention (n=1388)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Most important things to ensure healthy pregnancy[a]							
Eating well (quality foods eaten frequently)	2283	82.8	1132	82.6	1151	83.0	*0.77*
Avoiding alcohol	104	3.8	54	3.9	50	3.6	*0.64*

Not smoking	51	1.9	20	1.5	31	2.2	*0.13*
Attending ANC clinics	2085	75.7	1036	75.6	1049	75.7	*0.96*
Taking iron tablets/syrup	52	1.9	29	2.1	23	1.7	*0.37*
Prevent malaria with nets/drugs	820	29.8	445	32.5	375	27.1	*0.002*
Check HIV status	525	19.0	268	19.6	257	18.5	*0.49*
Other (avoid stress, exercise, etc)	2240	81.3	1110	81.0	1130	81.5	*0.73*
Start attending ANC clinic[b]							
As soon as pregnancy is suspected	676	24.5	345	25.1	331	23.9	*0.45*
No later than 4 months pregnancy	2182	79.1	1104	80.5	1078	77.8	*0.14*
No. of times pregnant woman should attend ANC clinic[c]							
Times	5.2[1]	1.8[2]	5.3[1]	1.8[2]	5.1[1]	1.8[2]	*0.005*
<3 times	20	0.7	9	0.7	11	0.7	*0.005*
3 times	480	17.4	211	15.4	269	19.4	
4 times	679	24.6	325	23.7	354	25.6	
5 times	546	19.8	267	19.5	279	20.1	
6 times	459	16.7	257	18.7	202	4.6	
7 times	169	6.1	103	7.5	66	4.8	
8 times	183	6.6	93	6.8	90	6.5	
9 times	206	7.5	97	7.1	109	7.9	
>9 times	14	0.5	9	0.6	5	0.3	
Services that occur at ANC visit[d]							
Health check-up (BP and tests)	2067	75.2	1027	75.1	1040	75.3	*0.91*
Weight taken	1543	56.1	757	55.4	786	56.9	*0.41*
Nutritional advice	316	11.5	159	11.6	157	11.4	*0.82*
Given medication & vaccines	1741	63.4	866	63.4	875	63.4	*0.99*

[1] mean, [2] standard deviation[a] n=2 in Intervention group and n=3 women in the Control group do not know or are missing data; valid n=2756; [b] Missing data for n=2 in Intervention group and n=1 in the Control group; valid n=2758; [c] Missing data for n=3 in Intervention group and n=2 in the Control group; valid n=2756; [d] Missing data for n=7 in Intervention group and n=6 in the Control group; valid n=2748.

Eating well and attending ANC clinics continued to be recognized by most of the women, at least 80% and 75%, respectively, in all districts, as the most important practices to ensure health pregnancy. A higher proportion (42%) of women in Bunyala also recognized the importance of preventing malarial and checking HIV status compared to other districts. In addition, proportion of women in Bunyala who noted that pregnant women should start visiting ANC clinics no later than four months was higher compared to other districts. However, the proportion of women who believed that ANC attendance should start as soon as pregnancy is suspected or no later than 4 months of pregnancy lowest in Bungoma East (91%). In all the other three districts, all the women believed that ANC attendance should commence either as soon as a woman suspect that she is pregnant or when the pregnancy is not more than 4 months.

Majority of women in all districts believed that a pregnant woman should attend ANC 4, 5 or 6 times during the entire pregnancy period. Nonetheless, 22% of the women in Bunyala, the highest proportion of women compared to other districts, thought that women should attend ANC 7-8 times. In contrast, the highest proportion (45%) of women in Bungoma North compared to other districts believed that ideal number of ANC visits were 3-4 times. The average number ANC visits reported by the women varied narrowly across the districts, from 5.1 times in Bungoma East to 5.8 times in Bunyala.

Health check-up, including blood pressure measurement, was reported by most of the women in all the districts, at least 70%, as the most common service received at ANC visits. About 70% of the women in Kimilili reported receiving medication and vaccines at ANC visit compared to a low of 57% of women in Bunyala who reported the same. Women who reported that their weight measured were 80% in all districts, while only 10% to 12% of women reported receiving nutritional advice during their ANC visit.

Table 29: *Women's knowledge of health seeking behaviours, by districts*

	By districts							
	Kimilili (n=620)		Bunyala (n=221)		Bungoma North (n=1706)		Bungoma East (n=214)	
	N	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Most important things to ensure healthy pregnancy[a]								
Eating well (quality foods eaten frequently)	515	83.2	176	80.0	1417	83.2	175	81.8
Avoiding alcohol	22	3.6	12	5.5	62	3.6	8	3.7
Not smoking	9	1.5	4	1.8	37	2.2	1	0.5
Attending ANC clinics	468	75.6	167	75.9	1282	75.3	168	78.5
Taking iron tablets/syrup	12	1.9	5	2.3	32	1.9	3	1.4
Prevent malaria with nets/drugs	193	31.2	93	42.3	487	28.6	47	22.0
Check HIV status	107	17.3	54	24.5	322	18.9	42	19.6
Other (Avoid stress, exercise, etc)	495	80.0	169	76.8	1415	83.1	161	75.2
Start attending ANC clinic[b]								
As soon as pregnancy is suspected	162	26.2	54	24.4	425	24.9	35	16.5
No later than 4 months pregnancy	489	79.0	186	84.2	1349	79.1	158	74.5
No. of times pregnant woman should attend ANC clinic[c]	5.3^1	1.7^2	5.8^1	1.8^2	5.1^1	1.9^2	5.3^1	1.8^2
<3 times	3	0.5	0	0.0	17	1.0	0	0.0
3 times	93	15.0	23	10.5	336	19.7	28	13.1
4 times	150	24.2	38	17.3	432	25.4	59	27.7
5 times	123	19.9	44	20.0	336	19.7	43	20.2
6 times	124	20.0	46	20.9	248	14.6	41	19.2
7 times	46	7.4	23	10.5	89	5.2	11	5.2
8 times	35	5.7	26	11.8	109	6.4	13	6.1
9 times	42	6.8	19	8.6	128	7.5	17	8.0
>9 times	3	0.5	1	0.5	9	0.5	1	0.5
Services that occur at ANC visit[d]								
Health check-up (BP and tests)	465	75.1	162	74.3	1289	75.9	151	71.2
Weight taken	351	56.7	114	52.3	951	56.0	127	59.9
Nutritional advice	68	11.0	23	10.6	204	12.0	21	9.9
Given medication & vaccines	434	70.1	125	57.3	1045	61.5	137	64.6

[1] mean [2] standard deviation. [a]n=3 in Bungoma North and n=1 in Kimilili and Bunyala districts, each, do not know or are missing data; valid n=2756; [b] Missing data for n=2 in Bungoma East and n=1 in Kimilili districts; valid n=2758; [c] Missing data for n=2 in Bungoma North and n=1 in Bungoma East, Kimilili, and Bunyala, each; valid n=2756; [d] Missing data for n=7 in Bungoma North, n=2 in Bungoma East, n=1 in Kimilili and n=3 in Bunyala; valid n=2748.

3.2.5 Knowledge of child-care practices

Overall, women's knowledge of childcare practices immediately after birth was limited. Twenty six per cent of the women acknowledged that a mother should breastfeed the baby immediately after birth, 2% noted holding the baby and only <1% noted taking a vitamin A capsule as important child care practices immediately after birth. A significantly greater proportion of women in the Control group(28%) cited breastfeeding the baby immediately after birth as important compared to the Intervention group (25%). Most women, over 80%, believed that feeding the baby colostrum after birth was beneficial. Only 18% of the women cited using colostrum to feed the baby as bad. These proportions were almost the same between the Control and Intervention areas. Few women (13%) were able completely define exclusive breastfeeding correctly, while the majority (43%) were only partially correct in the definition of exclusive breastfeeding.

Sixty per cent of the women also believed that the baby should be breastfed until 24 months of age, while 20% in each category believed that the infant should be breastfed for less or greater than 24 months. On average, the women noted 26 months as the ideal age to stop breast-feeding the child. The majority of women recognized that exclusive breastfeeding entailed provision of breastmilk as the sole source of food for the baby in the first 6 months of life, but failed to exclude water from the diet as well. This is particularly evident by the fact that 74% of the women stated that water should be introduced at less than 6 months of life, while only a quarter of the women felt that water should be introduced to the infant at 6 months or later in life. The ideal average age for introducing water in a child's diet reported by the women was two months. These proportions were not significantly different between the two study areas.

The majority of the women, 67%, reported that complementary foods should be introduced at 6 months of age, while 25% reported introducing complementary foods at less than 6 months of age. A significantly greater proportion of the women in the Intervention group believed in introducing complementary foods at less than 6 months compared to that of the Control group. In overall, the women noted an average of 5 months as the ideal age of introducing complimentary foods in a child's diet. In addition,93%of all the respondents believed that sweetpotato should be introduced in an infant diet at 6 months of age or later. On average, the women noted 9 months as the ideal age to introduce sweet potatoes in a child's diet.

Almost all women reported that a breastfed 6-8 month old infant should be fed complementary foods at least 2 times during the day and a breastfed 1 year old should be fed complementary foods at least 3 times per day. In overall, the women noted an average of 4times as the ideal number of times a breast fed 1 year old should be fed complimentary foods.

Table 30: *Women's knowledge of child-care practices, overall and by study areas.*

	All	By study areas		
		Control	Intervention	*p*

	(n=2761)		(n=1373)		(n=1388)		
	n	*%*	*n*	*%*	*n*	*%*	
Immediately after birth, the mother should[a]							
Hold the baby (ensure skin contact)	59	2.1	24	1.7	35	2.5	*0.15*
Breastfeed the baby	727	26.3	387	28.1	340	24.5	*0.028*
Take a vitamin A capsule	19	0.6	13	0.9	6	0.4	*0.10*
Feeding the baby colostrum after birth[b]							
Good	2235	81.0	1121	81.7	1114	80.4	*0.79*
Bad	504	18.3	242	17.6	262	18.9	
Don't know	19	0.7	9	0.7	10	0.7	
Able to define exclusive breastfeeding							*<0.001*
Completely correct	369	13.4	232	16.9	137	9.9	
Partially correct	1189	43.1	592	43.1	597	43.0	
Age to introduce water, months[c]	2.02[1]	2.6[2]	2.28	2.7	1.76	2.5	
<6 months	2037	73.9	960	70.0	1077	77.7	*<0.001*
6 months	640	23.2	362	26.4	278	20.1	
>6 months	81	2.9	50	3.6	31	2.2	
Age to introduce complementary foods (CF), months[d]	5.2[1]	1.8[2]	5.4	1.7	5.1	1.8	
<6 months	687	24.9	301	21.9	386	27.8	*<0.001*
6 months	1837	66.6	937	68.3	900	64.9	
>6 months	235	8.5	134	9.8	101	7.3	
Age to introduce sweetpotato, months[e]	9.1[1]	5.1[2]	9.0	5.2	9.1	5.6	*0.07*
<6 months	193	7.0	81	5.9	112	8.1	
6 months	1042	37.8	529	38.6	513	37.1	
>6 months	1520	55.2	761	55.5	759	54.8	
Age to breastfeed baby until, months[f]	25.6[1]	12.0[2]	26.4	12.9	24.9	11.0	*0.20*
<24 months	571	20.7	277	20.2	294	21.2	
24 months	1639	59.5	803	58.6	836	60.3	
>24 months	546	19.8	290	21.2	256	18.5	
A breastfed 6-8mo. old should be fed CFs[g]	3.6[1]	1.2[2]	3.6	1.1	3.6	1.2	*0.74*
<2	9	0.3	4	0.3	5	0.4	*0.50*
≥2	2743	99.7	1367	99.2	1376	99.6	
A breastfed 1 yr. old should be fed CFs[h]	4.0[1]	1.4[2]	4.0	1.4	4.0	1.5	*0.82*
<3	172	6.3	96	7.0	76	5.5	*0.10*
≥3	2580	93.8	1275	93.0	1305	94.5	
Source of child-feeding information[i]							
Health Center	1985[1]	72.0	986	71.9	999	72.0	*0.95*
Extension Agent	83	3.0	42	3.1	41	3.0	*0.86*
Mosque/Church	92	3.3	34[b]	2.5	58[a]	4.2	*0.013*
Husband	41	1.5	21	1.5	20	1.4	*0.84*
Mother	1096	39.7	563	41.1	533	38.4	*0.15*
Mother-in-law	254	9.2	128	9.3	126	9.1	*0.81*
Other female relative	332	12.0	161	11.7	171	12.3	*0.63*
Other female	209	7.6	97	7.1	112	8.1	*0.32*
Other male relative/other male	23	0.8	14	1.0	9	0.6	*0.23*
Radio	237	8.6	127	9.3	110	7.9	*0.21*
School	535	19.4	250	18.2	285	20.5	*0.12*

Traditional Healer	21	0.8	3ᵦ	0.2	18ₐ	1.3	*<0.001*
Trained health volunteer/promoter	155	5.6	66	4.8	89	6.4	*0.06*
Do not know	8	0.3	4	0.3	4	0.3	*0.98*

[1]mean [2]standard deviation; [a] n=15 in Intervention group and n=14 in the Control group do not know what the mother should do after birth. [b] Missing data for n=2 in Intervention group and n=1 in the Control group; valid n=2758; [c] Missing data for n=2 in Intervention and n=1 in the Control groups; valid n=2758; [d] Missing data for n=1 in Intervention and Control groups, each; valid n=2759; [e] Missing data for n=4 in Intervention and n=2 in Control group; valid n=2755; [f] Missing data for n=2 in Intervention and n=3 in Control groups; valid n=2756; [g] Missing data for n=7 in Intervention and n=2 in Control groups; valid n=2752; [h] Missing data for n=7 in Intervention and n=4 in Control groups; valid n=2750; [i] Missing data for n=1 in Intervention and n=2 in Control groups; valid n=2758; [2]Traditional healer category combined with Mosque/Church category to obtain >5 counts in each cell.

Most of the women, 72%, noted the health centre as their primary source of child feeding information. About 40% stated that their mothers were their primary source of feeding information. Small proportion of women (≤ 12 %) also cited other females including relatives & mother-in-law, the radio and trained health volunteers as important sources of the information as well.

Knowledge of child-care practices was disparate across the districts. The proportion of women who were aware that breastfeeding the baby immediately after birth was important varied widely across the districts ranging from 40%in Bunyala to 24% in Kimilili. Similarly, a greater proportion of women in Bunyala (88%) believed that feeding the baby colostrum after birth was good compared to a 77% of the women in Kimilili. In addition, 34% of women in Bunyala, the highest proportion across the districts, were able to correctly define exclusive breastfeeding compared to low of 12% each in Kimilili and Bungoma North and 2% of women in Bungoma East.

About three-quarters of the women in Kimilili, Bungoma North and Bungoma East believed that water should be introduced to the infant at less than 6 months of age whereas, 48% in Bunyala stated the same. The remaining 52% of the women in Bunyala, the highest proportion across districts, believed that water should be introduced to the infant at 6 months of age or later. Moreover, the average ideal age of introducing water in a child's diet noted by the women was comparatively higher in Bunyala compared to the other districts.

Majority of women, ranging from 63% in Bunyala to 69% in Kimilili, believed that complementary foods should be introduced to the infant at 6 months of age. Further still a range of between 14% in Bunyala and 27% in Bungoma North stated that CFs should be introduced in a child's diet at less than 6 months of age. Except for Bunyala where 22% of the women stated that CFs should be introduced in a child's diet later than 6 months, only ≤ 10% of the women in the other districts stated that CFs should be introduced later than 6 months in a child's life. A range of between 30% in Bungoma East and 49% in Bunyala believed that sweetpotatoes should be introduced in a child's life at 6 months of age. A still larger proportion, ranging from 48% in Bunyala to 68% in Bungoma East believed in introducing sweetpotatoes later than 6 months in a child's life. Just a few women (less than 8%) in the four districts believed in introducing

sweetpotatoes in a child's diet at less than 6 months of age. In addition, the women in Bunyala reported a comparatively lower average ideal age of introducing sweet potatoes in the infants' diet.

While majority of women in all districts believed that the infant should be breastfed until 24 months of age, a higher proportion of women in Bunyala (31%) compared to other districts, reported that a child should be breastfed beyond 24 months of age. Additionally the average ideal age reported by the women for which to stop breastfeeding a child varied widely across the districts with a high of 30 months in Bunyala and a low of 11 months in Kimilili. Nonetheless, almost all women in all the districts believed that a breastfed infant 6-8 months of age and a breastfed 1 year old should be fed complementary foods at least 2 and 3 times per day, respectively.

Table 31: *Women's knowledge of child-care practices, by districts*

	By districts							
	Kimilili (n=620)		**Bunyala (n=221)**		**Bungoma North (n=1706)**		**Bungoma East (n=214)**	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Immediately after birth, the mother should[a]								
Hold the baby (ensure skin contact)	10	1.6	7	3.2	32	1.9	10	4.8
Breastfeed the baby	147	23.9	88	40.2	428	25.3	64	30.5
Take a vitamin A capsule	6	1.0	0	0.0	13	0.8	0	0.0
Feeding the baby colostrum after birth[b]								
Good	479	77.4	194	87.8	1385	81.2	177	83.1
Bad	136	22.0	26	11.8	309	18.1	33	15.5
Don't know	4	0.6	1	0.5	11	0.6	3	1.4
Able to define exclusive breastfeeding								
Completely correct	78	12.6	74	33.5	213	12.5	4	1.9
Partially correct	274	44.2	81	36.7	748	43.8	86	40.2
Age to introduce water, months[c]	1.8[1]	2.6[2]	3.7	2.8	1.8	2.6	1.9	2.6
<6 months	477	77.1	107	48.4	1292	75.8	161	75.2
6 months	129	20.8	90	40.7	372	21.8	49	22.9
>6 months	13	2.1	24	10.9	40	2.3	4	1.9
Age to introduce complementary foods (CF), months[d]	5.2[1]	1.6[2]	5.96	1.6	5.15	1.8	5.33	1.7
<6 months	152	24.6	31	14.0	455	26.7	49	22.9
6 months	429	69.3	141	63.8	1124	65.9	143	66.8
>6 months	38	6.1	49	22.2	126	7.4	22	10.3
Age to introduce sweetpotato, months[e]	9.1[1]	5.4[2]	7.4	2.8	9.2	5.6	9.6	5.5
<6 months	39	6.3	17	7.7	125	7.3	12	5.6
6 months	237	38.3	99	44.8	643	37.8	63	29.6
>6 months	343	55.4	105	47.5	934	54.9	138	64.8
Age to breastfeed baby until, months[f]	24.7[1]	10.6[2]	30.9	17.7	25.1	11.3	27.2	12.6

<24 months	132	21.4	44	19.9	362	21.3	33	15.4
24 months	381	61.7	106	48.0	1025	60.2	127	59.3
>24 months	105	17.0	71	31.1	316	18.6	54	25.2
A breastfed 6-8mo. old should be fed CFs[g]	3.6[1]	1.1[2]	3.3	0.9	3.6	1.2	3.5	1.1
<2	1	0.2	0	0.0	7	0.4	1	0.5
≥2	617	99.8	221	100.0	1694	99.6	211	99.5
A breastfed 1 yr. old should be fed CFs[h]	4.1[1]	1.4[2]	3.6	1.2	4.0	1.5	3.9	1.3
<3	43	7.0	18	8.1	97	5.7	14	6.6
≥3	575	93.0	203	91.9	1604	94.3	198	93.4
Source of child-feeding information[i]								
Health Center	424	68.5	173	78.3	1236	72.5	152	71.4
Extension Agent	10	1.6	20	9.0	44	2.6	9	4.2
Mosque/Church	16	2.6	3	1.4	61	3.6	12	5.6
Husband	10	1.6	5	2.3	20	1.2	6	2.8
Mother	264	42.6	70	31.7	697	40.9	65	30.5
Mother-in-law	58	9.4	13	5.9	166	9.7	17	8.0
Other female relative	74	12.0	29	13.1	188	11.0	41	19.2
Other female	39	6.3	11	5.0	146	8.6	13	6.1
Other male relative/other male	6	1.0	5	2.3	10	0.6	2	0.9
Radio	61	9.9	10	4.5	133	7.8	33	15.5
School	115	18.6	32	14.5	349	20.5	39	18.3
Traditional Healer	1	0.2	2	0.9	13	0.8	5	2.3
Trained health volunteer/promoter	33	5.3	20	9.0	83	4.9	19	8.9
Do not know	1	0.2	1	0.5	6	0.4	0	0.0

[1] is the mean and [2] is the standard deviation; [b] Missing data for n=1 in Bungoma North, Bungoma East and Kimilili, each; valid n=2758; [c]. Missing data for n=2 in Bungoma North and n=1 in Kimilili districts; valid n=2758; [d] Missing data for n=1 in Bungoma North and Kimilili districts, each; valid n=2759; [e]. Missing data for n=4 in Bungoma North, n=1 in Bungoma East and Kimilili, each; valid n=2755; [f] Missing data for n=3 in Bungoma North and n=2 in Kimilili districts; valid n=2756; [g] Missing data for n=5 in Bungoma North, n=2 in Bungoma East, and n=2 in Kimilili; valid n=2752; [h] Missing data for n=7 in Bungoma North, n=2 in Bungoma East, and n=2 in Kimilili; valid n=2750; [i] Missing data for n=1 from Bungoma North, Bungoma East and Kimilili districts, each; valid n=2758.

A greater proportion of women ranging from 68% in Kimilili to 78% in Bunyala reported the health center as their primary source of information regarding child-feeding practices. Relatively fewer women in Bunyala cited school and mother as sources of information compared to other districts.

3.2.5   Derived Knowledge scores

3.2.5.1. Distribution of knowledge scores

3.2.6.1.1. Knowledge score about nutrition

The distribution of women's knowledge score about nutrition is shown in ***figure 10*** Mean (SD) score was of 4.5 (2.4); it was 4.5 (2.4) in Control and 4.6 (2.4) in Intervention (*p=0.21*).
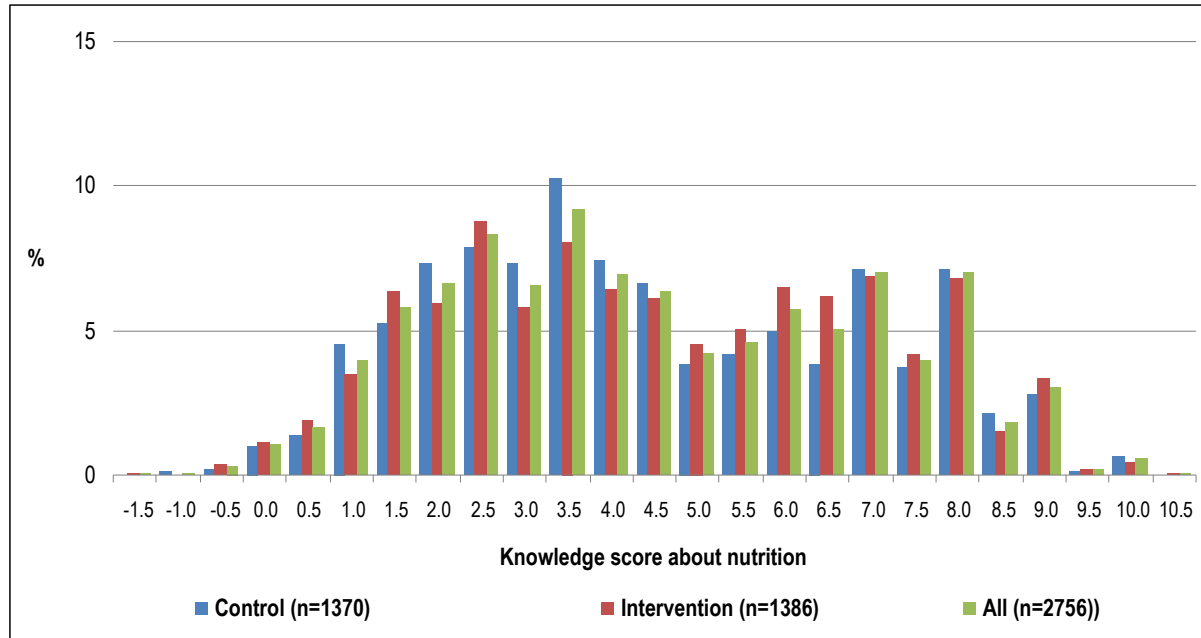
Figure 10: *Distribution of knowledge score about nutrition, overall and by study areas*

The knowledge score on nutrition does not show any trend in differences between the Intervention and the Control areas. It also shows two clusters between 2.5 and 4.5 and 4.5 and 8.0.

3.2.5.1.2. Knowledge score about vitamin A

The distribution of women's knowledge score about vitamin A is shown in ***figure 11***. Mean (SD) score was of 2.9 (1.5); it was 2.9 (1.5) in Control and 3.0 (1.5) in Intervention (*p=0.18*)
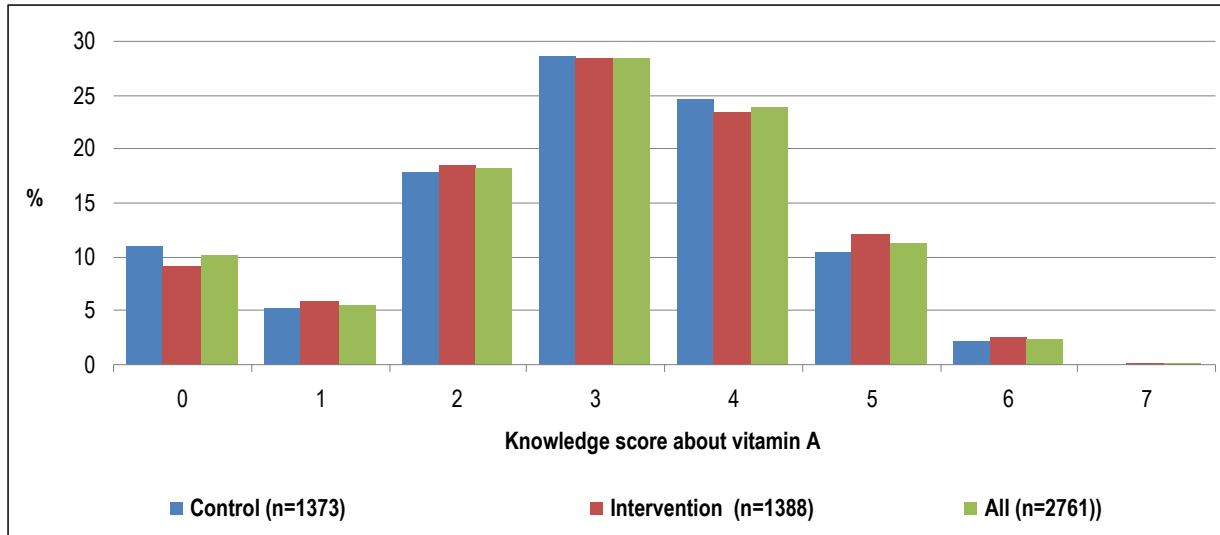
Figure 11: *Distribution of knowledge score about vitamin A, overall and by study areas*

Looking at the distribution of knowledge about vitamin A, the data shows that there is little difference in the trend of the knowledge between the Intervention and the Control areas. We also find that it is normally distributed through with a heavy tail at zero and one.

3.2.6.1.3. Knowledge score about health seeking behaviours

The distribution of women's knowledge score about health seeking behaviours is shown in *figure 12*. Mean (SD) score was of 6.3 (1.7); it was 6.4 (1.7) in Control and 6.2 (1.7) in Intervention (*p=0.033*).
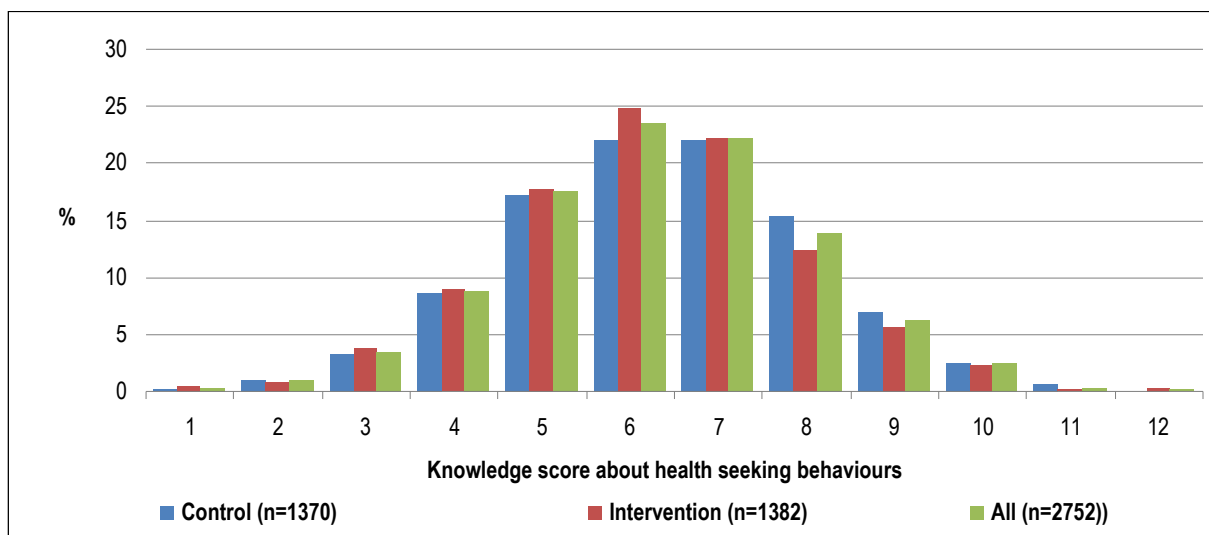
Figure 12: *Distribution of knowledge score about health seeking behaviours, overall and by study areas.*

When the distribution of knowledge score about health seeking behaviour is plotted, we find that it also follow a normal distribution with the highest cluster being at 6 and 7. There is also little difference in trend between the Intervention and the Control areas though at score 6 the score for the Intervention is slightly higher than that of the Control areas.

3.2.6.1.4. Knowledge score about child care

The distribution of women's knowledge score about child care is shown in *figure 13*. Mean (SD) score was of 8.3 (2.5); it was 8.5 (2.5) in Control and 8.1 (2.4) in Intervention ($p<0.001$)
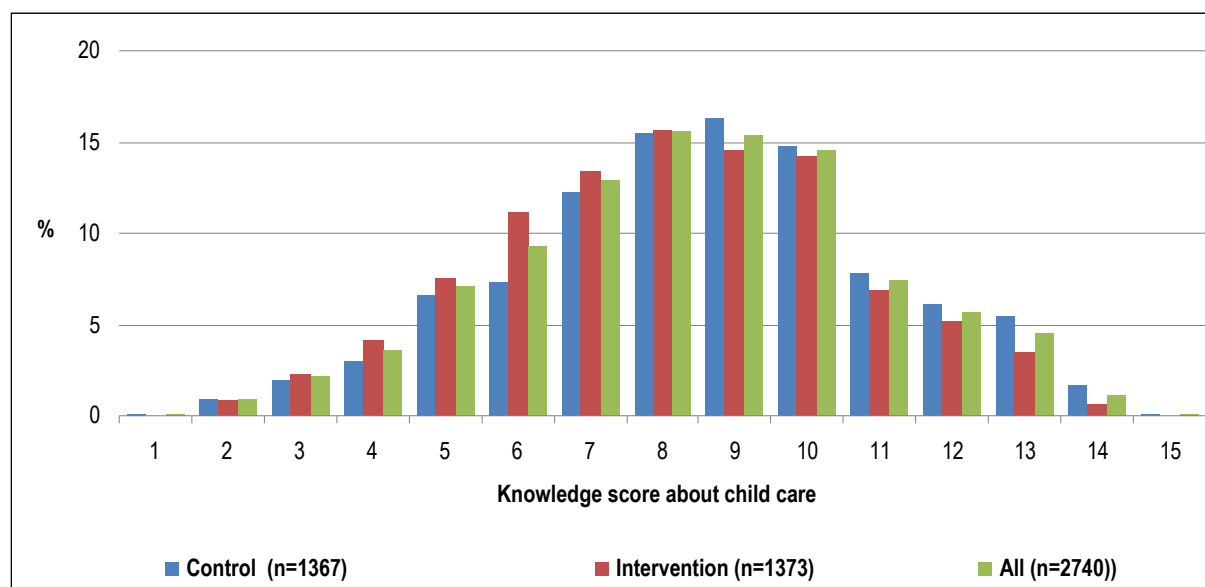
Figure 13: *Distribution of knowledge score about childcare, overall and by study areas.*

Looking at the knowledge score of about childcare, we find that more of the respondents are clustered at score of 6 to 10. There is a marked decline above score 11. At the lower end of the graph, we observe that the Interventions have a consistent higher score whereas at the upper end the Control areas show a consistent higher childcare score.

3.2.6.1.5. Knowledge score about orange-fleshed sweetpotato

The distribution of women's knowledge score about orange-fleshed sweetpotato is shown in *figure 14*. Mean (SD) score was of 2.7 (1.4), it was 2.7 (1.4) in Control and 2.8 (1.3) in Intervention ($p=0.07$)
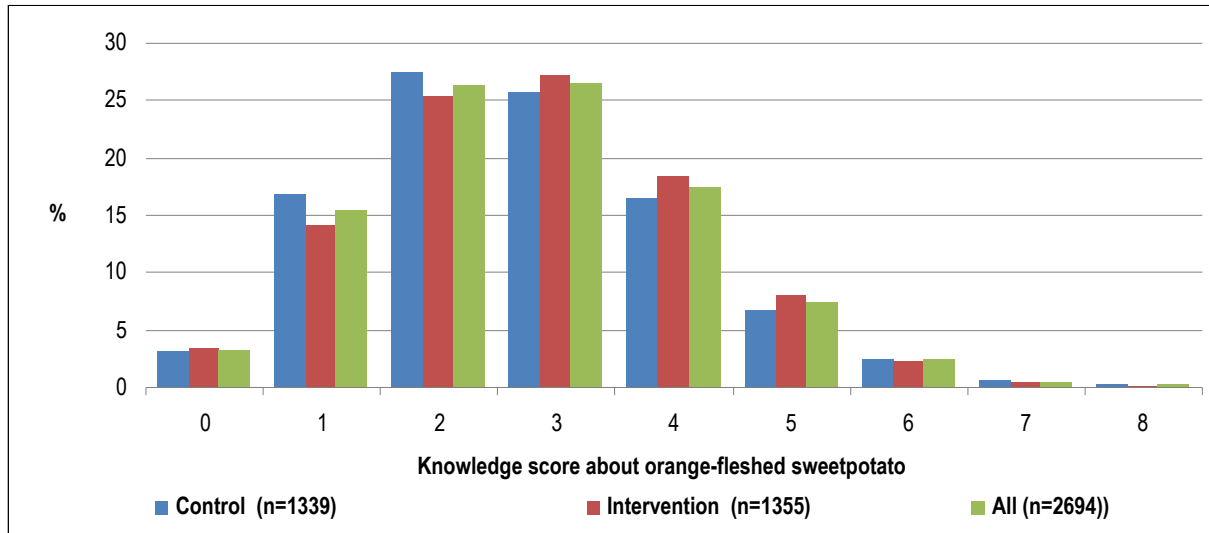
Figure 14: *Distribution of knowledge score about orange-fleshed sweetpotato, overall and by study areas.*

The distribution of knowledge about orange flesh sweetpotato shows that the Control area have consistent lower scores than the Intervention whereas at the upper end of the curve there is a consistence that the Intervention areas has higher score up to score 5 and this reverses at score 7 and 8.

3.2.6.1.6. Combined knowledge score about nutrition and vitamin A

The distribution of women's knowledge score about nutrition and vitamin A is shown in ***figure 15***. Mean (SD) score was of 7.4 (3.2); it was 7.3 (3.2) in Control and 7.5 (3.2) in Intervention (*p=0.11*).
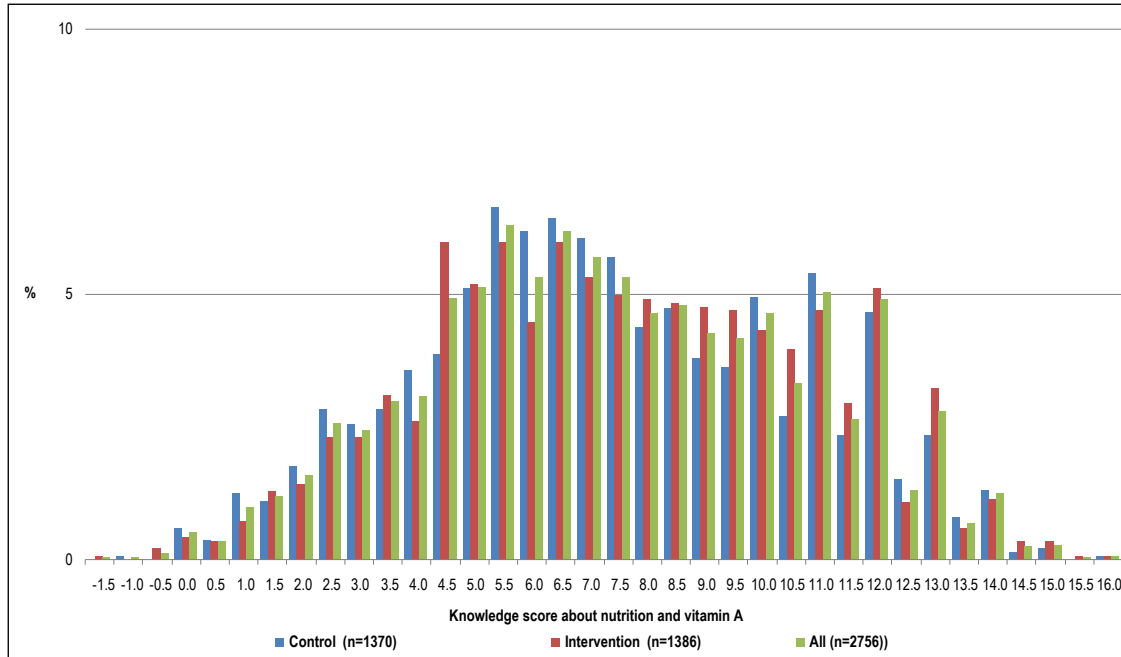
Figure 15: *Distribution of knowledge score about nutrition and vitamin A, overall and by study areas.*

3.2.6.1.7. Combined knowledge score about health

The distribution of women's knowledge score about health is shown in *figure 16*. Mean (SD) score was of 14.6 (3.2); it was 14.9 (3.3) in Control and 14.3 (3.2) in Intervention (*p<0.001*).

Looking at the combine knowledge score about health, we find that there is no trend of differences between the Intervention areas and the Control areas. The first half of the of the curves shows that the Control areas had higher score mainly up to score 7.5. On the second half of the curve, we find that the Interventions have more points where they have higher scores.
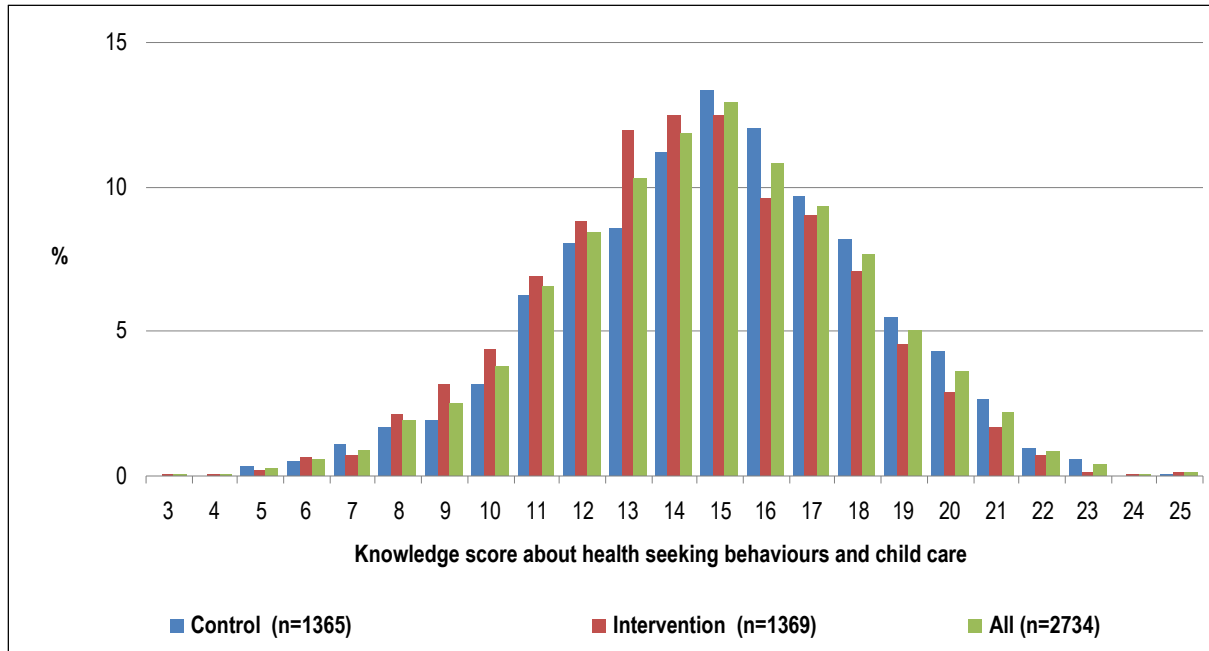
Figure 16*: Distribution of knowledge score about health seeking behaviours and childcare, overall and by study areas.*

Looking at the knowledge score about health seeking behaviors and childcare, we find that the graph follows the normal curve. We also observe a trend where the first half of the graph Interventions areas show dominance in having higher percentage at each score. This trend is reversed at the second half of the curve where the Control areas dominants with higher scores at more points.

3.2.6.1.8. Combined knowledge score about health and nutrition

The distribution of women's knowledge score about health and nutrition is shown in *figure 17*. Mean (SD) score was of 22.1 (5.3); it was 22.3 (5.3) in Control and 21.9 (5.3) in Intervention (*p=0.06*).
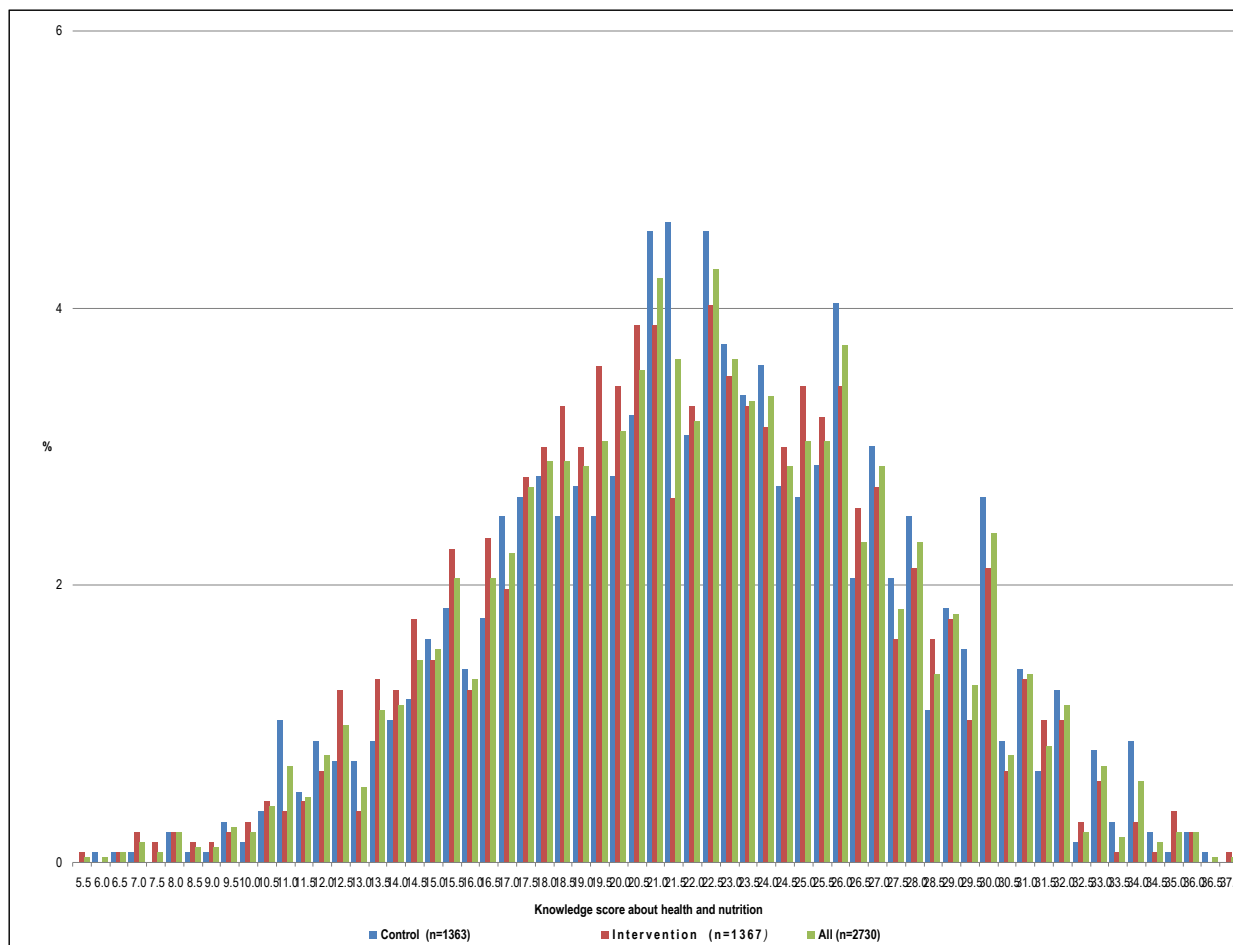
Figure 17*: Distribution of knowledge score about health and nutrition, overall and by study areas.*

Looking at the knowledge score about health and nutrition, we find that the graph follows the normal curve though the tail is fatter at the upper end hence negatively skewed. We also observe a trend where the first half of the graph Interventions areas show dominance in having higher percentage at each score. This trend is reversed at the second half of the curve where the Control areas dominants with higher scores at more points.

3.2.6.1.9. Global knowledge score about health, nutrition and orange-fleshed sweetpotato

The distribution of women's knowledge score about health and nutrition is shown in figure 18. Mean (SD) score was of 24.9 (5.6); it was 25.1 (5.7) in Control and 24.8 (5.6) in Intervention. Again looking at the global knowledge score about health, nutrition, and orange-fleshed sweetpotato we find that the graph follows the normal curve though the tail is fatter at the upper end hence negatively skewed. We also observe a trend where the first half of the graph Interventions areas show dominance in having higher percentage at each score. This trend is reversed at the second half of the curve where the Control areas dominants with higher scores at **Figure 18***: Distribution of knowledge score about health and nutrition, overall and by study areas***(p=0.20).*

Knowledge score about health, nutrition and orange-fleshed sweetpotato

Control (n=1330)   Intervention (n=1335)   All (n=2665))
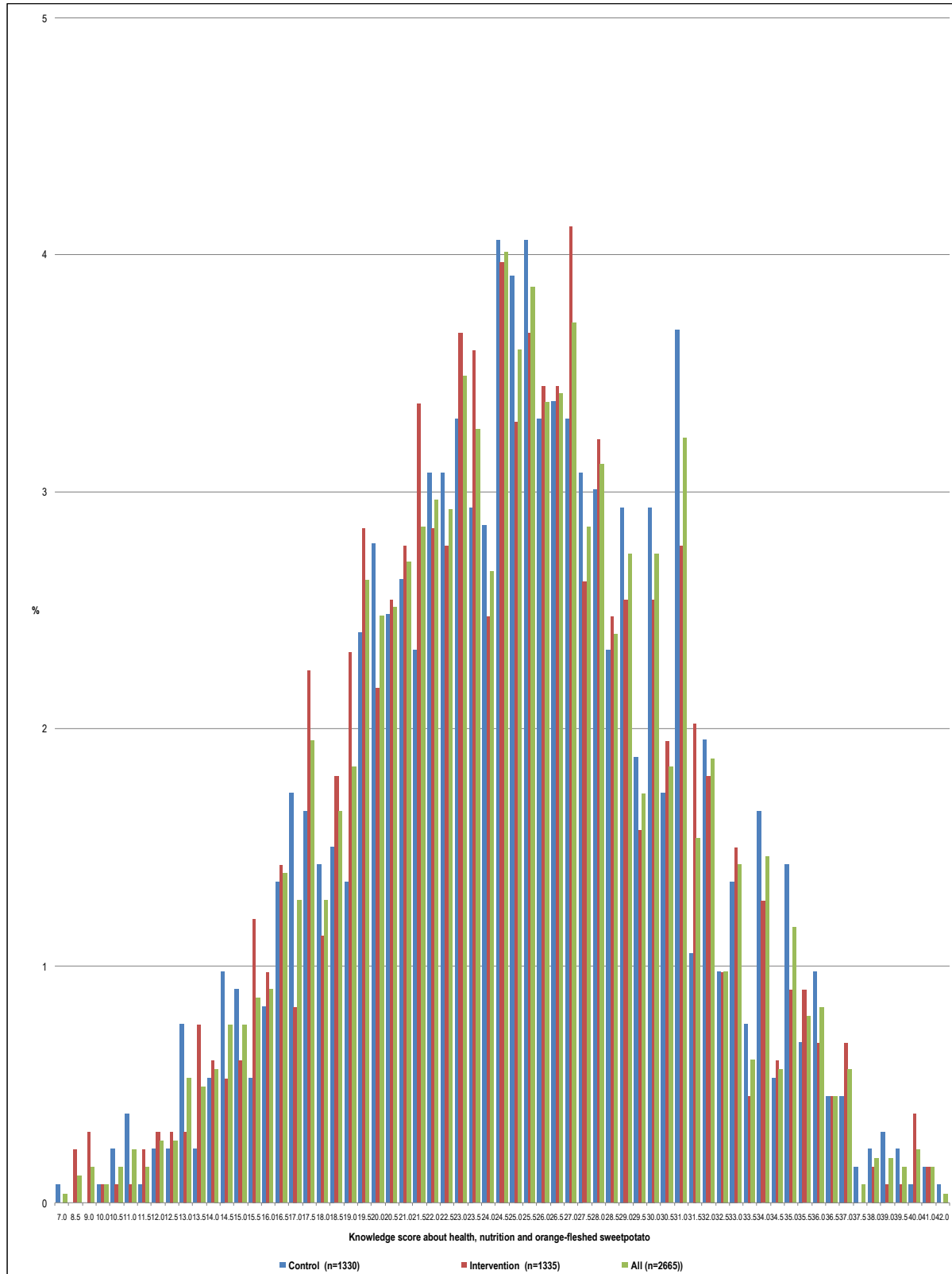
Figure 19: *Distribution of knowledge score about health and nutrition, overall and by study areas* (*p=0.20*).

3.2.6.2   *Knowledge scores by study areas and districts*

Appendix7 presents the proportion of women whose knowledge scores on nutrition, Vitamin A, healthcare seeking behavior, child care practices, and OFSP were ranked in the highest tercile of knowledge across study areas and districts. As shown in annex 7A, women in the Intervention group had more knowledge about nutrition though the difference was not significant. However, women knowledge about nutrition varied significantly across the four districts. The proportion of women whose scores were in the highest tercile was highest in Bungoma North and lowest in Bunyala (36% vs.24%, respectively). In addition, the wide nutrition knowledge gap among the women in Bunyala is also shown by the disparity between the proportion of women in overall whose scores were in the highest tercile (34%) and that of the women in Bunyala (24%).Similarly, Vitamin A knowledge (annex 7B) was almost the same for both study groups and was significantly different across the four districts. Proportion of women whose knowledge levels were in the highest tercile varied widely across the four districts; they were highest in Bungoma East (50%) and lowest in Bunyala District (29%). Moreover, as shown in annex 7F , the proportion of women whose combined knowledge about nutrition and vitamin A was in the highest tercile of knowledge was almost the same between the two study groups however, it was significantly different across the four districts ranging from a high of 36% in Bungoma East to a low of 23 % in Bunyala.

From annex 7C and7D, proportion of women in the Control group whose knowledge scores about health seeking behaviours and childcare were in the highest tercile was significantly higher compared to that of the Intervention group (26% vs. 21% and 36% vs. 30%, respectively). Similarly, the difference on the levels of knowledge about health seeking behaviours and child care across the four districts was significant at 1 per cent level; it was highest in Bunyala (27% and 51%, respectively) and least in Bungoma East (14% and 30%, respectively).Similarly, proportion of women whose combined knowledge scores about health seeking behaviour and child care were in the highest tercile(annex 7G) was significantly higher for the Control group (32%) compared to that of the Intervention group (26%). Moreover, it was significantly different across the four districts ranging between44% in Bunyala and 24 % in Bungoma East. Proportion of women on the same was 29% and 27% for Bungoma North and Kimilili respectively.

Proportion of women whose combined knowledge scores about health and nutrition were in the highest tercile of knowledge (annex 7H) was almost the same for both study groups but was significantly different across the four districts at 1% significance level. Women in Bunyala were the most knowledgeable on health and nutrition while those in Bungoma East were the least knowledgeable on the same (proportions were 35% and 30%, respectively).

Women's knowledge about the orange-fleshed sweet potato (annex7 E) was comparable between the two study groups. However, it was significantly different across the four districts at 5 per cent level of significance. Proportion of women whose sweetpotato knowledge scores were ranked in the highest tercile ranged from 31% in Bungoma East to 24 %in Kimilili.

Proportion of women whose global knowledge scores on health, nutrition and orange-fleshed sweetpotato were in the highest tercile (fig13 I)was not significantly different between the Control and Intervention areas. In addition the difference in global knowledge across the four districts was only significant at 10 per cent level. Women in Bunyala were the most knowledgeable while those in Kimilili were the least knowledgeable (proportions were 37% and 32%, respectively). For Bungoma East and Bungoma North the proportions were 34% for each.

3.2.6.3. Knowledge scores by individual and households characteristics

Women's knowledge about health seeking behaviours and child care was associated with the category of women (whether pregnant or mother-child pair), age of the women, whether the woman is currently enrolled in formal schooling, highest level of formal education attained, marital status of the woman, involvement in commercial agriculture, involvement in casual labour and her involvement in self-employment. It was also associated with the education level of the household head

Older women were more knowledgeable on health seeking behaviours and child care; proportion of women aged more than 25 years whose knowledge scores about health seeking behaviours and child care were ranked in the highest tercile (33%) was significantly higher compared to that of women aged ≤ 25 years (25%). Similarly women who had at least one child had more knowledge on the same; the proportion of women with at least one child whose knowledge scores on the same was ranked in the highest tercile was significantly greater compared to that of who were only pregnant with no child (32% vs. 24%, respectively). Similarly, married women especially those who were monogamously married were also more knowledgeable on health seeking behaviours and childcare

In addition, significantly higher proportions of women who had higher education levels and/ or those who were enrolled in formal schooling were in the highest tercile of knowledge about health seeking behaviours and childcare. The education level of the household heads was also found to be positively associated with the women's knowledge on health seeking behaviour and childcare. Moreover, women who were involved in either self-employment or in commercial agriculture were also more likely to have more knowledge about health seeking behaviour and childcare. However, involvement in casual labour was negatively associated with knowledge on health seeking behaviour and health care.

Women's knowledge about nutrition and vitamin A was also associated with age of the woman, enrolment in formal schooling, education levels of the women, principal activity of the woman, and involvement in commercial agriculture, salaried employment, casual labour and self-employment. It was also associated with the household size, age of the household head, and the education level of the household head. Women aged more than 25 years were more likely to be knowledgeable about nutrition and vitamin A. We find that more educated women, with higher than primary level, and those currently enrolled in formal schooling had more knowledge on the same. Likewise, education levels of the household head were positively associated with the woman's knowledge on the nutrition and Vitamin A. Women whose principal activity is agriculture were also found to be having more knowledge about vitamin A and nutrition. Similarly, women who are involved in income generating activities were also found to be more knowledgeable on nutrition and vitamin A except for those involved in casual labour that were less knowledgeable on the same. Household size is positively correlated with levels of knowledge about nutrition and vitamin A. The higher the proportion of households with more than 4 persons the higher the proportion of women with more knowledge on nutrition and Vitamin A. Age of the household head household was also found to be positively associated with the women's knowledge on nutrition and vitamin A.

Women's knowledge about orange-fleshed sweetpotato was also associated with age of the woman, education level of the woman, sex of the household head and education level of the household head. The higher the level of education of the women or of the household head the greater the proportion of women with high knowledge on orange-fleshed sweetpotato. In addition, women from male-headed households were more likely to be knowledgeable about the orange-fleshed sweetpotato.

Table 32: *Women's knowledge scores by individual and household characteristics*

	Women in the highest tercile of knowledge about health seeking behaviours and child care			Women in the highest tercile of knowledge about nutrition and vitamin A			Women in the highest tercile of knowledge about orange-fleshed sweetpotato		
	n	*%*	*p*	*n*	*%*	*p*	*n*	*%*	*p*
Category of women			*<0.001*			*0.24*			*0.83*
Pregnant	232	24.1		289	29.6		273	28.7	
Mother-child pair	565	31.9		577	32.4		489	28.1	
Age (years)[1]			*<0.001*			*<0.001*			*0.039*
≤25	300	25.0		290	23.8		314	26.7	
>25	487	32.5		559	37.1		441	29.7	
Currently enrolled in formal schooling			*0.048*			*<0.001*			*0.13*
No	750	28.8		791	30.1		734	28.5	
Yes	40	38.8		64	61.5		23	23.0	
Highest level of formal education completed			*<0.001*			*<0.001*			*<0.001*
Primary or lower	469	28.3		371	18.7		512	26.4	
Higher than primary	321	43.4		483	64.6		246	33.6	
Marital status			*0.001*			*0.52*			*0.92*
Married monogamous	652	30.4		683	31.6		597	28.3	
Married polygamous	61	28.1		69	31.8		59	27.4	
Single	61	23.1		81	30.6		73	27.9	
Other	17	19.3		22	24.7		29	33.0	

	n	%	p-value	n	%	p-value	n	%	p-value
Is currently involved in growing sweetpotatoes			0.16			0.17			0.16
No	98	26.5		109	28.9		99	31.0	
Yes	692	29.5		746	31.7		659	28.0	
Agriculture is principal activity			0.54			0.045			0.35
No	601	29.8		612	30.2		559	27.9	
Yes	163	29.2		197	34.9		163	29.9	
Has sold agriculture or livestock products last year			<0.001			<0.001			0.20
No	201	25.4		216	27.0		223	29.3	
Yes	589	30.7		639	33.1		535	28.0	
as undertaken salaried employment last year			0.8			<0.001			0.59
No	737	28.7		770	29.8		712	28.2	
Yes	53	35.8		85	57.4		46	31.9	
Has done casual labour last year			0.034			<0.001			0.27
No	466	29.9		549	34.7		429	27.9	
Yes	324	28.1		306	26.5		329	29.0	
Has been involved in informal business last year			0.46			0.43			0.06
No	667	29.5		725	31.7		632	28.3	
Yes	123	27.5		130	29.0		126	28.5	
Has been involved in some other form of self-employment			0.001			<0.001			0.10
No	552	27.7		611	30.5		535	27.3	
Yes	238	33.0		244	33.4		22	31.5	
Household size (number of members)			0.78			0.006			0.06
0-3	388	29.0		389	28.8		349	26.8	
4-15	409	29.3		477	34.0		413	29.6	
Age of household head (years)			0.21			0.005			0.08
16-35	402	29.3		400	28.9		356	26.7	
36-93	385	29.1		461	34.5		398	30.0	
Sex of household head			0.07			0.12			0.010
Female	58	26.1		58	25.7		47	21.4	
Male	739	29.4		808	31.9		715	28.9	
Highest level of formal education completed by household head			<0.001			<0.001			0.011
Primary or lower	383	23.5		401	24.4		423	26.4	
Higher than primary	414	37.6		465	41.9		339	31.1	
Household wealth quintiles			0.17			0.239			0.44
Lowest	225	41.1		155	28.3		93	17.0	
second	196	35.1		176	31.5		116	20.8	
middle	179	32.8		169	31.0		100	18.3	
fourth	191	34.8		179	32.4		118	21.3	
highest	182	32.7		187	33.6		111	20.0	

3.2.7. Qualitative description of attitudes towards dietary and child feeding practices.

Table 33: Women's attitude towards nutrition and health scenarios, overall

Women had a mixed level of aptitude in responding to the qualitative descriptions of attitudes towards dietary and child feeding practices. Majority of women (74%) agreed or strongly agreed that maize porridge was enough for a child to eat and grow well while the remaining 26% disagreed or strongly disagreed on the same. In addition, 64% of the women disagreed or strongly disagreed that it was best to follow traditions and eat ugali every day. Almost equal proportions of women in overall, 50% at each end of the spectrum agreed or strongly agreed and disagreed or strongly disagreed that feeding the child mashed pumpkin at 4 months of age was beneficial. However, compared to 30% who disagreed or strongly disagreed, almost 70% of women agreed or strongly agreed that sweetpotatoes are more nutritious source of food than

bread. Approximately 80% of the women also agreed or strongly agreed that they should follow nurse's advice on feeding their child with egg.

Majority of women (66%) disagreed or strongly disagreed with the idea that they should stop feeding ripe mangoes to the children due to frequent bowel movement and change in the colour of faeces. Similarly, a substantial proportion of the women, 75%, agreed or strongly agreed with the idea of reducing the amount of breastmilk fed to the child to prevent diarrhoea.

Regarding pregnancy, majority of women (88%) disagreed or strongly disagreed with the scenario which stated four months of pregnancy as very early to seek ANC services since even at six months of pregnancy one can still get all the important treatment before birth. Similarly, majority of women (70%) disagreed or strongly agreed that they should avoid gaining weight during pregnancy in order to prevent difficulty during childbirth. In addition, 80% of the women in overall also agreed or strongly agreed with the importance of cutting down on hard work during the last month of pregnancy. Acceptance of OFSP was high among the women surveyed as 90% of the women disagreed or strongly disagreed with the idea of failing to grow OFSP due to lack of knowledge regarding the origin of the orange colour.

Table 33: *Women's attitude towards nutrition and health scenarios*

	Strongly agree		Agree		Neither		Disagree		Strongly disagree	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Overall (n=2761)										
Maize porridge is enough for a child to eat and will grow well	967	35.0	1071	38.8	5	0.2	439	15.9	279	10.1
Best to follow traditions and eat ugali everyday	486	17.6	509	18.4	8	0.3	906	32.8	852	30.9
Mashed pumpkin is good to start eating at 4 months of age	532	19.3	842	30.5	14	0.5	783	28.4	590	21.4
Sweetpotatoes are more nutritious than bread	1220	44.2	680	24.6	18	0.7	558	20.2	285	10.3
Breastmilk is not enough for 2 months old baby & water must be given throughout the day	798	28.9	796	28.8	15	0.5	674	24.2	478	17.3
Should follow nurse's advice on feeding child with egg	1314	47.6	903	32.7	14	0.5	309	11.2	221	8.0
Avoid gaining a lot of weight to prevent difficulty during childbirth	339	12.3	480	17.4	17	0.6	1044	37.8	881	31.9
Stop feeding mangoes due to frequent bowel movements and change in colour of faeces	369	13.4	550	19.9	28	1.0	1171	42.4	643	23.3
Important to cut down on hard work during the last month of pregnancy	1641	59.4	563	20.4	19	0.7	265	9.6	273	9.9
Reduce the amount of breastmilk fed to the child to stop diarrhea	230	8.3	444	16.1	17	0.6	1004	36.4	1066	38.6
Not grow OFSP since you do not know where the orange color comes from	54	2.0	160	5.8	32	1.2	979	35.5	1536	55.6
4 months of pregnancy is very early to seek ANC since even at 6 months pregnancy one can still get all the important treatments before birth	101	3.7	239	8.7	6	0.2	863	31.3	1552	56.2

The patterns of response, i.e. whether majority of women strongly agreed or agreed and strongly disagreed or disagreed with a particular scenario, remained consistent across study groups. There were, however, significant differences in the proportion of women in the strongly agreed versus agreed categories between Control and Intervention groups. While majority of women, approximately 73%, in both the Control and Intervention groups believed that maize porridge was sufficient for a child to eat and grow well, a significantly greater proportion of women in the Intervention group strongly agreed with this statement compared to the Control group (39%vs.32%, respectively).Similarly, a significantly greater proportion of women in the Intervention group (20%) strongly agreed that it was best to follow traditions and eat ugali every day compared to that of the Intervention group (15%). Nonetheless, majority of women, about 63%, in both study groups largely disagreed with this statement.

A significantly higher proportion of women in the Control group(47%) compared to the Intervention group (36 %)agreed or strongly agreed that was beneficial to introduce mashed pumpkin to the child at 4 months of age. Similarly, a significantly greater proportion of women in the Intervention groups (33%) strongly agreed that breastmilk was not sufficient for a 2 month old baby and water should be supplemented throughout the day, compared to the Control group where only 25% of women strongly agreed with the statement. Lastly, although few in numbers, a significantly higher proportion of women in the Intervention group (3%) compared to 1% of the women in the Control group strongly agreed with the statement that OFSP should not be grown due to lack of knowledge regarding the origin of the orange colour. There were no significant differences between study groups in other scenarios assessing attitudes towards nutrition and health.

Table 34: *Women's attitude towards nutrition and health scenarios, by study areas*

	Strongly agree		Agree		Neither		Disagree		Strongly disagree		*p*
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	
Control (n=1373)											
Maize porridge is enough for a child to eat and will grow well	432	31.5	575	41.9	0	0.0	227	16.5	139	10.1	*0.001*
Best to follow traditions and eat ugali everyday	212	15.4	281	20.5	2	0.1	464	33.8	414	30.2	*0.002*
Mashed pumpkin is good to start eating at 4 months of age	229	16.7	416	30.3	1	0.1	410	29.9	317	23.1	*0.001*
Sweetpotato are more nutritious than bread	610	44.4	339	24.7	7	0.5	271	19.7	146	10.6	*0.89*
Breastmilk is not enough for 2 months old baby & water must be given throughout the day	345	25.1	406	29.6	9	0.7	360	26.2	253	18.4	*<0.001*
Should follow nurse's advice on feeding child with egg	672	48.9	451	32.8	2	0.1	154	11.2	94	6.8	*0.13*
Avoid gaining a lot of weight to prevent difficulty during childbirth	161	11.7	260	18.9	12	0.9	511	37.2	429	31.2	*0.16*
Stop feeding mangoes due to frequent bowel movements and change in colour of faeces	193	14.1	273	19.9	9	0.7	576	42.0	322	23.5	*0.77*
Important to cut down on hard work during the last month of pregnancy	833	60.7	276	20.1	9	0.7	127	9.2	128	9.3	*0.56*
Reduce the amount of breastmilk fed to the child to stop diarrhea	116	8.4	236	17.2	5	0.4	501	36.5	515	37.5	*0.39*
Not grow OFSP since you do not know where the orange color comes from	16	1.2	68	5.0	13	0.9	486	35.4	790	57.5	*0.003*
4 months of pregnancy is very early to seek ANC since even at 6 months pregnancy one can still get all the important treatments before birth	43	3.1	116	8.4	0	0.0	433	31.5	781	56.9	*0.47*
Intervention (n=1388)											
Maize porridge is enough for a child to eat and will grow well	535	38.5	496	35.7	5	0.4	212	15.3	140	10.1	
Best to follow traditions and eat ugali everyday	274	19.7	228	16.4	6	0.4	442	31.8	438	31.6	
Mashed pumpkin is good to start eating at 4 months of age	303	21.8	426	30.7	13	0.9	373	26.9	273	19.7	
Sweetpotato are more nutritious than bread	610	43.9	341	24.6	11	0.8	287	20.7	139	10.0	
Breastmilk is not enough for 2 months old baby & water must be given throughout the day	453	32.6	390	28.1	6	0.4	314	22.6	225	16.2	
Should follow nurse's advice on feeding child with egg	642	46.3	452	32.6	12	0.9	155	11.2	127	9.1	
Avoid gaining a lot of weight to prevent difficulty during childbirth	178	12.8	220	15.9	5	0.4	533	38.4	452	32.6	
Stop feeding mangoes due to frequent bowel movements and change in colour of faeces	176	12.7	277	20.0	19	1.4	595	42.9	321	23.1	
Important to cut down on hard work during the last month of pregnancy	808	58.2	287	20.7	10	0.7	138	9.9	145	10.4	

Reduce the amount of breastmilk fed to the child to stop diarrhoea	114	8.2	208	15.0	12	0.9	503	36.2	551	39.7	
Not grow OFSP since you do not know where the orange color comes from	38	2.7	92	6.6	19	1.4	493	35.5	746	53.7	
4 months of pregnancy is very early to seek ANC since even at 6 months pregnancy one can still get all the important treatments before birth	58	4.2	123	8.9	6	0.4	430	31.0	771	55.5	

The proportion of women who strongly agreed that maize porridge was enough for a child to eat and grow well lowest in Bunyala district (30%)compared to a high of 47% in Bungoma East. In addition, Bunyala district had the highest proportion of women who strongly agreed that sweetpotatoes were more nutrition than bread (51% and the lowest proportion of women (19%) who strongly agreed that breastmilk was not enough for a 2 months old baby and that water should be supplemented throughout the day. Similarly, Bunyala had the greatest proportion of women (65%) compared to other districts who strongly agreed that it was important to cut down on hard work during the last month of pregnancy.

Acceptance of OFSP was comparatively low in Bungoma East where 8.4% of the women strongly agreed that OFSP should not be grown due to lack of knowledge regarding the origins of the orange colour. This was contrasted by 0.5%, 1.6% and 1.5% of women in Bunyala, Kimilili and Bungoma North, respectively, who strongly agreed with the statement. In addition, the proportion of women who strongly agreed that its best practice to follow traditions and eat ugali every day was relatively high in Bungoma East (26%) compared to that in Bunyala (15%), Kimilili(17%) and Bungoma North(17%).

Table 35: *Women's attitude towards nutrition and health scenarios, by districts*

	Strongly agree		Agree		Neither		Disagree		Strongly disagree	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Bunyala (n=221)										
Maize porridge is enough for a child to eat and will grow well	67	30.3	86	38.9	0	0.0	38	17.2	30	13.6
Best to follow traditions and eat ugali everyday	34	15.4	38	17.2	0	0.0	75	33.9	74	33.5
Mashed pumpkin is good to start eating at 4 months of age	30	13.6	54	24.4	0	0.0	74	33.5	63	28.5
Sweetpotato are more nutritious than bread	113	51.1	52	23.5	0	0.0	45	20.4	11	5.0
Breastmilk is not enough for 2 months old baby & water must be given throughout the day	42	19.0	49	22.2	2	0.9	74	33.5	54	24.4
Should follow nurse's advice on feeding child with egg	113	51.1	68	30.8	0	0.0	25	11.3	15	6.8
Avoid gaining a lot of weight to prevent difficulty during childbirth	24	10.9	38	17.2	2	0.9	82	37.1	75	33.9
Stop feeding mangoes due to frequent bowel movements and change in colour of faeces	30	13.6	48	21.7	0	0.0	90	40.7	53	24.0
Important to cut down on hard work during the last month of pregnancy	143	64.7	37	16.7	0	0.0	25	11.3	16	7.2
Reduce the amount of breastmilk fed to the child to stop diarrhea	12	5.4	33	14.9	1	0.5	91	41.2	84	38.0
Not grow OFSP since you do not know where the orange color comes from	1	0.5	6	2.7	0	0.0	80	36.2	134	60.6
4 months of pregnancy is very early to seek ANC since even at 6 months pregnancy one can still get all the important treatments before birth	10	4.5	13	5.9	0	0.0	69	31.2	129	58.4
Kimilili (n=620)										
Maize porridge is enough for a child to eat and will grow well	192	31.0	269	43.4	0	0.0	101	16.3	58	9.4
Best to follow traditions and eat ugali everyday	103	16.6	136	21.9	2	0.3	207	33.4	172	27.7
Mashed pumpkin is good to start eating at 4 months of age	102	16.5	209	33.7	1	0.1	174	28.1	134	21.6
Sweetpotato are more nutritious than bread	267	43.1	151	24.4	2	0.3	124	20.0	76	12.3
Breastmilk is not enough for 2 months old baby & water must be given throughout the day	179	28.9	191	30.8	3	0.5	157	25.3	90	14.5
Should follow nurse's advice on feeding child with egg	283	45.6	236	38.1	1	0.2	58	9.4	42	6.8
Avoid gaining a lot of weight to prevent difficulty during childbirth	62	10.0	135	21.8	3	0.5	230	37.1	190	30.6
Stop feeding mangoes due to frequent bowel movements and change in colour of faeces	93	15.0	132	21.3	7	1.1	250	40.3	138	22.3
Important to cut down on hard work during the last month of pregnancy	351	56.6	141	22.7	5	0.8	55	8.9	68	11.0
Reduce the amount of breastmilk fed to the child to stop diarrhea	58	9.4	118	19.0	2	0.3	224	36.1	218	35.2
Not grow OFSP since you do not know where the orange color comes from	10	1.6	39	6.3	9	1.5	220	35.5	342	55.2
4 months of pregnancy is very early to seek ANC since even at 6 months pregnancy one can still get all the important treatments before birth	22	3.5	54	8.7	0	0.0	193	31.1	351	56.6

	Strongly agree		Agree		Neither		Disagree		Strongly disagree	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Bungoma North (n=1706)										
Maize porridge is enough for a child to eat and will grow well	607	35.6	655	38.4	5	0.3	272	15.9	167	9.8
Best to follow traditions and eat ugali everyday	293	17.2	305	17.9	5	0.3	583	34.2	520	30.5

Statement										
Mashed pumpkin is good to start eating at 4 months of age	349	20.5	522	30.6	8	0.5	486	28.5	341	20.0
Sweetpotato are more nutritious than bread	739	43.3	430	25.2	13	0.8	352	20.6	172	10.1
Breastmilk is not enough for 2 months old baby & water must be given throughout the day	502	29.4	502	29.4	10	0.6	403	23.6	289	16.9
Should follow nurse's advice on feeding child with egg	807	47.3	548	32.1	5	0.3	207	12.1	139	8.1
Avoid gaining a lot of weight to prevent difficulty during childbirth	218	12.8	279	16.4	11	0.6	666	39.0	532	31.2
Stop feeding mangoes due to frequent bowel movements and change in colour of faeces	216	12.7	331	19.4	15	0.9	751	44.0	393	23.0
Important to cut down on hard work during the last month of pregnancy	1017	59.6	355	20.8	9	0.5	169	9.9	156	9.1
Reduce the amount of breastmilk fed to the child to stop diarrhea	143	8.4	267	15.7	10	0.6	622	36.5	664	38.9
Not grow OFSP since you do not know where the orange color comes from	25	1.5	101	5.9	18	1.1	619	36.3	943	55.3
4 months of pregnancy is very early to seek ANC since even at 6 months pregnancy one can still get all the important treatments before birth	58	3.4	136	8.0	3	0.2	555	32.5	954	55.9
Bungoma East (n=214)										
Maize porridge is enough for a child to eat and will grow well	101	47.2	61	28.5	0	0.0	28	13.1	24	11.2
Best to follow traditions and eat ugali everyday	56	26.2	30	14.0	1	0.5	41	19.2	86	40.2
Mashed pumpkin is good to start eating at 4 months of age	51	23.8	57	26.6	5	2.3	49	22.9	52	24.3
Sweetpotato are more nutritious than bread	101	47.2	47	22.0	3	1.4	37	17.3	26	12.1
Breastmilk is not enough for 2 months old baby & water must be given throughout the day	75	35.0	54	25.2	0	0.0	40	18.7	45	21.0
Should follow nurse's advice on feeding child with egg	111	51.9	51	23.8	8	3.7	19	8.9	25	11.7
Avoid gaining a lot of weight to prevent difficulty during childbirth	35	16.4	28	13.1	1	0.5	66	30.8	84	39.3
Stop feeding mangoes due to frequent bowel movements and change in colour of faeces	30	14.0	39	18.2	6	2.8	80	37.4	59	27.6
Important to cut down on hard work during the last month of pregnancy	130	60.7	30	14.0	5	2.3	16	7.5	33	15.4
Reduce the amount of breastmilk fed to the child to stop diarrhea	17	7.9	26	12.1	4	1.9	67	31.3	100	46.7
Not grow OFSP since you do not know where the orange color comes from	18	8.4	14	6.5	5	2.3	60	28.0	117	54.7
4 months of pregnancy is very early to seek ANC since even at 6 months pregnancy one can still get all the important treatments before birth	11	5.1	36	16.8	3	1.4	46	21.5	118	55.1

3.4. Consumption of Vitamin A rich foods

3.4.1. Frequency of food groups consumption

3.4.1.1. Number of days different food groups were consumed during the last week

3.4.1.1.1. Pregnant women

Table 36: *Mean (SD) number of day's food groups and sweetpotatoes were consumed by pregnant women during the last week*

	All		By study areas				
			Control (n=489)		Intervention (n=491)		*p*
	(n=980)						
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	
Food groups							
- *Cereals and tubers*	6.8	0.8	6.8	0.8	6.8	0.7	0.22
- *Pulses*	2.1	1.8	1.9	1.7	2.2	1.8	0.001
- *Vegetables*	5.4	1.8	5.4	1.8	5.4	1.8	0.97
- *Fruits*	3.2	2.7	3.1	2.8	3.2	2.7	0.49
- *Meat and fish*	3.4	2.3	3.4	2.4	3.4	2.3	0.82
- *Milk*	4.5	3.0	4.4	3.1	4.6	3.0	0.21
- *Oils and fats*	3.8	3.1	3.9	3.1	3.6	3.1	0.14
Sweetpotatoes							
- *Yellow -fleshed*	1.1	1.5	1.0	1.5	1.2	1.5	-
- *White -fleshed*	0.8	1.4	0.7	1.3	0.9	1.4	-
- *Orange-fleshed*	0.1	0.7	0.0	0.4	0.2	0.8	-
- *All kind*	1.8	2.1	1.6	2.0	2.1	2.1	-

Table 59 Mean (SD) number of days food groups and sweetpotatoes were consumed by pregnant women during the last week.

The number of days different food groups were consumed by pregnant women during the last week is presented in table 59. Cereals and tubers were the food group most consumed by pregnant women, almost every day (average of 6.8 different days in a week); vegetables (average of 5.4 different days in a week) and milk (average of 4.5 different days in a week) groups ranked second and third, respectively. Pulses were the food group least consumed by the pregnant women with an average consumption of 2.1 days in a week. There was no significant difference in consumption of the food groups, between the two study groups, except for pulses, which were consumed more frequently in Intervention areas with an average consumption of 2.2 different days in a week, as compared to Control areas with an average of 1.9 different days in a week.

Sweetpotatoes were consumed on average of 1.8 different days in a week with an average of 1.6 days in Control areas and 2.1 days in Intervention areas. Among the sweetpotatoes, the yellow-fleshed sweetpotato was the most frequently consumed with an average consumption of 1.1 different days in a week. That is in comparison white-fleshed sweetpotato with an average consumption of 0.8 different days in a week and orange-fleshed sweetpotato that was the least

consumed with an average of 0.1 different days in a week. Consumption was particularly low in the Control areas (0.0 different days in a week).

3.4.1.1.2. *Caretakers of children aged 6-23 months*

Table 37*: Mean (SD) number of days food groups and sweetpotatoes were consumed by caretakers of children aged 6-23 months during the last week.*

	Overall		By Study areas				
	(n=1780)		Control (n=884)		Intervention (n=896)		*p*
	Mean	SD	Mean	SD	Mean	SD	
Food groups							
- Cereals and tubers	6.8	0.8	6.8	0.8	6.8	0.8	0.69
- Pulses	2.2	1.8	2.0	1.9	2.3	1.8	0.001
- Vegetables	5.5	1.5	5.5	1.7	5.5	1.7	0.91
- Fruits	3.0	2.7	2.8	2.7	3.3	2.6	<0.001
- Meat and fish	3.8	2.3	3.7	2.4	3.8	2.3	0.77
- Milk	5.4	2.6	5.2	2.7	5.5	2.5	0.003
- Oils and fats	3.9	3.2	3.9	3.2	3.9	3.2	-
Sweetpotatoes							
- Yellow -fleshed	1.2	1.6	1.0	1.4	1.5	1.7	-
- White -fleshed	0.9	1.5	0.7	1.2	1.0	1.6	-
- Orange-fleshed	0.1	0.5	0.0	0.4	0.1	0.6	-
- All kind	1.7	2.1	1.4	1.9	2.1	2.3	-

The number of days different food groups were consumed by caretakers of children aged 6-23 months during the last week is presented in Table 37 above. Food groups consumption by caretakers of children aged 6-23 months was dominated by cereals and tubers group (average of 6.8 different days in a week); vegetables and milk ranked second (average of 5.5 different days in a week) and third (average of 5.4 different days in a week), respectively. Pulses were the least frequently consumed of all the food groups (average2.2 different days in a week). The frequency of consuming pulses, fruits and milk was significantly higher among the Intervention group (2.3, 3.3 and 5.5 different days in a week, respectively) compared to the Control group (2.0, 2.8, and 5.2 different days in a week, respectively).Sweetpotatoes were consumed on an average of 1.7 days in a week (1.4 days in Control areas and 2.1 days in Intervention areas). The yellow-fleshed variety was the mostly consumed sweet potato type on an average of 1.2 days a week while the orange-fleshed sweetpotato variety was the least consumed, average of 0.1 days in a week.

3.4.1.1.3. Children aged 6-23 months

Table 38: Mean (SD) number of days food groups and sweetpotatoes were consumed by children aged 6-23 months during the past week.

	Overall (n=1999)		Control (n=997)		Intervention (n=1002)		p
	Mean	SD	Mean	SD	Mean	SD	
Food groups							
- *Cereals and tubers*	6.6	1.4	6.6	1.5	6.6	1.4	0.64
- *Pulses*	1.9	1.8	1.8	1.9	2.1	1.8	-
- *Vegetables*	4.9	2.4	4.9	2.4	4.9	2.4	0.43
- *Fruits*	3.0	2.7	2.7	2.7	3.3	2.6	-
- *Meat and fish*	3.4	2.4	3.5	2.4	3.4	2.4	0.39
- *Milk*	5.6	2.5	5.4	2.6	5.7	2.3	0.003
- *Oils and fats*	3.8	3.2	3.8	3.2	3.8	3.2	0.84
Sweetpotatoes							
- *Yellow -fleshed*	1.1	1.5	0.9	1.4	1.3	1.7	-
- *White -fleshed*	0.8	1.4	0.6	1.2	0.9	1.6	-
- *Orange-fleshed*	0.1	0.5	0.0	0.4	0.1	0.6	-
- *All kind*	1.7	2.1	1.4	1.9	2.1	2.3	-

The number of days different food groups were consumed by children aged 6-23 months during the last week is presented in Table 38 above. The most frequently consumed food group was cereals and tubers (average of 6.6 different days in a week) while milk ranked second (average of 5.6 different days in a week), and vegetables third (average of 4.9 different days in a week). Pulses were still the least consumed of all the food groups with an average of 1.9 days in a week. Consumption of the various food groups was almost the same for both study groups except for milk where the frequency of consumption was significantly higher for the Intervention group (5.7 days per week) compared to the Control group (5.4 days per week). The sweetpotato consumption pattern was close to that of their caretakers' average of 1.7 days a week with the yellow-fleshed variety being the mostly consumed and the OFSP variety being the least consumed of the three varieties.

3.4.1.2. Consumption of different food groups and sweetpotatoes at least once during the last week by women and children

3.4.1.2.1. Pregnant women
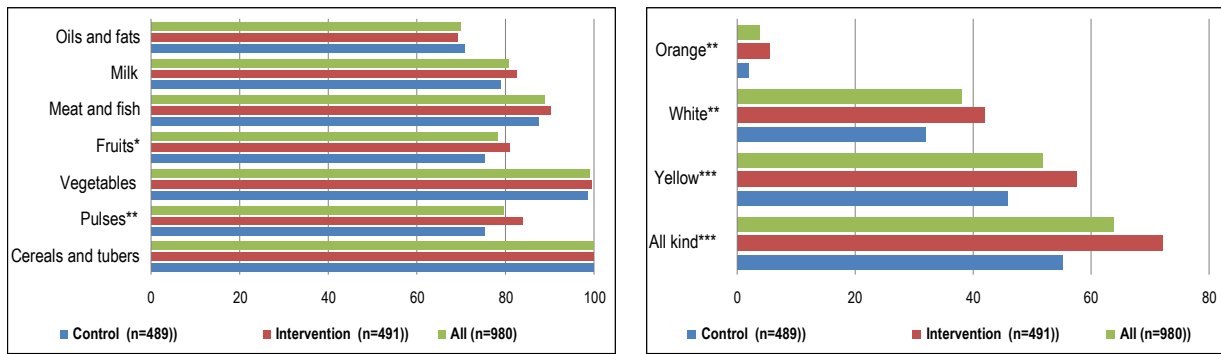
A - Food groups

B - Sweetpotatoes

*p-value <0.05; **p-value <0.01; ***p-value <0.001

Figure 20: *Proportion of pregnant women who consumed different food groups and sweetpotatoes at least once during the last week.*

Figure 19 above illustrates the proportion of pregnant women who consumed different food groups and sweetpotatoes at least once during the last week. In both Control and Intervention areas, all pregnant women consumed cereals and tubers and almost all consumed vegetables at least once during the last week. This was expected since in the studied area, the principal meal is made of Ugali (maize-based dough) with locally produced leafy vegetables, especially kales. The proportion of pregnant women in the Control group who consumed fruits and those who consumed pulses at least once in a week was significantly greater for the Intervention compared to the Control group. However, for the other food groups the difference in consumption between the study groups was not significant.

With regard to sweetpotato consumption, 64% of pregnant women consumed them at least once in a week; the yellow-fleshed, white-fleshed and orange-fleshed varieties were consumed by 52%, 38% and4% of pregnant women, respectively. The proportion of pregnant women who consumed sweetpotato was significantly higher in Intervention areas, as compared to Control areas for all the varieties.

3.4.1.2.2.   Caretakers of children aged 6-23 months
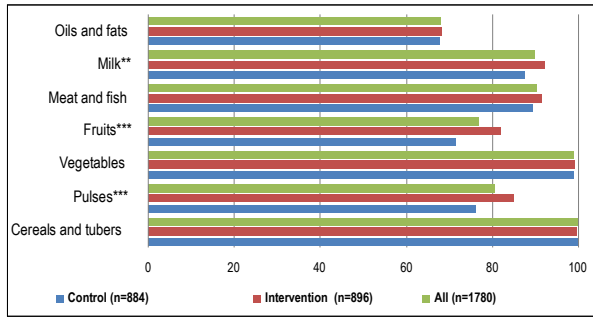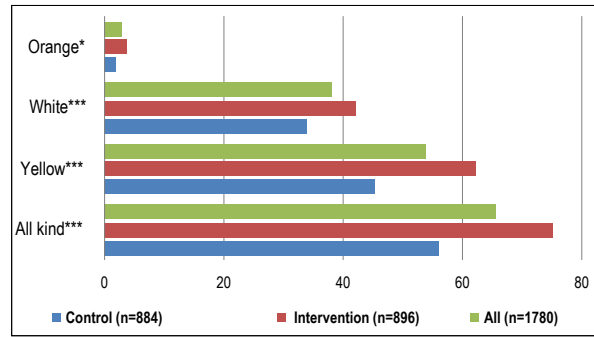
A-Food groups

B-Sweetpotatoes

*p-value <0.05; **p-value <0.01; ***p-value <0.001

Figure 21: *Proportion of caretakers of children aged 6-23 months who consumed different food groups and sweetpotatoes at least once during the last week.*

Figure 20 illustrates proportion of caretakers of children aged 6-23 months who consumed different food groups and sweetpotatoes at least once during the last week. Just like with the pregnant mothers, all the caretakers of children aged between 6 and 23 months consumed cereals and tubers and almost all of them consumed vegetables at least once per week and the proportions were almost the same for both study groups. For pulses, milk and fruits the proportion of women who consumed the foods at least once in a week was significantly greater among the Intervention group compared to the Control group. For all the other food groups consumption was almost the same for both study groups. Similarly, the proportion of women who consumed sweet potatoes at least once in a week was significantly higher for the Intervention group compared to the Control group for all the varieties.

3.4.1.2.3. Children aged 6-23 months
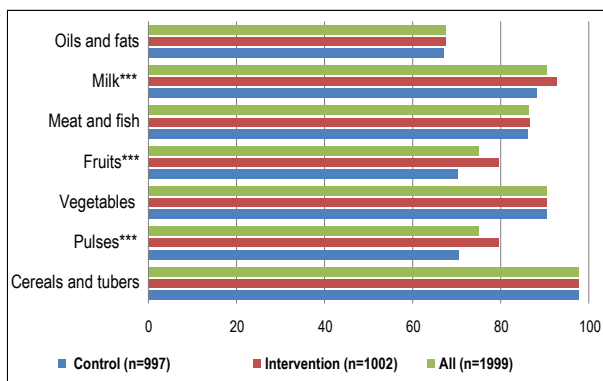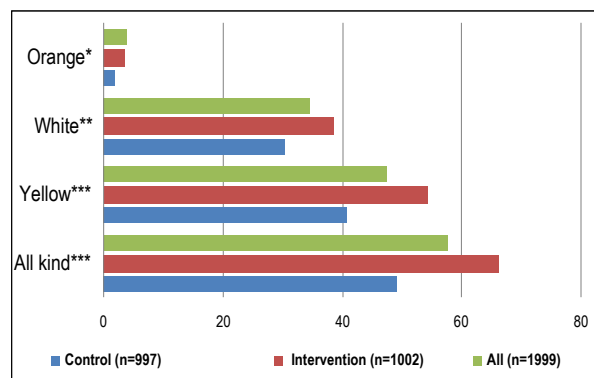
A-Food groups

B-Sweetpotatoes

*p-value <0.05; **p-value <0.01; ***p-value <0.001

Figure 22: *Proportion of children aged 6-23 months who consumed different food groups and sweetpotatoes at least once during the last week.*

Figure 21 above illustrates proportion of children aged 6-23 months who consumed different food groups and sweetpotatoes at least once during the last week. Consumption patterns of children aged 6-23 months were similar to those of their caretakers. Significantly, more children in the Intervention areas consumed pulses, fruits and milk at least once in a week compared to those in the Control areas. Moreover, the proportion of children in the Intervention areas who consumed sweet potatoes at least once in a week was significantly higher than the same for those in the Control areas for all the varieties.

3.4.2. Vitamin A food consumption

3.4.2.1   Households vitamin A food consumption frequency

Table 39: *Household vitamin A food consumption frequency among the pregnant women*

	Total (days/week) consumed animal VIT A source			HKI Vit A food consumption frequency score		
	mean	*Stddev*	*median*	*mean*	*Stddev*	*median*
By study area						
Overall (n=978)	1.49	2.00	*1.00*	2.87	2.30	*2.33*
Control (n=489)	1.51	2.00	*1.00*	2.80	2.30	*2.17*
Intervention (n=489)	1.44	1.99	*1.00*	2.94	2.30	*2.33*
By district						
Kimilili (n=222)	1.43	1.92	*1.00*	2.67	2.18	*2.17*
Bunyala (n=64)	1.38	1.86	*1.00*	2.26	2.10	*1.42*
Bungoma North (n=623)	1.51	2.04	*1.00*	2.97	2.35	*2.33*
Bungoma East (n=69)	1.61	1.96	*1.00*	3.14	2.34	*2.50*
By wealth status						
Lowest (n=197)	1.44	2.01	*1.00*	2.81	2.83	*2.17*
Second (n=191)	1.62	2.24	*1.00*	3.00	2.60	*2.17*
Middle (n=194)	1.42	1.88	*1.00*	2.85	2.13	*2.33*
Fourth (n=191)	1.53	1.99	*1.00*	2.87	2.32	*2.33*
Highest (n=205)	1.45	1.87	*1.00*	2.84	2.13	*2.33*
By education level						
None (n=25)	1.20	1.12	*1.00*	2.59	1.53	*2.50*
Primary (n=694)	1.48	2.00	*1.00*	2.86	2.32	*2.33*
Secondary (n=228)	1.48	2.04	*1.00*	2.86	2.33	*2.33*
College/graduate (n=27)	1.85	2.16	*1.00*	3.20	2.19	*3.00*
Total number of days in a week Consumed vit A from animal ≤4days per week >4 days per week	897[a] 81[a]	91.7[b] 8.3[b]				
HKI food frequency score[1] ≤ 6 days per week >6 days per week	886[a] 65	93.2[b] 6.8				

[a]represents number of women [b] is the proportion of women (%). [1] missing n=29

The Hellen Keller International (HKI) food frequency method was used in determining the prevalence of VAD. The HKI vitamin A food consumption frequency score range was between 0 and 14.2 with a mean ± standard deviation of 2.9±2.3. We found that the mean was considerably below the HKI food frequency method threshold that requires a frequency of more than 6 days per week. Similarly, the mean number of days per week that the pregnant women consumed animal Vitamin A foods was also way below the threshold of more than 4 days per week.

Table 40; *Household vitamin A food consumption frequency among the caretakers of children aged 6-23 months*

	Total (days/week) consumed animal VIT A source			HKI Vit A food consumption frequency score		
	mean	*Stddev*	*median*	*mean*	*Stddev*	*median*
By study area						
Overall (n=1775)	1.56	2.19	1.00	2.92	2.44	2.33
Control n=881	1.68	2.34	1.00	2.94	2.55	2.17
Intervention n=894	1.44	2.04	1.00	2.89	2.33	2.33
By district						
Kimilili (n=397)	1.54	2.23	1.00	2.82	2.52	2.00
Bunyala (n=156)	2.32	2.56	1.50	3.21	2.68	2.50
Bungoma North (n=1080)	1.47	2.10	1.00	2.92	2.37	2.33
Bungoma East (n=142)	1.46	2.23	1.00	2.86	2.48	2.17
By wealth status						
Lowest (n=346)	1.76	2.35	1.00	3.13	2.61	2.33
Second (n=367	1.59	2.13	1.00	2.97	2.38	2.33
Middle (n=352	1.44	2.25	1.00	2.76	2.48	2.00
Fourth (n=361	1.32	1.92	1.00	2.68	2.21	2.00
Highest (n=349)	1.70	2.30	1.00	3.05	2.50	2.50
By education level						
None (n=52)	1.42	1.95	1.00	2.61	2.01	1.83
Primary (n=1228)	1.59	2.25	1.00	2.94	2.48	2.17
Secondary(n=445)	1.51	2.11	1.00	2.88	2.40	2.33
College/graduate (n=51)	1.41	1.78	1.00	2.87	2.14	2.50
Total number of days in a week Consumed vit A from animal						
≤4days per week	1623[a]	91.4[b]				
>4 days per week	153	8.6				
HKI food frequency score[1]						
≤ 6 days per week	1606[a]	92.7[b]				
>6 days per week	126	7.3				

[a]represents number of women [b] is the proportion of women (%). [1] missing n=49

The proportion of pregnant women who attained the vitamin A requirements as defined by the HKI threshold was 7%. The households' wealth status does not affect the consumption of Vitamin A among the pregnant women; the HKI Vitamin A frequency score was almost the

same for all the five wealth quintiles though it was marginally higher for those women in the second wealth quintile. Education levels of the woman positively influence the consumption of Vitamin A; the mean HKI Vitamin A consumption frequency increases with the levels of education of the women. Women in Bunyala had the least frequency score among the four districts and the average different days in a week that the women consumed Vitamin A from animal sources was especially low in Bunyala (less than 1 day/week).

Table 41:*Household vitamin A food consumption frequency among children aged 6-23 months.*

	Total (days/week) consumed animal VIT A source			HKI Vit A food consumption frequency score		
	mean	*Stddev*	*median*	*mean*	*Stddev*	*median*
By study area						
Overall (n=1992)	1.61	2.33	1.00	3.30	2.64	2.50
Control	1.72	2.45	1.00	3.30	2.74	2.50
Intervention	1.51	2.21	1.00	3.31	2.54	2.67
By district						
Kimilili (n=458)	1.59	2.35	1.00	3.16	2.66	2.33
Bunyala (n=171)	2.05	2.60	1.00	3.03	2.81	2.17
Bungoma North (n=1207)	1.61	2.34	1.00	3.44	2.64	2.67
Bungoma East (n=152)	1.25	1.95	0.50	2.94	2.30	2.33
By wealth status						
Lowest (n=400)	1.82	2.52	1.00	3.51	2.84	2.67
Second (n=410)	1.55	2.32	1.00	3.26	2.64	2.50
Middle (n=376)	1.43	2.19	1.00	3.09	2.45	2.33
Fourth (n=393)	1.59	2.28	1.00	3.25	2.60	2.50
Highest (n=409)	1.68	2.36	1.00	3.40	2.65	2.67
By education level of the caretaker						
None (n=59)	1.76	2.14	1.00	3.36	2.31	3.00
Primary (n=1376)	1.66	2.43	1.00	3.34	2.72	2.50
Secondary (n=493)	1.46	2.13	1.00	3.18	2.49	2.50
College/graduate (n=61)	1.53	1.86	1.00	3.25	2.25	2.83
Total f days in a week Consumed vit A from animal ≤4days per week >4 days per week	1783[a] 210	89.5[b] 10.5				
HKI food frequency score ≤ 6 days per week >6 days per week	1744[a] 198	89.8[b] 10.2				

[a]represents number of women [b] is the proportion of women (%).

Like the pregnant women, consumption of Vitamin A foods was low among the caretakers of children aged 6-23 months. The HKI Vitamin A consumption frequency score ranged from 0 to 17.8 with a mean ± standard deviation of 2.9±2.4 and the average number of different days in a week that the women consumed Vitamin A rich foods from animal sources was 1.6 days. These

indicators of VAD were also below the HKI threshold. The proportion who had not attained the required vitamin A rich food consumption as defined by these thresholds was approximately 93%. Consumption of Vitamin A among the caretakers was also almost the same in the various wealth classes and did not change much with the education levels of the women. However, consumption of Vitamin A rich animal sources continued to be low in Bunyala District (less than 1 day in a week).

Though the HKI vitamin A food consumption frequency score among the children was higher than that of the women, it was still way below the threshold hence indicating Vitamin deficiency among the children aged 6 to 23 months. The mean number of days in a week that the children consumed vitamin A rich foods from animal sources was 1.7 days/week while the HKI frequency score was 3.3 days. Approximately 90% of the children had a HKI food frequency score lower than the minimum threshold of more than 6 days per week. Consumption of vitamin A did not vary with the households' wealth status and with the levels of education of the caretakers.
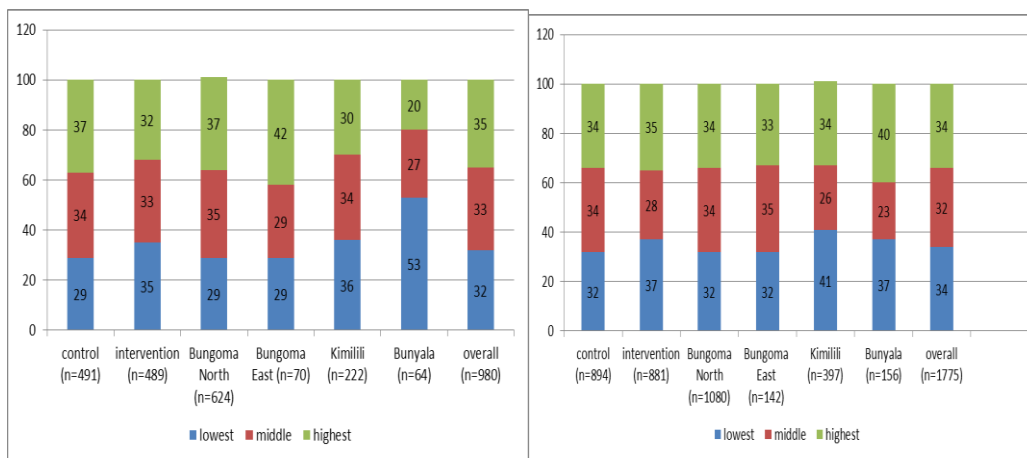
Pregnant mothers (*p value by study area= 0.17* Caretakers (*p value by study area= 0.003 and by district=0.000and by district= 0.01*)
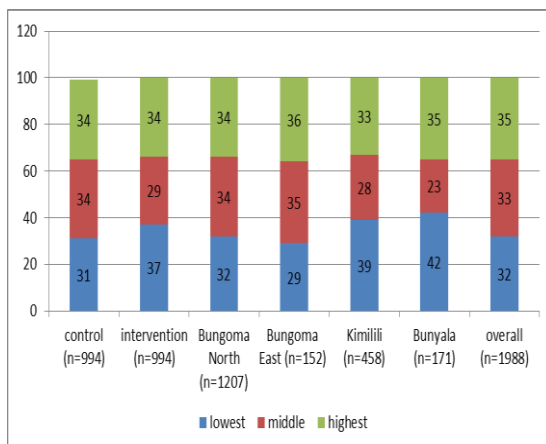
Children Aged 6-23 months *(p value by study area=0.03 and by district=0.000)*
Figure 23: *Distribution of HKI Vitamin A food consumption frequency score by study area and by districts.*

As shown in Figure 22 above, the proportion of pregnant women whose HKI Vitamin A food frequency scores were in the highest tercile was approximately 35% and was comparable among the study groups. However, it varied significantly among the four districts; a high of 43% of the women in Bungoma East were in the highest tercile compared to a low of 20% of the women in Bunyala. Bunyala also had the highest proportion of pregnant women with HKI Vitamin A FCS in the lowest tercile (53%) while Bungoma East and Bungoma North had the least (29%) each.

The proportion of caretakers with a Vitamin A FCS in the lowest tercile varied significantly across the study groups and across the districts. A significantly higher proportion of women in the Control group had a Vitamin A FCS in the lowest tercile compared to that of the Intervention group (37% vs. 32%, respectively). Similarly, the proportion of caretakers with a Vitamin A FCS in the lowest tercile ranged from 41% in Kimilili to 32% in Bungoma East and Bungoma North each. Still among children aged 6-23 months, the proportion that had a HKI Vitamin A FCS in the lowest tercile varied significantly across the study areas and across the districts. It was significantly higher among the Intervention groups compared to the Control group (37% vs. 31%, respectively). In addition, of the four districts, Bunyala had the highest proportion of women whose Vitamin A FCS was in the lowest tercile (42%) while Bungoma North had the least (29%) of the same.

3.4.2. Dietary diversity

3.4.2.1. Distribution of women and children according to consumption of different food groups during the last 24h

Figure 23 below illustrates the proportion of pregnant women, care takers of children and children aged 6-23 months who consumed the different food groups which were included in obtaining the dietary diversity indices during the last 24 hours prior to the survey. Majority of the pregnant women (at least 75%) had consumed starchy foods, oils and fats, dark green leafy vegetables and milk & milk products during the last 24 hours of the survey (fig 23 A).The following categories of foods were consumed by a significantly greater proportion of the women in the Intervention group compared to the Control group; milk &milk products, legumes, nuts &seeds, organ meat and starchy foods. However, the proportion of women in the Control group who consumed organ meat was marginally but significantly higher than that of the Intervention group. For all the other food groups the proportions were almost the same.

Similarly among the caretakers of children aged 6-23 months at least three quarters of them had consumed oils &fats, milk &milk products, dark green leafy vegetables and starchy staples 24

hours prior to the survey(fig 23 B). Significantly, greater proportion of women in the Intervention areas compared to the Control areas had consumed the following foods; oils and fats, milk &milk products, legumes, nuts & seeds and other vitamin A rich fruits & vegetables. However, for consumption of all the other food groups the proportions were almost the same.

At least three quarters of the children had consumed grains, roots &tubers, legumes, dairy products and vitamin A rich fruits and vegetables 1 day prior to the survey (fig 23 C). More children in the Intervention areas compared to the Control areas had consumed legumes, dairy products and other fruits and vegetables. Conversely, a significant greater proportion of women in the Control area compared to the Intervention areas had consumed meat & fish. However the proportions who consumed grains, roots &tubers, eggs and vitamin A rich fruits and vegetables was almost the same for the two study groups.
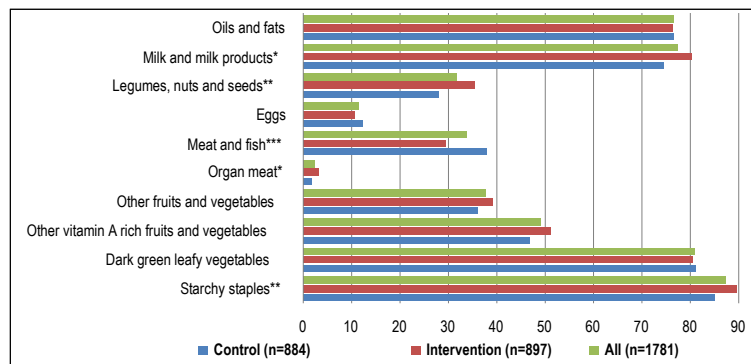
A-Pregnant women
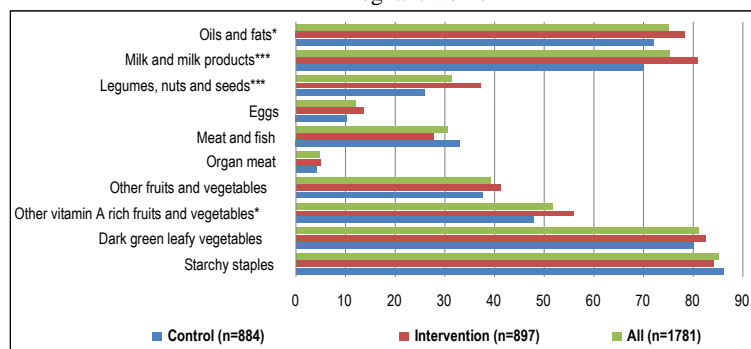
B-Caretakers
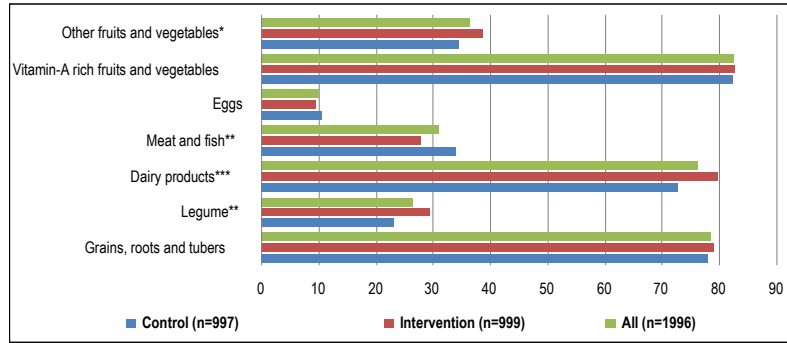
C-Children

Figure 24*: Proportion of pregnant women, caretakers and children who consumed different food groups during the last 24 h.*

3.4.2.2.   *Dietary diversity score*

3.4.2.2.1.   *Distribution of the dietary diversity score*

Figure 24 below illustrates the proportion pregnant women, caretakers and children according to the dietary diversity scores overall and for the study groups. The dietary diversity scores range was from 0-10 for the pregnant mothers and caretakers of children aged between 6 and 23 months and from 1 to 7 for the children depending on the number of different foods the individual had consumed 1 day prior to the survey. More than half of the pregnant women had a dietary diversity score of either 5 or 6(fig 24 A). Proportion of pregnant women who had a dietary diversity score greater than 5 was higher for the Intervention group compared to the Control groups, and conversely, that which had a dietary diversity score≤ 5 was higher for the Control groups than the Intervention group. This implies that compared to the Control areas, more pregnant women in the Intervention areas had higher dietary diversity scores.

Approximately, three quarters of all the caretakers had a dietary diversity score of 4, 5 or 6 (fig 24 B). The proportion of caretakers according to dietary diversity scores across the study groups, were only marginally different except for the DDS of 5 for which the proportion of the Intervention group was comparatively higher. Among the children, majority of them (>60%) had a dietary diversity score of 3 or 4 (fig 24 C). The proportions of the children according to the dietary diversity score were also marginally different between the study groups.

3.4.2.2.1.   *Distribution of the dietary diversity score*

115
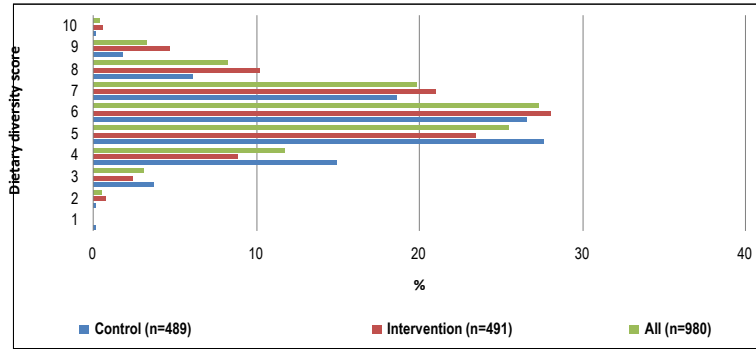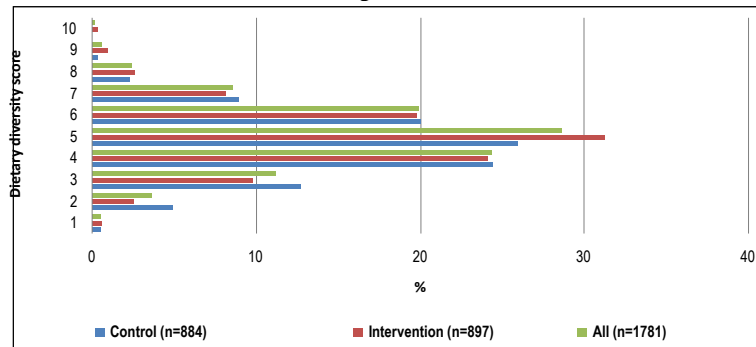
A-Pregnant women
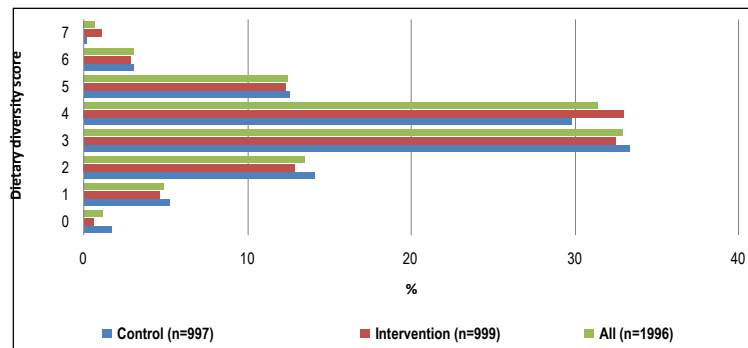
B- Caretakers

C-Children

Figure 25: *Proportion of women and children according to the dietary diversity score.*

3.4.2.2.2. Dietary diversity by study area and districts

Fig 25 below shows the proportion of pregnant women and caretakers who had high dietary diversity score and of children with minimum dietary diversity scores and acceptable diets for the study groups and across the four districts. The dietary diversity scores were categorized in to two; high and low, using the median value. From Fig 21A below, the proportion of women with high DDS varied significantly between the two study groups and across the four districts. It was higher among the pregnant women in the Intervention areas compared to those in the Control areas(65% vs.53%, respectively). In addition it was highest in Bungoma East (70%) followed by

Bungoma North and Kimilili (64% and 50%, respectively) and was lowest in Bunyala district (34%).Similarly, the proportion of caretakers with high DDS varied significantly between the study groups and across the four districts. It was also higher for those caretakers in the Intervention areas compared to those in the Control areas (63%vs. 58%, respectively). The proportion ranged from a high of 65% in Bungoma East to a low of 34% in Bunyala.

Generally, the nutrition levels of the children in the survey area as indicated by the minimum dietary diversity and accepted diet were low. Overall, only 47% and 33% of the children had attained the minimum dietary diversity score and acceptable diet respectively (fig 21 C &D). The proportion of children with minimum dietary diversity was higher in the Intervention areas compared to the Control (49% vs.46%) though the difference was only significant at 10% level. It was also varied significantly across the districts, with a range of 51% in Bungoma East and 26% in Bunyala. Similarly, the proportion of children with minimum acceptable diet also varied significantly across the districts. It was highest in Bungoma East (35%) and least in Bunyala district (17%).Of all the four districts, Bunyala district is indeed the most food insecure and Bungoma East is the most food secure.
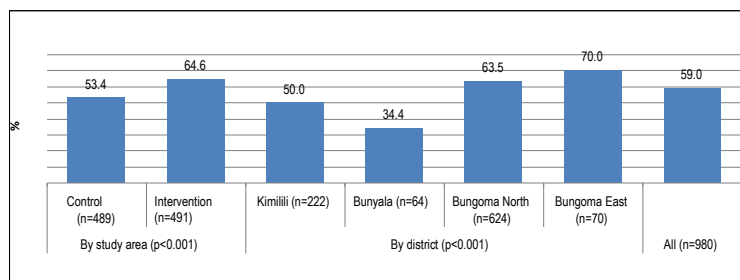
A-Pregnant women with high DDS
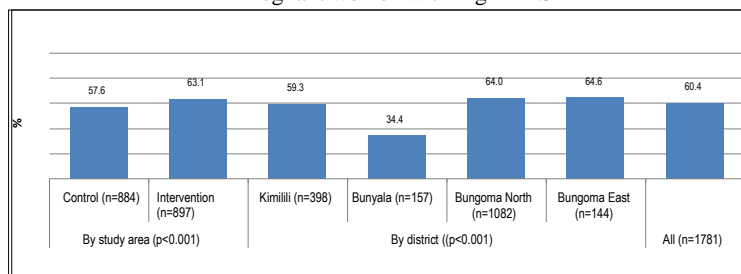
B- Caretakers with high DDS
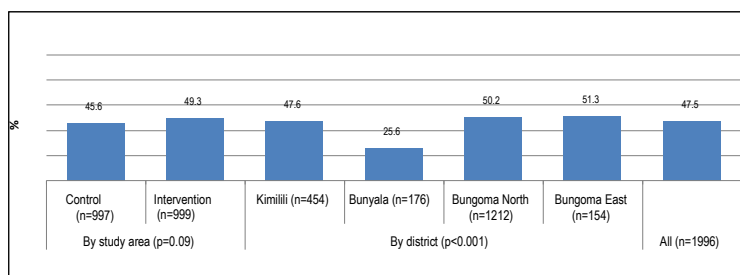
C-Children with minimum dietary diversity
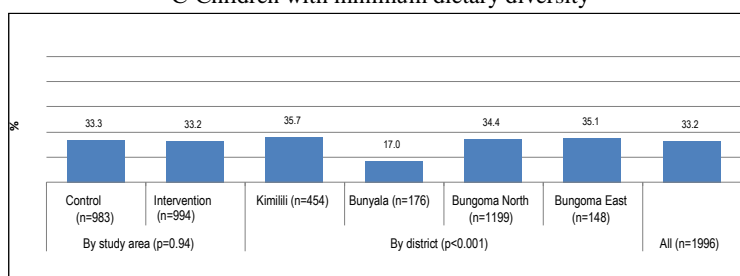
D-Children with minimum acceptable diet

Figure 26: *Proportion of women with high dietary diversity score and children with minimum dietary diversity and acceptable diet, by study area and districts.*

3.4.2.2.3.   *Dietary diversity by individual and household characteristics*

Analysis of women with high DDS and children with minimum dietary diversity according to individual and households' characteristics are presented in *tables 42* to *45*.

Table 42: *Number (%) of pregnant women with high dietary diversity, by individual and households' characteristics*

	n	*%*	*p*
Age (years)[1]			*0.006*
15-25	319	62.8	
26-54	248	54.1	
Pregnancy stage[2]			*0.86*
First trimester	98	60.9	
Second trimester	220	58.4	
Third trimester	259	58.9	
Currently enrolled in formal schooling			*0.042*
No	540	58.0	
Yes	31	73.8	
Highest level of formal education completed			*0.003*
Primary or lower	400	55.9	
Higher than primary	170	66.4	
Marital status			*0.73*
Married monogamous	456	58.1	
Married polygamous	43	63.2	
Single	62	61.4	
Other	10	52.6	
Is currently involved in growing sweetpotatoes			*0.37*
No	94	55.6	
Yes	477	59.3	
Agriculture is principal activity			*0.28*
No	125	55.6	

Yes	406	59.6	
Has sold agriculture or livestock products last year			*0.001*
No	176	51.3	
Yes	395	62.7	
Has undertaken salaried employment last year			*0.13*
No	534	58.1	
Yes	37	68.5	
Has done casual labour last year			*0.89*
No	347	58.5	
Yes	224	58.9	
Has been involved in informal business last year			*0.021*
No	443	56.9	
Yes	128	66.0	
Has been involved in some other form of self-employment			*0.045*
No	429	57.0	
Yes	142	64.5	
Household size (number of members)			*0.32*
1-3	325	60.4	
4-15	253	57.2	
Age of household head (years)			*0.86*
16-35	332	59.1	
36-93	242	59.6	
Sex of household head			*0.96*
Female	45	59.2	
Male	533	59.0	
Highest level of formal education completed by household head			*<0.001*
Primary or lower	318	54.0	
Higher than primary	260	66.5	
Household wealth quintile			*0.000*
lowest	88	44.4	
second	109	57.1	
middle	110	56.7	
fourth	115	60.2	
highest	158	76.7	

Pregnant women's dietary diversity was associated with pregnant women's age, education and involvement in informal business and in some other form of self-employment, as well as with household head education and household wealth index. The proportion of pregnant women with high DDS was significantly higher for women aged 15-25 years compared to those aged between 26 and 54 years (63% vs. 54%). Moreover, a significantly greater proportion of women who had more than primary levels of education (66%) compared to those with primary level education or lower (60%) had high DDS. Likewise, the higher is the level of education of the households' head, the higher is the proportion of women with high DDS.

Involvement of pregnant women in income-generating activities including informal businesses, self-employment and commercial agriculture were also associated with higher proportions of women with high DDS. Households that had higher wealth status had higher proportion of women with high DDS. A high of 77% of the women in the highest wealth quintile compared to a low of 44% of the women in the lowest quintile had high DDS

Table 43: *Number (%) caretakers with high dietary diversity, by individual and households' of characteristics.*

	n	%	p
Status of caretaker			*0.87*
Mother	1023	60.2	
Other	44	61.1	
Age (years)[1]			*0.49*
≤25	433	61.0	
>25	624	59.4	
Currently enrolled in formal schooling			*0.008*
No	1014	59.6	
Yes	48	76.2	
Highest level of formal education completed			*<0.001*
Primary or lower	716	56.3	
Higher than primary	345	70.1	
Is currently involved in growing sweetpotatoes			*0.018*
No	110	52.6	
Yes	952	61.1	
Agriculture is principal activity			*0.88*
No	811	60.0	
Yes	206	60.4	
Has sold agriculture or livestock products last year			*<0.001*
No	222	48.2	
Yes	840	64.4	
Has undertaken salaried employment last year			*<0.001*
No	987	59.0	
Yes	75	79.8	
Has done casual labour last year			*0.31*
No	605	61.2	
Yes	457	58.8	
Has been involved in informal business last year			*0.001*
No	884	58.6	
Yes	178	69.3	
Has been involved in some other form of self employment			*0.015*
No	732	58.3	
Yes	330	64.6	
Household size (number of members)			*0.30*
0-3	503	61.6	
4-15	572	59.3	
Age of household head (years)			*0.87*
16-35	499	60.6	
36-93	561	60.2	
Sex of household head			*0.14*
Female	99	66.0	
Male	976	59.8	
Highest level of formal education completed by household head			*<0.001*
Primary or lower			
Higher than primary	594	56.0	
	481	66.7	
Household wealth quintiles			*0.000*
lowest	171	48.9	
second	200	54.5	
middle	219	62.2	
fourth	248	68.5	
highest	238	68.0	

Caretakers' dietary diversity was associated with her education, sweetpotato growing, selling agriculture or livestock product and involvement in salaried employment, in informal business and in some other form of self-employment. It was also associated with household head

education and household wealth index. The higher is the level of education of the pregnant women or of the households' head, the higher is the proportion of women with high DDS. A significantly higher proportion of women with more than primary school level of education (70%) had high DDS compared to those with primary level or less (56%).

Likewise, involvement of the caretakers in income-generating activities was positively associated with higher proportions of women with high DDS. Significantly, higher proportions of caretakers involved in salaried employment, commercial agriculture, informal businesses and self-employment had high DDS compared to those not involved. In addition, a significantly higher proportion of caretakers who grew sweetpotato (61%) had high DDS compared to those who did not grow (53%). Similarly, households with higher wealth status were associated with higher proportions of women with high DDS. A high of 68% of the caretakers in the highest household wealth quintile compared to a low of 49% of the women in the lowest household wealth quintile had high DDS. Indeed, education as source of knowledge and income are inputs to adequate dietary practices.

Table 44: *Number (%) of children aged 6-23 months with minimum dietary diversity, by individual characteristics.*

	n	*%*	*p*
Child's age (months)[1]			<0.001
6-11	272	39.2	
12-23	669	51.8	
Child's sex			0.23
Female	472	48.9	
Male	476	46.2	
Status of caretaker			0.29
Mother	900	47.2	
Other	40	53.3	
Caretaker is pregnant			0.83
No	844	47.4	
Yes	104	48.1	
Caretaker's age (years)[1]			0.86
≤25	392	47.6	
>25	543	47.2	
Caretaker currently enrolled in formal schooling			0.06
No	899	47.0	
Yes	38	58.5	
Caretaker's highest level of formal education completed			<0.001
Primary or lower	630	43.5	
Higher than primary	306	57.7	
Caretaker's marital status			0.09
Married monogamous	759	48.5	
Married polygamous	66	38.8	
Single	77	44.5	
Other	35	47.9	
Caretaker is currently involved in growing sweetpotatoes			0.025
No	96	40.5	
Yes	841	48.3	

Caretaker has agriculture as principal activity			0.08
No	697	46.1	
Yes	200	51.0	
Caretaker has sold agriculture or livestock products last year			0.10
No	230	44.2	
Yes	707	48.4	
Caretaker has undertaken salaried employment last year			0.45
No	886	47.1	
Yes	51	51.0	
Caretaker has done casual labour last year			0.021
No	548	49.6	
Yes	389	44.4	
Caretaker has been involved in informal business last year			0.012
No	774	46.1	
Yes	163	54.0	
Caretaker has been involved in some other form of self-employment			0.024
No			
Yes	648	45.7	
	289	51.3	
Household size			0.62
1-3	459	48.1	
4-15	489	47.0	
Age of household head (years)			0.10
16-35	476	49.4	
36-93	460	45.8	
Sex of household head			0.67
Female	79	49.1	
Male	869	47.4	
Highest level of formal education completed by household head			<0.001
Primary or lower			
Higher than primary	540	44.3	
	408	52.6	
Household wealth quintiles			0.000
Lowest	164	40.8	
second	189	45.2	
middle	179	44.9	
fourth	209	52.5	
Highest	207	54.6	

Table 44above shows proportion of children aged 6-23 months who had attained the minimum dietary diversity by individual characteristics. Attainment of the minimum dietary diversity among children aged between 6-23 months was associated with age of the child, caretakers' education levels, growing sweetpotatoes, involvement in income generating activities and households' wealth. A significantly higher proportion of children aged 12- 23 years (52%) had attained the minimum dietary diversity compared to that of those aged 6-11 years (39%). The higher the level of education of the caretaker and of the household head the higher the proportion of children who have attained the minimum dietary diversity. In addition, children whose caretakers grew sweetpotatoes were more likely to have attained the minimum dietary diversity;

of the caretakers who grew sweetpotatoes 48% of the children attained the minimum dietary diversity compared to only 40% of those who did not.

Similarly, where the caretaker was the involved in self-employment and informal businesses, the children were more likely to have attained the minimum dietary diversity. However, for the caretakers involved in casual labour the children were less likely to have attained the minimum dietary diversity; probably because involvement in casual labour draws the caretakers' time away from taking care of the children. Lastly, a child's attainment of the minimum dietary diversity was positively associated with the household wealth levels; of the households in the highest wealth quintile, a high of 55%of the children had attained the minimum dietary diversity compared to a low of 41% for the households in the lowest wealth quintile.

Table 45: *Number (%) of children aged 6-23 months with minimum acceptable diet, by individual characteristics*

	n	*%*	*p*
Child's age (months)[1]			0.18
6-11	243	35.3	
12-23	414	32.3	
Child's sex			0.50
Female	325	34.0	
Male	332	32.5	
Status of caretaker			<0.001
Mother	649	34.3	
Other	7	9.3	
Caretaker's age (years)[1]			0.44
≤25	262	32.1	
>25	385	33.8	
Caretaker currently enrolled in formal schooling			0.004
No	617	32.5	
Yes	32	50.0	
Caretaker's highest level of formal education completed			<0.001
Primary or lower			
Higher than primary	437	30.5	
	211	40.3	
Caretaker's marital status			0.12
Married monogamous	531	34.3	
Married polygamous	44	26.0	
Single	53	31.0	
Other	21	28.8	
Caretaker is currently involved in growing sweetpotatoes			0.05
No	65	27.7	
Yes	584	33.8	
Caretaker has agriculture as principal activity			0.40
No	482	32.3	
Yes	135	34.5	
Caretaker has sold agriculture or livestock products last year			0.32
No	162	31.3	

Yes	487	33.7	
Caretaker has undertaken salaried employment last year			0.67
No	614	33.0	
Yes	35	35.0	
Caretaker has done casual labour last year			0.35
No	371	34.0	
Yes	278	32.0	
Caretaker has been involved in informal business last year			0.026
No			
Yes	533	32.1	
	116	38.7	
Caretaker has been involved in some other form of self- employment			0.08
No			
Yes	448	32.0	
	201	36.0	
Household size			0.48
1-3	308	32.5	
4-15	349	33.9	
Age of household head (years)			0.34
16-35	328	34.3	
36-93	321	32.3	
Sex of household head			0.25
Female	47	29.2	
Male	610	33.6	
Highest level of formal education completed by household head			0.001
Primary or lower			
Higher than primary	369	30.5	
	288	37.5	
Household wealth quintile			
Lowest	115	29.0	0.06
second	129	31.1	
middle	129	32.7	
fourth	142	36.0	
highest	142	37.8	

Table 45 above shows the proportion of children aged 6-23months who had attained the minimum acceptable diet by individual characteristics. Attainment of minimum acceptable diet was associated with the status of the mother, education levels of the caretaker and of the household head, growing sweetpotatoes and caretakers' involvement in informal businesses. The higher the education level of the caretakers' the higher the likelihood of the children to have attained the minimum acceptable diet; of the children whose caretakers had education levels higher than at primary level, 40% had attained minimum acceptable diet compared to only 31%for those with primary education or lower. Education levels of the household head were also positively associated with attainment of the minimum acceptable diet. In addition, the status of the caretakers, whether the caretaker is a mother also influenced the minimum acceptable diets of the children. For those children whose caretakers were mothers, a greater proportion (34%) had attained the minimum acceptable diet in comparison to those whose caretakers were not mothers(9%).Involvement of the caretakers in informal businesses also influenced the children's

attainment of the minimum acceptable diet positively; of the children whose caretakers were involved in informal businesses, a greater proportion had attained the minimum acceptable diet compared those not involved (39% vs. 32%, respectively). Likewise, involvement of the caretakers in growing sweetpotatoes was positively associated with the children's attainment of the minimum acceptable diets. Of the children whose caretakers grew sweetpotatoes, a significantly higher proportion had attained the minimum acceptable diet compared to those who did not (34% vs. 28%, respectively).

3.5. Health and nutrition

3.5.1. Antenatal service utilization

Of the 980 pregnant women surveyed, 582 (60%) reported going to a health facility for antenatal care (ANC) for their current pregnancies; this proportion was not significantly different between the two study groups. On average, the women were approximately 4.5 months pregnant at their first ANC visit during their current pregnancy; this was comparable between the study groups. Majority of these women (66%) were in their second trimester at first ANC visit and only 145 (25%) were in their first trimester at first ANC visit. The proportion of women who were less than 5 months pregnant at the first ANC visit was significantly higher among the Intervention group (56%) compared to the Control group(52%).

There were several reported barriers for seeking ANC for the first time during second trimester or later. Lack of money was reported by the majority of women (33%) as a significant reason for not seeking ANC at less than 5 months. Other commonly cited reasons for not seeking care in the first trimester included; waiting for the abdomen to enlarge or not experiencing any problems (11%), lack of knowledge regarding importance of seeking care earlier (11%), not wanting to expose pregnancy (7%), being too busy and wanting to avoid too many visits (7%). Small proportions of women (less than10%) also noted that distance to facility, being weak and sick and aversion to hospitals and needles were barriers to seeking ANC earlier. None of the women reported being afraid of a HIV test as being a reason for seeking ANC late. There were no significant differences between the Control and Intervention groups in this regard.

At the time of the survey, almost equal proportion of women had reported receiving ANC once (27%), twice (27%), three times (25%), and 4 or more times (21%). The number of times women reported receiving ANC for their current pregnancy was comparable across the Control and Intervention groups. For the services provided during the ANC visit; majority of the women reported being measured for weight (93%), having a blood sample taken (93%), and blood pressure measured (80%). Just over half of the women (66%) reported giving a urine sample during their visit and only few (19%) reported being measured for height during their ANC visit. These proportions of services provided during ANC visit did not differ significantly between the

Control and Intervention groups. Despite receiving services at the ANC clinic, 51% of the women reported that the results were never or rarely discussed by the nurses, while only 28% of the women reported that nurses regularly or always discussed results with them. These rates were significantly different between Control and Intervention groups with more women in the Intervention group (33%) having reported discussing the results with the nurses regularly or always compared to those in the Control group (23%).

Table 46: *Antenatal service utilization for current pregnancy, overall and by study areas*

	All (n=980)		By study areas				p
			Control (n=489)		Intervention (n=491)		
	n	*%*	*n*	*%*	*n*	*%*	
Went to health facility for antenatal care	582	60.3	282	58.1	300	62.5	*0.16*
No. of months pregnant at first ANC visit[b]	4.5[1]	1.49[2]	4.6	1.40	4.4	1.57	*0.24*
1 month	13	2.2	4	1.4	9	3.0	*0.04*
2	43	7.4	18	6.4	25	8.3	
3	89	15.3	43	15.3	46	15.3	
4	155	26.7	66	23.5	89	29.7	
5	131	22.5	79	28.1	52	17.3	
6	97	16.7	48	17.1	49	16.3	
7	45	7.7	22	7.8	23	7.7	
8 months	7	1.2	1	0.4	6	2.0	
If went after >5 months pregnancy, why not earlier?[c]							
Lack of money	55	33.1	24	31.6	31	34.4	*0.95*
No problems/waiting for abdomen to enlarge	18	10.8	8	10.5	10	11.1	
Lack of knowledge/no reason to go earlier	18	10.8	7	9.2	11	12.2	
Did not want to expose pregnancy	12	7.2	7	9.2	5	5.6	
Busy/to avoid many visits	12	7.2	4	5.3	8	8.9	
Simply did not go	11	6.6	6	7.9	5	5.6	
Health facility far/lack of transport	5	3.0	3	3.9	2	2.2	
Was weak and sick/told by nurse not to attend until feeling well	11	6.6	6	7.9	5	5.6	
Dislike hospitals/afraid of nurses, , injections	5	3.0	2	2.6	3	3.3	
Afraid of HIV test	0	0.0	0	0.0	0	0.0	
Other	19	11.4	9	11.8	10	11.1	
No. of times received ante-natal care so far[d]	2.56[1]	1.41[2]	2.65[1]	1.44[2]	2.46[1]	1.39[2]	*0.12*
Once	154	26.7	69	24.6	85	28.6	*0.64*
Twice	154	26.7	71	25.4	83	27.9	
3 times	146	25.3	76	27.1	70	23.6	
4 or more times	123	21.3	64	22.9	59	19.9	
Service provided during ANC visit[e]							
Measured weight	537	92.9	264	94.3	273	91.6	*0.21*
Measured height	111	19.2	49	17.5	62	20.8	*0.31*
Measured blood pressure	450	77.9	222	79.3	228	76.5	*0.42*
Blood sample taken	535	92.6	255	91.1	280	94.0	*0.18*
Urine sample taken	384	66.4	180	64.3	204	68.5	*0.28*
Were the results discussed by the nurse?[f]							
Never	177	30.7	93	33.1	84	28.4	*0.004*

	118	20.5	68	24.2	50	16.9	
Rarely	118	20.5	68	24.2	50	16.9	
Occasionally	121	21.0	56	19.9	65	22.0	
Regularly/always	161	27.9	64	22.8	97	32.8	

[1] is the mean, [2] =standard deviation [a] Missing data for n=11 and n=4 women in Intervention and Control groups, respectively; valid n=965; [b] Missing data for n=1 woman in the Control area, from those who went to health facility; valid n=581; [c] n=166 provided reasons for not attending ANC clinic earlier; n=90 are in Intervention and n=76 in the Control groups; [d] Missing data for n=3women in Intervention and n=2 women in Control groups; valid n=577; [e] Missing data for n=2 women in Intervention and Control groups; valid n=578; [f] Missing data for n=4 women in Intervention group and n=1woman in the Control group; valid n=577

Pregnancy trimester at first ANC visit among women in their current pregnancy by years of formal education and household' wealth status

Though the difference was only slight, the average years of formal training were higher for those women who first attended ANC clinics during their first pregnancy trimester; at least they had an average of more than Primary level education (more than 8 years). Those who first sought ANC during their second trimester had the least years of formal education that is about 7.5 years. Contrary, to what would be expected those who attended who first attended ANC clinic during their third trimester had on average more levels of education compared to those who attended in their second trimester.

Though the relationship between household wealth status and pregnancy trimester at first ANC visit was not significant, the proportion of women who sought ANC for the first time in their third trimester decreased with the increase in household' wealth status, 12% of the women in the lowest wealth status compared to 6% of those in the highest wealth status.

Average years of formal education　　　　　*by wealth status, p=0.42*

Figure 27**:** *Pregnancy trimester at first ANC visit among women in their current pregnancy by years of formal education and household' wealth status*

In all the four districts, majority of the women, at least 55%, reported going to a health facility for antenatal care during their current pregnancy. The average time in months during which the women sought ANC services ranged from 4.8 months in Bunyala to 4.2 months in Bungoma East. In Kimilili, Bungoma North, and Bungoma East, 61%, 66% and 65%, respectively reported seeking ANC for the first time in their second trimester, while in Bunyala this was reported by 80% of the women. In all the districts, only less than 30% of the women reported seeking ANC care in their first trimester, with the lowest proportion (15%) being reported in the Bunyala district. The major barriers to seeking care before 5 months pregnancy varied across the districts. They included; the lack of money in Kimilili (40%) and Bungoma North (36%), not wanting to expose pregnancy in Bunyala (23%), and the lack of knowledge regarding the importance of seeking ANC in Bungoma East (50%). The number of times women received ANC, at the time of the survey, were comparable across the four districts.

Similarly, majority of women in all districts reported having weight and blood pressure measurement taken as well as giving blood samples during their ANC visit. The highest proportion of women (80%) who reported providing a urine sample during their visit were in Bunyala, while the lowest proportions, 49% and 50%, were in Kimilili and Bungoma East, respectively. In addition, 38% of the women in Bungoma East stated that nurses regularly or always discussed results with them compared to only 17% of women in Kimilili sharing the same experience. The proportions of women who reported that they never or rarely discussed the results with the nurses were highest in Kimilili(63%) and lowest in Bungoma North (47%).

Table 47: *Antenatal service utilization for current pregnancy, by districts*

	By districts							
	Kimilili (n=222)		Bunyala (n=64)		Bungoma North (n=624)		Bungoma East (n=70)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Went to health facility for antenatal care[a]	130	59.4	40	62.5	374	61.0	38	55.1
No. of months pregnant at first ANC visit[b]	4.4[1]	1.50[2]	4.8	1.12	4.5	1.53	4.20	1.34
1 month	3	2.3	0	0	9	2.4	1	2.6
2	7	5.4	1	2.5	33	8.8	2	5.3
3	26	20.2	5	12.5	50	13.4	8	21.1
4	33	25.6	8	20.0	101	27	13	34.2
5	31	24.0	15	37.5	78	20.9	7	18.4
6	15	11.6	9	22.5	69	18.4	4	10.5
7	13	10.1	2	5.0	28	7.5	2	5.3
8 months	1	0.8	0	0	6	1.6	0	0
If went after >5 months pregnancy, why not earlier?[c]								
Lack of money	10	40.0	2	15.4	43	35.8	0	0.0
No problems/waiting for abdomen to enlarge	2	8.0	2	15.4	13	10.8	1	12.5
Lack of knowledge/no reason to go earlier	2	8.0	2	15.4	10	8.3	4	50.0

Did not want to expose pregnancy	2	8.0	3	23.1	6	5.0	1	12.5
Busy/to avoid many visits	2	8.0	0	0.0	9	7.5	1	12.5
Simply did not go	3	12.0	0	0.0	8	6.7	0	0.0
Health facility far/lack of transport	1	4.0	1	7.7	3	2.5	0	0.0
Was weak and sick/told by nurse not to attend until feeling well	1	4.0	0	0	10	8.3	0	0.0
Dislike hospitals/afraid of nurses & injections	1	4.0	1	7.7	2	1.7	1	12.5
Afraid of HIV test	0	0.0	0	0.0	0	0.0	0	0.0
Other	1	4.0	2	15.4	16	13.3	0	0.0
No. of time received ante-natal care so far[d]	2.67[1]	1.50[2]	2.53[1]	1.32[2]	2.49[1]	1.39[2]	2.84[1]	1.57[2]
Once	34	26.4	11	27.5	101	27.2	8	21.6
Twice	30	23.3	10	25.0	104	28.0	10	27.0
3 times	31	24.0	10	25.0	98	26.4	7	18.9
4 or more times	34	26.4	9	22.5	68	18.3	12	32.4
Service provided during ANC visit[e]								
Measured weight	126	97.7	40	100.0	338	91.1	33	86.6
Measured height	18	14.0	11	27.5	70	18.9	12	31.6
Measured blood pressure	101	78.3	29	72.5	287	77.4	33	86.8
Blood sample taken	117	90.7	37	92.5	345	93.0	36	94.7
Urine sample taken	63	48.8	32	80.0	270	72.8	19	50.0
Were the results discussed by the nurse?[d]								
Never	45	34.9	15	37.5	107	28.8	10	27.0
Rarely	36	27.9	6	15.0	67	18.1	9	24.3
Occasionally	26	20.2	11	27.5	80	21.6	4	10.8
Regularly/always	22	17.0	8	20.0	117	31.5	14	37.8

[1] is the mean, [2] =standard deviation [a] Missing data for n=11 in Bungoma North, n=1 in Bungoma East, and n=3 in Kimilili; valid n=965; [b] Missing data for n=1 woman in Kimilili from those who attended health facility; valid n=581; [c] n=166 provided reasons for not attending ANC clinic earlier; n=120 in Bungoma North, n=8 in Bungoma East, n=25 in Kimilili, and n=13 in Bunyala districts; [d] Missing data for n=3 in Bungoma North and n=1 in Bungoma East and Kimilili districts, each; valid n=577. [e] Missing data for n=3 in Bungoma North and n=1 in Kimilili districts; valid n=578

Overall, 2363 (96%) of the women who were previously pregnant went to a health facility for antenatal care. Of these, majority of the women (61%) sought ANC for the first time during their second trimester, 31% percent of the women had their first ANC visit in the first trimester, and the remaining 8% of the women sought ANC for the first time in their third trimester. These proportions were statistically different between the two groups (p=0.07), with women in the Intervention group more likely to seek ANC for the first time within the first trimester compared to women in the Control group (33% vs. 29%, respectively). Additionally, a greater proportion of women in the Control group (64%) sought ANC for the first time in their second trimester compared to the Intervention group (59%). On average, the women first sought ANC when they were approximately 4.3 months pregnant.

Just like women with current pregnancies, majority of the women with a previous pregnancy who did not attend ANC clinic at less than 5 months reported various reasons for not attending.

These are lack of money (24%), not experiencing problems with pregnancy (11%), lack of knowledge (11%), and not wanting to expose pregnancy (8%), among the top reasons for not seeking ANC earlier. 14% said that they had no reason for not going and they simply did not want to go for ANC earlier. Few proportions of women also stated being busy or wanting to avoid many visits (6%), lack of transport or the health facility being too far (6%), dislike for hospitals or being afraid of injections (5%) and being sick (4%) as reasons why they sought ANC services later than 5 months. Only 1 woman cited fear of HIV test as reason for seeking these services late. This was not significantly different between women in the Intervention versus Control groups. However, unlike responses of currently pregnancy women, 64% of women with previous pregnancies reported receiving ANC 4 or more times, 27% of the women received ANC care at least 3 times, and only few (<10%) received ANC only one or two times. These proportions were comparable across the study groups.

Measurement of weight (97%) and blood pressure (88%) as well as having blood sample (95%) taken remained the most commonly reported of the services provided during ANC in the previous pregnancy. However, a statistically greater proportion of women in the Control group reported giving blood sample and having blood pressure taken compared to the Intervention group. Almost equal proportions of women reported having never (27%), rarely (22%), occasionally (25%), or regularly/always (26%) had results discussed by the nurses for their previous pregnancy. This was in contrast with women with current pregnancy, where the majority reported never or rarely having results discussed by the nurse.

Table 48: *Antenatal service utilization for previous pregnancy, overall and by study areas*

| | Overall | | By study areas | | | | |
| | (n=2487 | | Control (n=1244) | | Intervention (n=1243) | | *p* |
	n	*%*	*n*	*%*	*n*	*%*	
Went to health facility for antenatal care[b]	2363	95.9	1175	95.6	1188	96.3	*0.40*
No. of months pregnant at first ANC visit[c]	4.3[1]	1.56[2]	4.3	1.49	4.3	1.62	*0.23*
1 month	77	3.3	29	2.5	48	4.1	*0.11*
2	200	8.5	89	7.6	111	9.5	
3	443	18.9	220	15.8	223	19.0	
4	643	27.5	338	28.9	305	26.0	
5	461	19.7	236	20.2	225	19.2	
6	331	14.1	171	14.6	160	13.7	
7	136	5.8	66	5.6	70	6.0	
8 months	41	1.8	20	1.7	21	1.8	
9 months	10	0.4	2	0.2	8	0.7	
If went after >5 months pregnancy, why not earlier?[d]							
Lack of money	145	23.5	75	25.3	70	21.8	*0.44*
No problems/waiting for abdomen to enlarge	70	11.3	32	10.8	38	11.8	
Lack of knowledge/no reason to go earlier	70	11.3	28	9.5	42	13.1	
Did not want to expose pregnancy	52	8.4	23	7.8	29	9.0	
Simply did not go	86	13.9	41	13.9	45	14.0	

Busy/to avoid many visits	39	6.3	23	7.8	16	5.0	
Health facility far/lack of transport	35	5.7	21	7.1	14	4.4	
Was weak and sick/instructed to get well by nurse before going to the clinic	24	3.9	13	4.4	11	3.4	
Dislike hospitals/afraid of nurses, injections	30	4.9	12	4.1	18	5.6	
Afraid of HIV test	1	0.0	1	0.0	0	0.0	
Other	66	10.7	28	9.5	38	11.8	
No. of time received ante-natal care[e]	4.26[1]	1.67[2]	4.27[1]	1.70[2]	4.25[1]	1.65[2]	*0.67*
Once	73	3.2	36	3.1	37	3.2	*0.80*
Twice	139	6.0	71	6.1	68	5.9	
3 times	621	26.9	314	27.1	307	26.7	
4 or more times	1474	63.8	737	63.6	737	64.0	
Service provided during ANC visit[f]							
Measured weight	2254	96.7	1121	96.6	1133	96.8	*0.78*
Measured height	465	20.0	226	19.5	239	20.4	*0.56*
Measured blood pressure	2052	88.1	1036	89.3	1016	86.8	*0.06*
Blood sample taken	2217	95.2	1113	95.9	1104	94.4	*0.07*
Urine sample taken	1699	72.9	832	71.7	867	74.1	*0.19*
Were the results discussed by the nurse?[g]							
Never	630	27.3	309	26.7	321	27.8	*0.14*
Rarely	500	21.7	264	22.8	236	20.5	
Occasionally	585	25.3	293	25.3	292	25.3	
Regularly/always	594	25.7	290	25.1	304	26.4	

[1] is the mean, [2] =standard deviation[a] Of the total n=2761 women in the study, n=2487 qualify to answer questions regarding previous pregnancy; [b] Missing data for n=9 in the Intervention and n=15 in the Control groups; valid n=2463; [c] Missing data for n=17 in Intervention and n=4 in the Control groups, from those women who attended ANC clinic ; valid n=2342; [d] n=617 provided reasons for not attending ANC clinic earlier; n=321in the Intervention and n=296 in the Control groups; [e] Missing data for n=37 in the Intervention and n=17 in the Control group, from those who attended ANC clinic; valid n=2309; [f] Missing data for n=18 in Intervention and n=15 in Control groups, from those who attended ANC clinic; valid n=2330; [g] Missing data for n=35 in Intervention and n=19 in Control groups, from those who attended ANC clinic; valid n=2309.
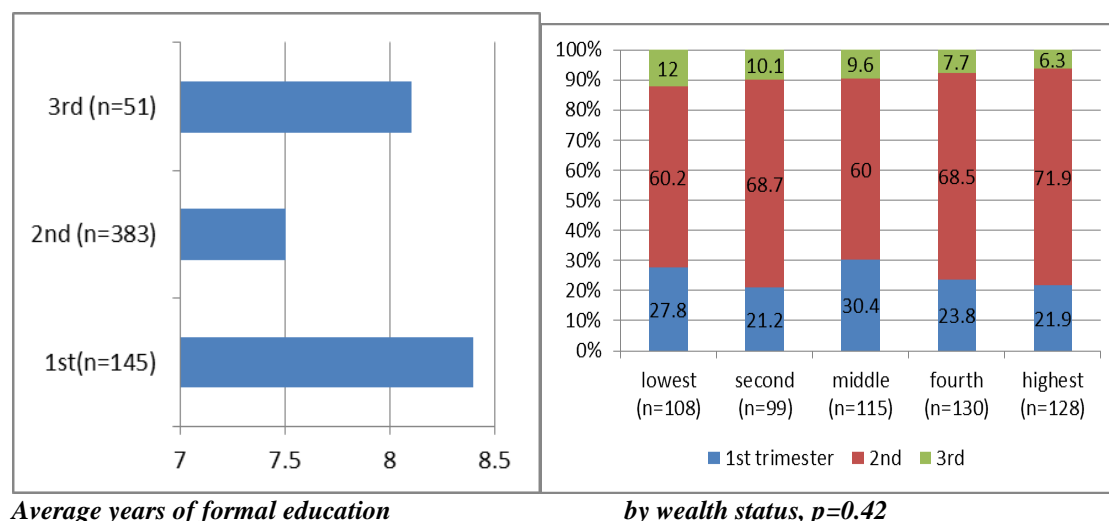
Pregnancy trimester at first ANC visit among women for previous pregnancy by years of formal education and household' wealth status

Though the difference was marginal those women who first sought ANC during their third trimester for previous pregnancies were on average more educated compared to those who first sought ANC during their second and third trimesters. Majority of the women, about 60%, in all the wealth classes first attended ANC during their second pregnancy trimester. In addition, though the difference was not significant, a greater proportion of the women in the highest wealth status first sought ANC during their first trimester compared to those in the lowest wealth quintile(33% vs. 30%)
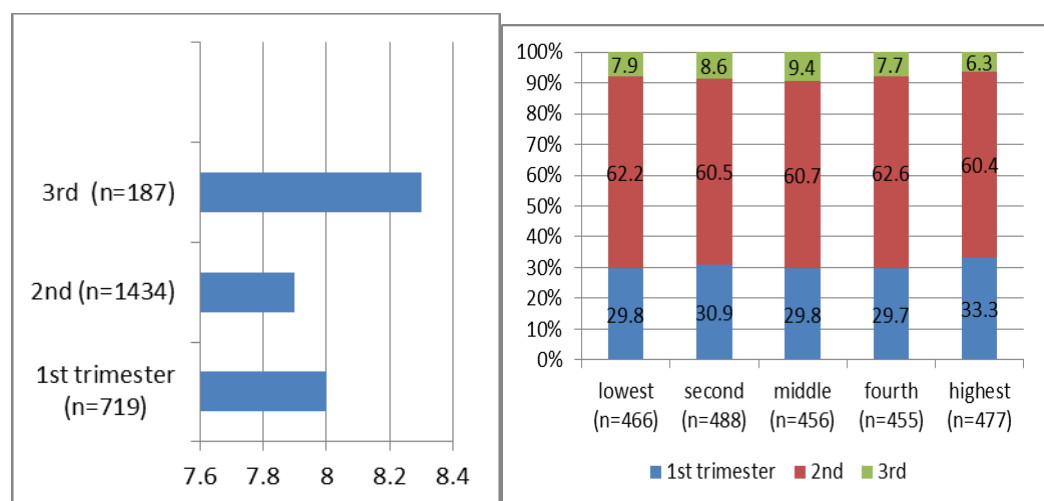
Average years of formal education   *by wealth status, p value=0.76*

Figure 28: *Pregnancy trimester at first ANC visit among women for previous pregnancy by years of formal education and household' wealth status*

In all four districts, almost all of the women surveyed reported going to a health facility for antenatal care in their previous pregnancy. Majority of the women went for their first ANC visit in the second trimester, while approximately one third of the women were in their first trimester at their first ANC visit. Lack of money continued to be the commonly reported reason across districts for why women did not seek ANC earlier in their pregnancy, particularly in Kimilili (29%) and Bunyala (27%). In the Bungoma East district, lack of knowledge was the most commonly reported reason for not seeking care earlier, while lake of money posed a challenge for 16% of the women. Nonetheless, over 60% of all women received ante-natal care 4 or more times in their previous pregnancy and approximately a quarter received ANC 3 times, comparable across the districts.

The services provided during ANC visit were reported with similar frequency across districts, although a lower proportion of women reported having blood pressure measured and a higher proportion reported giving urine samples in Bunyala compared to other districts. Women who reported that the nurse regularly or always discussed the results of the tests were 20% to 30%. When combined, majority of the women reported that nurses occasionally or regularly/ always discussed the results for all the districts.

Table 49: *Antenatal service utilization for previous pregnancy, by districts*

	By districts							
	Kimilili (n=565)		Bunyala (n=205)		Bungoma North (n=1532)		Bungoma East (n=175)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Went to health facility for antenatal care[b]	532	95.5	202	99.0	1454	95.7	175	95.6

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No. of months pregnant at first ANC visit[c]	4.3[1]	1.49[2]	4.0	1.40	4.3	1.60	4.4	1.55
1 month	17	3.2	3	1.5	51	3.5	6	3.5
2	29	5.5	22	10.9	137	9.5	12	6.9
3	105	19.8	48	23.9	261	18.2	29	16.8
4	155	29.2	63	31.3	371	25.8	54	31.2
5	110	20.7	34	16.9	281	19.6	36	20.8
6	72	13.6	23	11.4	219	15.2	17	9.8
7	34	6.4	5	2.5	82	5.7	15	8.7
8	8	1.5	2	1.0	27	1.9	4	2.3
9 months	1	0.2	1	0.5	8	0.6	0	0.0
If went after >5 months pregnancy, why not earlier?[d]								
Lack of money	35	28.9	10	27.0	92	22.5	8	15.7
No problems/waiting for abdomen to enlarge	15	12.4	0	0.0	52	12.7	3	5.9
Lack of knowledge/no reason to go earlier	4	3.3	7	18.9	50	12.3	9	17.6
Did not want to expose pregnancy	9	7.4	4	10.8	33	8.1	6	11.8
Simply did not go	16	13.2	2	5.4	62	15.2	6	11.8
Busy/to avoid many visits	9	7.4	3	8.1	25	6.1	2	3.9
Health facility far/lack of transport	11	9.1	5	13.5	14	3.4	5	9.8
Was weak and sick/instructed to get well by nurse before going to the clinic	5	4.1	1	2.7	16	3.9	2	3.9
Dislike hospitals/afraid of nurses injections	5	4.1	3	8.1	17	4.2	5	9.8
Afraid of HIV test	1	0.01	0	0.0	0	0.0	0	0.0
Other	12	9.9	2	5.4	47	11.5	5	9.8
No. of time received ante-natal care[e]	4.19[1]	1.75[2]	4.59[1]	1.68[2]	4.24[1]	1.65[2]	4.27[1]	1.54[2]
Once	20	3.8	4	2.0	45	3.2	4	2.4
Twice	44	8.4	6	3.0	79	5.6	10	6.0
3 times	145	27.6	44	22.2	391	27.5	41	24.7
4 or more times	316	60.2	144	72.7	903	63.6	111	66.9
Service provided during ANC visit[f]								
Measured weight	510	97.1	195	98.0	1386	96.7	163	94.8
Measured height	90	17.1	52	26.1	287	20.0	36	20.9
Measured blood pressure	485	92.4	149	74.9	1270	88.6	148	86.0
Blood sample taken	503	95.8	195	98.0	1357	94.6	162	94.2
Urine sample taken	304	57.9	171	85.9	1127	78.6	97	56.4
Were the results discussed by the nurse?[g]								
Never	138	26.3	54	27.3	389	27.5	49	28.8
Rarely	128	24.4	30	15.2	304	21.5	38	22.4
Occasionally	143	27.2	55	27.8	350	24.7	37	21.8
Regularly/always	116	22.1	59	29.8	373	26.3	46	27.1

[1] is the mean, [2] =standard deviation [a] Of the total n=2761 women in the study, n=2487 qualify to answer questions regarding previous pregnancy; [b] Missing data for n=13 in Bungoma North, n=2 in Bungoma East, n=8 in Kimilili and n=1 in Bunyala districts; valid n=2463; [c] Missing data for n=17 in Bungoma North, n=2 in Bungoma East, and n=1 in Kimilili and Bunyala, each, from those women who attended ANC clinic ; valid n=2342; [d] n=617 provided reasons for not attending ANC clinic earlier; n=408 in Bungoma North, n=51 in Bungoma East, n=121 in Kimilili and n=37 in Bunyala; [e] Missing data for n=34 in Bungoma North, n=9 in Bungoma East, n=7 in Kimilili and n=4 in Bunyala districts from those who attended ANC clinic; valid n=2309; [f] Missing data for n=20 in Bungoma North, n=3 in Bungoma East, n=7 in Kimilili and n=3 in Bunyala districts from those who attended ANC clinic; valid n=2330; [g] Missing data for n=38 in Bungoma North, n=5 in Bungoma East, n=7 in Kimilili and n=4 in Bunyala districts from those who attended ANC clinic; valid n=2309.

3.5.2. Maternity services utilization

Among the women who were currently pregnant during the survey, 60% reported going to a health facility for antenatal care. The proportions were not significantly different between the study groups. Women also reported distances to the health facility by the number of minutes it took to walk, go by bicycle, or use a car there. Overall, the average distance to the health facility in walking minutes was 47±35minutes, by bicycle it was 36±32 minutes and by car it was 30±33 minutes.

Overall, majority of the women that is about 83% reported that there was a maternity ward in the health facility they were currently attending. This proportion was however significantly greater for the women in the Control group(88%) compared to those in the Intervention group (79%). Of those who reported that maternity was present in the health facility, 72% of the women overall intended to give birth there for their current pregnancy and the proportion was comparable for the women in both study groups. About56% of the women reported that there was no maternity ward in the health facility where they sought ANC services and planned to give birth at another health facility. This proportion was significantly higher among the women in the Intervention areas(58%) compared to those in the Control areas (54%) at 1% level of significance.

Table 50: *Maternity services utilization for current pregnancy, overall and by study areas (N=980)*

	Overall		By study areas				
	(n=980)		**Control (n=489)**		**Intervention (n=491)**		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Went to health facility for antenatal care[a]	582	60.3	282	58.1	300	62.5	*0.16*
Distance in minutes to health facility							
Walking	47.1[1]	± 34.7[2]	43.5	± 31.9	50.4	± 36.8	*0.06*
By bicycle	35.7[1]	± 32.3[2]	30.7	± 23.9	40.5	± 38.3	*0.08*
By car	29.9[1]	± 33.5[2]	27.0	± 18.3	32.8	± 43.9	*0.40*
Maternity ward in the health facility, yes	483	83.0	247	87.6	236	78.7	*0.017*
If maternity ward present, intention to give birth here, yes[c]	351	72.2	175	70.6	176	73.9	*0.40*
If maternity ward not present, plan to give birth at another health facility, yes	325	55.8	152	53.9	173	57.7	*<0.001*

[1]is the mean, [2] =standard deviation[a] Missing data for n=11 and n=4 women in Intervention and Control groups, respectively; valid n=965; [c] n=3 women who did not know whether health facility had a maternity ward or not, also responded to this question; valid n=486.

Across all districts, majority of the women with current pregnancies, ranging from 55% in Bungoma East to 63% in Bunyala, reported attending a health facility for antenatal care at the time of the survey. The average time it took to walk to the health facility varied across the districts and was longest in Bungoma East (50 ± 33 minutes) and shortest in Bunyala (35 ±

26minutes). Average time to the health facility by bicycle and by car was relatively shorter than the time it took to walk in all the districts except for Bungoma East district where the average time by car was 68 ±16minutes.

A greater majority of women in Kimilili (90%) and Bunyala (95%) reported that maternity ward was in the health facility, of which 62%and 82%, respectively, intended to give birth at the maternity ward. In comparison to the other districts, Bungoma East had the lowest proportion of women (66%) who reported that the maternity ward was in the health facility. However, a greater proportion of these women, 81%, intended to give birth at the health facility compared to Kimilili where only 62%of the women with access to maternity ward intended to give birth there. Of the women who reported not having a maternity ward in the health facility, a high of 74 % in Bungoma East and a low of 50% in Bunyala planned to give birth at another health facility; only 54% and 55% of the women in Kimilili and Bungoma North respectively planned to give birth at another health facility.

Table 51*: Maternity services utilization for current pregnancy, by districts (N=980).*

	Kimilili (n=222)		Bunyala (n=64)		Bungoma North (n=624)		Bungoma East (n=70)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Went to health facility for antenatal care[a]	130	59.4	40	62.5	374	61.0	38	55.1
Distance in minutes to health facility								
Walking	45.8^1	$\pm 34.5^2$	34.8	± 26.3	48.7	± 35.7	49.7	± 32.9
By bicycle	31.7^1	$\pm 25.5^2$	29.8	± 34.9	38.6	± 35.1	28.3	± 27.5
By car	27.7^1	$\pm 17.9^2$	5.0		27.5	± 18.2	68.0	± 15.8
Maternity ward in the health facility, yes	117	90.0	38	95.0	303	81.0	25	65.8
If maternity ward present, intention to give birth here, yes[c]	73	61.9	31	81.6	226	74.3	21	80.8
If maternity ward not present, plan to give birth at another health facility, yes	70	53.8	20	50.0	207	55.3	28	73.7

[1]is the mean, [2] =standard deviation[a] Missing data for n=11 in Bungoma North, n=1 in Bungoma East, and n=3 in Kimilili; valid n=965; [c] n=3 who did not know whether health facility had a maternity ward or not, also responded to this question; valid n=486.

Almost all women in the survey (96%) reported attending a health facility for antenatal care in their previous pregnancy. This proportion was comparable between the study groups. The average walking distance in minutes to the health facility was 50 ± 38; it was significantly greater for women in the Intervention group compared to the Control group (51.4 ± 39.4 versus 48.0 ± 36.3, respectively). The time spent by bicycle (35 ± 49 minutes) and by car (33 ± 30 minutes) was relatively lower and it was not significantly different between the two groups.

In both the Control and Intervention groups, only 28 % of the women reported giving birth in a health facility, despite over 80 per cent of women indicating that there was a maternity ward in the health facility where they received ANC services. Of the women who reported that the maternity ward was not in the health facility, only 29% reported giving birth at another facility, the other 71% did not give birth at a health facility. These proportions were comparable between the study groups.

Table 52: *Maternity services utilization for previous pregnancy, overall and by study areas (N=2487)*

	Overall (n=2487)		By study areas				
			Control (n=1244)		Intervention (n=1243)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Went to health facility for antenatal care[b]	2363	95.9	1175	95.6	1188	96.3	*0.40*
Distance in minutes to health facility[c]							
Walking	49.7[1]	± 37.9[2]	48.0	± 36.3	51.4	± 39.4	*0.08*
By bicycle	35.1[1]	± 49.3[2]	32.4	± 24.6	37.8	± 64.3	*0.25*
By car	33.1[1]	± 30.4[2]	32.8	± 27.4	33.6	± 34.1	*0.80*
Maternity ward in the health facility, yes[d]	2021	85.6	1047	89.1	974	82.1	*<0.001*
If maternity ward present, did you give birth here, yes[e]	571	28.2	291	27.7	280	28.6	*0.56*
If maternity ward not present, did you give birth at another facility?[f]							
Yes	550	29.3	279	29.4	271	29.1	*0.55*
Did not give birth at a health facility	1330	70.7	669	70.6	661	70.9	

[1] is the mean, [2] =standard deviation[a] Of the total n=2761 women in the study, n=2487 qualify to answer questions regarding previous pregnancy; [b] Missing data for n=9 in the Intervention and n=15 in the Control groups; valid n=2463; [c] Missing n=5 from Intervention and n=3 from the Control group; valid n=2355; [d] Missing n=2 from the Intervention group; valid n=2361; [e] n=7 who did not know whether health facility had a maternity ward or not, responded to this question as well; valid n=2028; [f] n=1880 responded to this question; n=932 in the Intervention and n=948 in the Control group.

Almost all the women (at least 95%) across the four districts went to the health facility for antenatal care. Distance to the health facility in walking minutes ranged from 45.5±36.7 minutes in Bungoma East to 51.4±38.9 minutes in Bungoma North. In Kimilili, although 91% of the women reported that there was a maternity ward in the in health facility where they sought ANC for their previous pregnancy, only 18% of the women gave birth at the maternity ward. This proportion was even lower in Bungoma East where only 15% of the women reported giving birth at the maternity ward for their previous pregnancy. This is in addition to the fact that a smaller proportion of women (72 %) in Bungoma East had also reported that there was a maternity ward at the health facility where they went for ANC.

A range of 21% in Kimilili to 35% in Bunyala of the women reported giving birth at another facility when they did not have access to a maternity ward at the health facility where they sought ANC. The remaining greater proportion of the women in all districts did not give birth at

a health facility for their previous pregnancy. This was especially highest in Kimilili where a high of 79% did not give birth at a health centre.

Table 53: *Maternity services utilization for previous pregnancy, by districts.*

	By districts							
	Kimilili (n=565)		Bunyala (n=205)		Bungoma North (n=1532)		Bungoma East (n=185)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Went to health facility for antenatal care[b]	532	95.5	202	99.0	1454	95.7	175	95.6
Distance in minutes to health facility[c]								
Walking	46.6[1]	± 33.9[2]	48.5	± 39.2	51.4	± 38.9	45.5	± 36.7
By bicycle	30.2[1]	± 23.0[2]	32.8	± 20.1	38.9	± 62.9	27.4	± 11.9
By car	31.3[1]	± 22.3[2]	40.1	± 39.3	34.7	± 33.7	19.3	± 13.1
Maternity ward in the health facility, yes[d]	485	91.2	180	89.1	1230	84.7	126	72.0
If maternity ward present, did you give birth here, yes[e]	88	18.0	70	38.9	394	32.0	19	14.7
If maternity ward not present, did you give birth at another facility?[f]								
Yes	98	21.4	70	46.4	335	29.8	47	31.8
Did not give birth at a health facility	360	78.6	81	53.6	788	70.2	101	68.2

[1]is the mean, 2 =standard deviation. [a]Of the total n=2761 women in the study, n=2487 qualify to answer questions regarding previous pregnancy; [b] Missing data for n=13 in Bungoma North, n=2 in Bungoma East, n=8 in Kimilili and n=1 in Bunyala districts; valid n=2463; [c] Missing data for n=6 from Bungoma North and n=1 from Bungoma East and Kimilili, each; valid n=2355, [d] Missing data for n=2 from Bungoma North, valid n=2361; [e] n=7 who did not know whether the health facility did or did not have a maternity unit, also responded to this questions; valid n=2028; [f] n=1880 responded to this question; n=1123 in Bungoma North, n=148 in Bungoma East, n=458 in Kimilili, and n=151 in Bunyala

3.5.3. Preventative health services used for mother

Of the 980 women who were pregnant at the time of the survey, 60% comparable across the study groups went to a health facility for antenatal care. Of those, 44% reported being given nutrition advice on breastfeeding, 52 % on diet, 49% on child-feeding practices and 7% reported receiving nutritional advice on OFSP. These proportions were comparable between the two groups except for those who received nutritional advice on OFSP. A significantly greater proportion of women in the Intervention group reported being given nutritional advice on OFSP compared to the women in the Control group (11% vs. 3%, respectively). Similarly, few women (<2%) reported having received advice on the above nutritional aspects from the community workers only or from both the community workers and the health facilities.

Overall, 40% of the women who were currently pregnancy also reported being given or buying iron supplements, 64% reported taking drugs to prevent malaria, 62% were given injection to prevent tetanus at the health facility, and only 21% reported taking drugs to prevent intestinal

worms. The proportion of women who were given or bought iron tablets and those who took antihelmintic drugs were significantly greater in the Intervention versus the Control groups. Nonetheless, overall, there was suboptimal level of preventative health services reported by the mothers for their current pregnancy

Table 54: *Nutritional counseling and health practice for current pregnancy, overall and by study areas.*

	All (n=980)		Control (n=489)		Intervention (n=491)		p
	n	*%*	*n*	*%*	*n*	*%*	
Went to health facility for antenatal care[a]	582	60.3	282	58.1	300	62.5	*0.16*
Were given nutritional advice on breast-feeding							
Yes, at health facility only	255	43.9	124	44.0	131	43.8	*0.97*
Yes, by the community worker only	9	1.5	4	1.4	5	1.7	
Yes, by both	5	0.9	2	0.7	3	1.0	
Were given nutritional advice on diet[b]							
Yes, at health facility only	299	51.5	142	50.4	157	52.5	*0.93*
Yes, by the community worker only	7	1.2	4	1.4	3	1.0	
Yes, by both	4	0.7	2	0.7	2	0.7	
Were given nutritional advice on child-feeding[b]							
Yes, at health facility only	284	48.9	141	50.0	143	47.8	*0.57*
Yes, by the community worker only	7	1.2	2	0.7	5	1.7	
Yes, by both	8	1.4	5	1.8	3	1.0	
Were given nutritional advice on OFSP[b]							
Yes, at health facility only	43	7.4	9	3.2	34	11.4	*<0.001*
Yes, by the community worker only	5	0.9	1	0.4	4	1.3	
Yes, by both	0	0.0	0	0.0	0	0.0	
Were given or bought iron tables/syrup, yes[c]	344	40.1	153	35.8	191	44.3	*0.011*
Take drugs to prevent malaria, yes[d]	546	63.5	281	65.8	265	61.2	*0.16*
Were given injection to prevent tetanus, yes[e]	536	62.4	267	62.7	269	61.1	*0.86*
Take drugs to prevent intestinal worms, yes[f]	178	20.7	70	16.5	108	24.9	*0.002*

[a, b] Differing subscripts denote significantly different proportions at an alpha of 0.05 as determined by the z-test for proportions; [a] Missing data for n=11 and n=4 women in Intervention and Control groups, respectively; valid n=965; [b] Missing data for n=1 woman in the Intervention group, from those women who attendant health facility; valid n=581; [c] n=858 currently pregnant women responded; n=431 in Intervention and n=427 in the Control groups; [d] n=860 currently pregnant women responded; n=433 in Intervention and n=427 in the Control groups; [e] n=859 currently pregnant women responded; n=433 in Intervention and n=426 in the Control groups; [f] n=858 currently pregnant women responded; n=433 in Intervention and n=425 in the Control groups.

The proportion of women who went to the health care facility for antenatal care ranged from 63 % in Bunyala to 55% in Bungoma East. Across all districts, of these women, approximately than 50% reported receiving nutrition advices on breastfeeding, diet, and child feeding practices. Fewer still, less than 10%, were given nutritional advice on OFSP, although this varied from a low of 2% in Kimilili to a high of 10% in Bungoma North.

The most commonly reported preventative health practices were taking drugs to prevent malaria and receiving injections for tetanus prevention; approximately 60% of the women in all the districts reported practicing them. About 55% in Bunyala and 31% in Bungoma East of the women were given or bought iron supplements. Still, less than 25% of the women in any of the districts reported taking anthelmintic drugs.

Table 55: *Nutritional counseling and health practice for current pregnancy, by districts.*

	By districts							
	Kimilili (n=222)		Bunyala (n=64)		Bungoma North (n=624)		Bungoma East (n=70)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Went to health facility for antenatal care[a]	130	59.4	40	62.5	374	61.0	38	55.1
Were given nutritional advice on breastfeeding[b]								
Yes, at health facility only	52	40.0	20	50.0	171	45.7	12	32.4
Yes, by the community worker only	1	0.8	0	0.0	7	1.9	1	2.7
Yes, by both	1	0.8	0	0.0	4	1.1	0	0.0
Were given nutritional advice on diet[b]								
Yes, at health facility only	63	48.5	18	45.0	199	53.2	19	51.4
Yes, by the community worker only	2	1.5	0	0.0	5	1.3	0	0.0
Yes, by both	1	0.8	0	0.0	3	0.8	0	0.0
Were given nutritional advice on child-feeding[b]								
Yes, at health facility only	68	52.3	19	47.5	183	48.9	14	37.8
Yes, by the community worker only	0	0.0	0	0.0	7	1.9	0	0.0
Yes, by both	1	0.8	0	0.0	6	1.6	1	2.7
Were given nutritional advice on OFSP[b]								
Yes, at health facility only	2	1.5	2	5.0	37	9.9	2	5.4
Yes, by the community worker only	0	0.0	0	0.0	5	1.3	0	0.0
Yes, by both	0	0.0	0	0.0	0	0.0	0	0.0
Were given or bought iron tables/syrup, yes[c]	65	33.0	30	54.5	230	42.4	19	31.3
Take drugs to prevent malaria, yes[d]	130	66.0	38	69.1	344	63.0	34	54.8
Were given injection to prevent tetanus, yes[e]	123	62.8	34	61.8	341	62.5	38	61.3
Take drugs to prevent intestinal worms, yes[f]	28	14.3	12	21.8	128	23.5	10	16.1
Take drugs to prevent intestinal worms, yes[f]	28	14.3	12	21.8	128	23.5	10	16.1

[a] Missing data for n=11 in Bungoma North, n=1 in Bungoma East, and n=3 in Kimilili; valid n=965; [b] Missing data for n=1 in Bungoma East district from those women who attendant health facility; valid n=581; [c] n=858 currently pregnant women responded; n=545 in Bungoma North, n=61 in Bungoma East, n=197 in Kimilili and n=55 in Bunyala; [d] n=860 currently pregnant women responded; n=546 in Bungoma North, n=62 in Bungoma East, n=197 in Kimilili and n=55 in Bunyala; [e] n=859 currently pregnant women responded; n=546 in Bungoma North, n=62 in Bungoma East, n=196 in Kimilili, and n=55 in Bunyala; [f] n=858 currently pregnant women responded; n=545 in Bungoma North, n=62 in Bungoma East, n=196 in Kimilili, and n=55 in Bunyala

In their previous pregnancy, almost all the women (96%) from both study areas attended a health facility for antenatal care. Of those, 64% reported they were given nutritional advice on breastfeeding, 66% were given advice on diet, 68% were given nutritional advice on child-feeding practices, and only 6% overall received nutritional advice on OFSP.

Table 56: *Nutritional counseling and health practice for previous pregnancy, overall and by study areas.*

	All (n=2487)		By study areas				
			Control (n=1244)		Intervention (n=1243)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Went to health facility for antenatal care[b]	2363	95.9	1175	95.6	1188	96.3	*0.40*
Were given nutritional advice on breastfeeding[c]							
Yes, at health facility only	1478	63.8	747	64.8	731	62.9	*0.32*
Yes, by the community worker only	63	2.7	25	2.2	38	3.3	
Yes, by both	28	1.2	12	1.0	16	1.4	
Were given nutritional advice on diet[c]							
Yes, at health facility only	1537	66.3	780	67.6	757	65.1	*0.13*
Yes, by the community worker only	39	1.7	15	1.3	24	2.1	
Yes, by both	22	0.9	7	0.6	15	1.3	
Were given nutritional advice on child-feeding[c]							
Yes, at health facility only	1576	68.0	806	69.8	770	66.2	*0.19*
Yes, by the community worker only	47	2.0	19	1.6	28	2.4	
Yes, by both	26	1.1	11	1.0	15	1.3	
Were given nutritional advice on OFSP[c]							
Yes, at health facility only	138	6.0	72	6.2	66	5.7	*0.17*
Yes, by the community worker only	36	1.6	7	0.6	29	2.5	
Yes, by both	4	0.2	1	0.1	3	0.3	
Were given or bought iron tables/syrup, yes[d]	1680	70.3	830	69.6	850	71.0	*0.46*
Take drugs to prevent malaria, yes[e]	2119	88.5	1061	88.7	1058	88.3	*0.76*
Were given injection to prevent tetanus, yes[f]	2255	94.2	1128	94.3	1127	94.0	*0.73*
Take drugs to prevent intestinal worms, yes[g]	918	38.5	407	34.1	511	42.9	*<0.001*

[2] Chi-square statistic computed based on whether the mother received nutritional advice or not, to ensure cell counts >5; [a] Of the total n=2761 women in the study, n=2487 qualify to answer questions regarding previous pregnancy; [b] Missing data for n=9 in the Intervention and n=15 in the Control groups; valid n=2463; [c] Missing data for n=25 in Intervention and n=22 in the Control group from those women who attended ANC clinic; valid n=2316; [d] n=2391 previously pregnant women responded; n=850 in the Intervention and n=830 in the Control groups; [e] n=2394 previously pregnant women responded; n=1198 in the Intervention and n=1196 in the Control group; [f] n=2395 previously pregnant women responded; n=1199 in the Intervention and n=1196 in the Control group; [g] n=2385 previously pregnant women responded; n=1192 in the Intervention and n=1193 in the Control group

These proportions were not significantly different across the study groups. Although the coverage of receiving nutritional advice on breastfeeding, diet and child-feeding practices was not high, the proportion of women who reported having received nutritional advice was greater for women responding to previous pregnancies compared to women with current pregnancies at the survey. This may suggest that nutritional counselling may be given during later antenatal care visits as opposed to being given at initial ANC visits.

Similarly, a greater proportion of women with previous pregnancy reported being given or buying iron supplements (70%), taking drugs to prevent malaria (89%), being given tetanus injection (94%), and taking antihelmintic drugs (39%), compared to women who were currently pregnant at the time of the survey. The high proportion of women, who received tetanus

immunization and took drugs to prevent malaria in their previous pregnancy, is encouraging. However, antihelmintic use continued to be the preventative practice with the lowest proportion of uptake by women in their previous pregnancy, although its use was significantly greater in the Intervention group compared to the Control group (43% vs.34%, respectively).

The proportions of women who were given nutritional advice on breastfeeding, diet, and child-feeding practices at the health facility for their previous pregnancy were comparable across districts. Bunyala district had the highest proportion of women who were given nutritional advice on breastfeeding (74%) compared to the lowest proportion in Kimilili (61%). Nutritional advice on OFSP was given to only 5 to 6% of women across the districts. Approximately, 94 to 96% of women in all districts reported receiving tetanus immunization and 88to 91%reported taking anti-malarial drugs in their previous pregnancy. However, the proportion who were given or bought iron supplements varied widely across the districts from a low of 66% in Kimilili to a high of 83% in Bunyala. Use of anti-helminthic to prevent intestinal worms was reported by a low of 28% of the women in Kimilili and high of 50% of the women in Bunyala. In fact, Bunyala district had the highest proportion of women who reported iron supplementation use, tetanus immunization, anti-malarial use and anti-helminthic use compared to all other districts.

Table 57: *Nutritional counseling and health practice for previous pregnancy, by districts.*

	By districts							
	Kimilili (n=565)		Bunyala (n=205)		Bungoma North (n=1532)		Bungoma East (n=185)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Went to health facility for antenatal care[b]	532	95.5	202	99.0	1454	95.7	175	95.6
Were given nutritional advice on breastfeeding[c]								
Yes, at health facility only	317	60.6	146	73.7	904	63.6	111	63.8
Yes, by the community worker only	13	2.5	4	2.0	44	3.1	2	1.1
Yes, by both	6	1.1	1	0.5	17	1.2	4	2.3
Were given nutritional advice on diet[c]								
Yes, at health facility only	331	63.2	132	66.7	965	67.9	109	62.2
Yes, by the community worker only	6	1.1	3	1.5	28	2.0	2	1.1
Yes, by both	5	1.0	1	0.5	13	0.9	3	1.7
Were given nutritional advice on child-feeding[c]								
Yes, at health facility only	354	67.6	138	69.7	975	68.6	109	62.6
Yes, by the community worker only	7	1.3	5	2.5	32	2.3	3	1.7
Yes, by both	4	0.8	2	1.0	18	1.3	2	1.1
Were given nutritional advice on OFSP[c]								
Yes, at health facility only	33	6.3	10	5.1	85	6.0	10	5.7
Yes, by the community worker only	4	0.8	1	0.5	25	1.8	6	3.4
Yes, by both	1	0.2	0	0	2	0.1	1	0.6
Were given or bought iron tables/syrup, yes[d]	357	65.9	168	83.2	1025	69.8	130	72.6
Take drugs to prevent malaria, yes[e]	478	87.9	184	91.1	1300	88.5	157	87.7
Were given injection to prevent tetanus, yes[f]	511	93.9	193	95.5	1383	94.1	168	93.9
Take drugs to prevent intestinal worms, yes[g]	153	28.2	99	49.5	592	40.4	74	42.0

[a] Of the total n=2761 women in the study, n=2487 qualify to answer questions regarding previous pregnancy; [b] Missing data for n=13 in Bungoma North, n=2 in Bungoma East, n=8 in Kimilili and n=1 in Bunyala districts; valid n=2463; [c] Missing data for n=33 in Bungoma North, n=1 in Bungoma East, n=9 in Kimilili, and n=4 in Bunyala districts from those women who attended ANC clinic; valid n=2316; [d] n=2391 previously pregnant women responded; n=1468 in Bungoma North, n=179 in Bungoma East, n=542 in Kimilili and n=202 in Bunyala; [e] n=2394 previously pregnant women responded; n=1469 in Bungoma North, n=179 in Bungoma East, n=544 in Kimilili and n=202 in Bunyala; [f] n=2395 previously pregnant women responded; n=1470 in Bungoma North, n=179 in Bungoma East, and n=544 in Kimilili, and n=202 in Bunyala; [g] n=2385 previously pregnant women responded; n=1466 in Bungoma North, n=176 in Bungoma East, n=543 in Kimilili, and n=200 in Bunyala.

3.5.4. Health Utilization satisfaction

From the 2761 women surveyed, only a subsample of 1857 (67%) women responded to questions regarding antenatal service utilization satisfaction. Overall, 91% of the women perceived the antenatal services they received as good or excellent, while the remaining 9% found the services to be poor or fair. In particular, 75% of the women perceived the ANC services as good, 16% as excellent, 5% as fair and 4% as poor. However, a significantly greater proportion of women (12%) in the Intervention group found ANC services to be of poor or fair quality compared to 7% in the Control group.

Good health care provision (72%), provision of medicines needed (45%), very nice healthcare staff (41%), and short waiting time (27%) were among the most commonly reported reasons for why women found ANC services to be good or excellent. A significantly greater proportion of women in the Intervention group stated good reception as a reason for why ANC services were good or excellent compared to the Control group (23%vs. 15%). Whereas, a significantly greater proportion of women in the Control group reported short waiting time and good health care provision as reasons for they felt ANC services were good or excellent.

On the contrary, most commonly reported reasons why women felt that ANC services were poor or fair include; long waits (39%), unfriendly personnel (36%), and frequent shortage of medicines (27%). There reasons were not statistically different between women in Intervention versus Control groups. Being attended to by unqualified staff, clinic closure, not receiving medicines, being harassed by nurses, and not receiving pregnancy related education, were also stated as reasons why women found ANC services to be poor or fair. However, the proportion of women that reported not receiving medicines as a reason why the ANC services were poor/fair was relatively small (17%), it was significantly greater for the women in the Control group (21%) compared to the Intervention group (13%).

A great majority of the women, at least 90%, in all districts were of the opinion that ANC services were good or excellent. Good health care provisions, receiving necessary medicines, staff friendliness, and short waiting time continued to be the most prominent reasons reported for why ANC services were good or excellent. Interestingly, good reception and short waiting time were stated as reasons for good/excellent ANC services by higher proportions of women in Bungoma East and Bunyala, respectively, compared to the other districts. This may be indicative of differences in important characteristics of ANC services for women at the community-level.

Table 58: *Antenatal service utilization satisfaction, overall and by study areas*

	Overall (n=2761)		By study areas				
			Control (n=1373)		Intervention (n=1388)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Opinion of antenatal services (ANC)[a]							
Poor	74	4.0	23	2.5	51	5.5	*0.010*
Fair	90	4.8	46	4.9	44	4.7	
Good	1400	75.4	715	76.9	685	73.9	
Excellent	293	15.8	146	15.7	147	15.9	
Reason why ANC services were poor/fair[b]							
Long waits	64	38.6	28	40.6	36	37.1	*0.65*
Unfriendly personnel	60	36.1	24	34.8	36	37.1	*0.75*
Frequently no medicines available	45	27.1	23	33.3	22	22.7	*0.12*
No medicine given	26	16.6	14	20.9	12	13.3	*0.046*
No qualified staff	24	14.5	8	11.6	16	16.7	*0.36*
Harassed by nurses	14	8.9	3	4.5	11	12.2	
No education on what to do during pregnancy	10	6.4	5	7.5	5	5.6	
Closed most of the time	10	6.0	3	4.3	7	7.2	*0.44*
Other reasons most commonly stated							
Reasons why ANC services were good/excellent[c]							
Good health care provided	1213	72.0	630	73.9	583	70.0	*0.07*
Got all medicines needed	763	45.3	376	44.1	387	46.5	*0.33*
Very nice health staff	682	40.5	338	39.7	344	41.3	*0.49*
Short waiting time	446	26.5	246	28.9	200	24.0	*0.024*
Good health care	402	25.9	243	30.5	159	21.0	*<0.001*
Given medicine/iron tables/vaccines	319	20.6	146	18.3	173	22.9	
Good reception	321	19.1	131	15.4	190	22.8	*<0.001*
Services done faster	196	12.6	112	14.1)	84	11.1	
Other reasons most commonly stated							

[a] n=1857 mothers responded; n=927 in Intervention and n=930 in the Control groups; [b] n=166 women provided reasons for services being poor or fair; n=97 in the Intervention and n=69 in the Control group; [c] n=1685 women provided reasons for services being good or excellent; n=833 in the Intervention and n=852 in the Control group.

Few women (less than 10%)were dissatisfied with the antenatal services received in all districts. Unfriendly personnel, long waits, and frequent shortage of medicines were the commonly reported reasons for why ANC services were poor or fair. Bunyala district had the highest proportion of women who reported frequent medical shortage while Bungoma East, had the lowest proportion of the same (46%vs. 8%, respectively). Furthermore, long waits and unfriendly personnel were reported by a higher proportion of women in Bunyala and Bungoma East as reasons contributing towards poor ANC services compared to Kimilili and Bungoma North.

Table 59: *Antenatal service utilization satisfaction, by districts*

	By districts

	Kimilili (n=620)		Bunyala (n=221)		Bungoma North (n=1706)		Bungoma South (n=214)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Opinion of antenatal services (ANC)[a]								
Poor	6	1.4	6	3.5	57	5.1	5	3.6
Fair	29	6.8	5	2.9	48	4.3	8	5.8
Good	335	78.5	138	81.2	833	74.3	94	67.6
Excellent	57	13.3	21	12.4	183	16.3	32	23.0
Reason why ANC services were poor/fair[b]								
Long waits	14	40.0	6	54.5	37	34.6	7	53.8
Frequently no medicines available	13	37.1	5	45.5	26	24.3	1	7.7
Unfriendly personnel	11	31.4	6	54.5	35	32.7	8	61.5
No medicine given	8	23.5	1	10.0	17	16.8	0	0.0
No qualified staff	5	14.3	0	0.0	17	16.0	2	15.4
No education on what to do during pregnancy	4	11.8	1	10.0	5	5.0	0	0.0
Closed most of the time	1	2.9	1	9.1	6	5.6	2	15.4
Harassed by nurses	1	2.9	1	10.0	10	9.9	2	16.7
Other reasons most commonly stated								
Reasons why ANC services were good/excellent[c]								
Good health care provided	292	75.3	123	78.3	711	70.1	87	69.0
Got all medicines needed	181	46.6	65	41.4	462	45.6	55	43.7
Very nice health staff	160	41.2	55	35.0	412	40.6	55	43.7
Good health care	121	33.9	44	29.9	220	23.3	17	16.5
Short waiting time	90)	23.3	57	36.3	266	26.2	33	26.2
Given medicine/iron tables/vaccines	68	19.0	19	12.9	215	22.8	17	16.5
Good reception	49)	12.6	33	21.0	193	19.0	46	36.5
Services done faster	43	12.0	16	10.9	123	13.0	14	13.6
Other reasons most commonly stated								

[a] n=1857 mothers responded; n=1121 in Bungoma North, n=139 in Bungoma East, n=427 in Kimilili and n=21 in Bunyala; [b] n=166 women provided reasons for services being poor or fair; 107 in Bungoma North, n=13 in Bungoma East, n=35 in Kimilili, and n=11 in Bunyala districts; [c] n=1685 women provided reasons for services being good or excellent; n=1014 in Bungoma North, n=126 in Bungoma East, n=388 in Kimilili and n=157 in Bunyala districts

Only 622 women (23%) of the overall survey sample responded to questions assessing the quality of maternity services. Majority of the women (88%) found the quality of maternity services to be of good or excellent quality while the remaining 12% of the women perceived the maternity services as being poor or fair. In particular, 72% perceived the services as good, 17% as excellent, and 6% each as poor and as fair. A significantly greater proportion of women in the Control group compared to the Intervention group perceived the maternity services as being of good or fair quality (92% vs. 84%, respectively), while a significantly greater proportion of women in the Intervention group compared to Control group found maternity services were of poor quality (9% vs. 4%, respectively).

Table 60: *Maternity service utilization satisfaction, overall and by study areas*

	Overall (n=2761)		By study areas				
			Control (n=1373)		Intervention (n=1388)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Opinion of maternity services[a]							
Poor	38	6.1	12	3.8	26	8.6	*0.018*
Fair	34	5.5	13	4.1	21	7.0	
Good	446	71.7	243	75.9	203	67.2	
Excellent	104	16.7	52	16.3	52	17.2	
Reason why maternity services were poor/fair[b]							
Unfriendly personnel	41	62.1	18	72.0	23	56.1	*0.19*
Long waits	29	43.9	14	56.0	15	36.6	*0.12*
Frequently no medicines available	10	15.2	2	8.0	8	19.5	*0.20*
No qualified staff	8	12.1	5	16.0	4	9.8	*0.45*
No medical facilities	6	9.2	1	4.0	5	12.5	*0.51*
Bad health care	5	7.7	2	8.0	3	7.5	
No medicine available	4	6.2	3	12.0	1	2.5	
Closed most of the time	3	4.5	1	4.0	2	4.9	*0.86*
Other reasons most commonly stated							
Reasons why maternity services were good/excellent[c]							
Good health care provided	394	73.0	207	70.9	187	75.4	*0.23*
Very nice health staff	346	64.1	191	65.4	155	62.5	*0.48*
Got all medicines needed	142	26.3	74	25.3	68	27.4	*0.58*
Short waiting time	134	24.8	73	25.0	61	24.6	*0.91*
Good reception	127	23.5	66	22.6	61	24.6	*0.58*
Helped when delivering	25	5.1	12	4.5	13	5.9	*0.002*
Felt taken care of	21	4.3	4	1.5	17	7.7	
Felt encouraged	12	2.5	4	1.5	8	3.6	
Other reasons most commonly stated							

[a] n=622 responded on quality of maternity services; n=302 in Intervention and n=320 in the Control group; [b] n=66 provided reasons for maternity services being poor or fair; n=41 in Intervention and n=25 in the Controls groups; [c] n=540 provided reasons for maternity services being good/excellent; n=248 in Intervention and n=292 in the Control groups.

Overall, good health provision (73%) and nice heath staff (64%) were the most prominent reasons for why maternity services were reported as good or excellent. Good reception, short waiting time and getting the necessary medicines were also stated by approximately one quarter of the women as reasons why the maternity services were excellent or good. On the other hand, unfriendly personnel (62%) and long waits (44%) were the most common reasons for why maternity services were considered poor or fair by the women. These proportions were comparable across the study groups.

Table 61: *Maternity service utilization satisfaction, by districts*

	By districts							
	Kimilili (n=620)		Bunyala (n=221)		Bungoma North (n=1706)		Bungoma East (n=214)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Opinion of maternity services[a]								
Poor	4	3.7	4	5.0	25	6.4	5	11.6

Fair	3	2.8	4	5.0	24	6.1	3	7.0
Good	87	80.6	61	76.3	273	69.8	25	58.1
Excellent	14	13.0	11	13.8	69	17.6	10	23.3
Reason why maternity services were poor/fair[b]								
Unfriendly personnel	6	85.7	3	37.5	29	63.0	3	60.0
Long waits	4	57.1	5	62.5	19	41.3	1	20.0
Frequently no medicines available	1	14.3	1	12.5	7	15.2	1	20.0
Closed most of the time	0	0.0	1	12.5	2	4.3	0	0.0
No qualified staff	0	0.0	1	12.5	6	13.0	1	20.0
Other reasons most commonly stated								
No medical facilities	0	0.0	1	12.5	3	6.8	2	33.3
Bad health care	1	14.3	0	0.0	4	9.1	0	0.0
No medicine available	0	0.0	3	37.5	1	2.3	0	0.0
Reasons why maternity services were good/excellent[c]								
Good health care provided	69	68.3	54	75.0	241	71.9	30	93.8
Very nice health staff	64	63.4	54	75.0	208	62.1	20	62.5
Got all medicines needed	26	25.7	16	22.2	92	27.5	8	25.0
Good reception	25	24.8	14	19.4	77	23.0	11	34.4
Short waiting time	23	22.8	17	23.6	89	26.6	5	15.6
Other reasons most commonly stated								
Helped when delivering	3	3.4	1	1.5	21	6.9	0	0.0
Felt taken care of	1	1.1	1	1.5	19	6.2	0	0.0
Felt encouraged	1	1.1	1	1.5	10	3.3	0	0.0

[a] n=622 responded on quality of maternity services; n=391 in Bungoma North, n=43 in Bungoma East, n=14 in Kimilili and n=11 in Bunyala districts; [b] n=66 provided reasons for maternity services being poor/fair; n=46 in Bungoma North, n=5 in Bungoma East, n=7 in Kimilili, and n=3 in Bunyala districts; [c] n=540 provided reasons for maternity services being good/excellent; n=335 in Bungoma North, n=32 in Bungoma East, n=101 in Kimilili and n=72 in Bunyala districts.

Majority of the women in all districts, from 82% in Bungoma East to 94% in Kimilili, perceived the maternity services as being of good or excellent quality. Unfriendly personnel and long waits continued to be the most commonly reported reasons for maternity services being of poor or fair quality in all the districts, although in Bungoma East and Bunyala, lack of medical facilities and lack of medicines were also prominent reasons. In contrast, good health care provision and nice health staff were the top-most reasons as to why maternity services were thought to be of good or excellent quality in all the districts. In Bungoma East, a greater proportion of women also stated good reception as a reason for good or excellent maternity service, compared to other districts.

3.5.6. Maternity services utilization for delivery

Most of the previously pregnant women, 62%, reported giving birth at home while only 33% gave birth at a health facility. These proportions did not differ significantly between the two study groups. The most frequently reported reasons for not using the heath facility included; labour occurred at night (26%), labour pains were abrupt leaving little time to reach a clinic (28%), and lack of financial resources (8%). In addition, delivering en route to the health facility, preference for delivering at home, distance to the health facility, and being home alone were also

main reasons for not delivering at the health facility cited by at least 5% of the women. These proportions were comparable across the study groups.

For most women assistance during childbirth was primarily provided by traditional birth attendants (42%), nurses (27%), and family members (10%). No assistance, being assisted by a doctor and assistance by neighbours were also reported by at least 5 per cent of the women in overall. A significantly greater proportion of women in the Control group reported being assisted by traditional birth attendants compared to those in the Intervention group (45% vs. 38%). Overall, 37% of the women reported receiving vitamin A capsule for the first two months after delivery, which is only slightly higher than the proportion of women who delivered at a health facility.

The proportion of women who gave birth at a health facility was highest among the women in the highest wealth status (39%) compared to those in the other wealth categories where the proportions ranged between 30% and 33%. Significantly, greater proportions of women with education levels beyond secondary school level gave birth at a health facility compared to those with lower levels of education. However, more women gave birth in a health facility compared to those who were uneducated.

Table 62: *Maternity services utilization for delivery, overall and by study areas.*

	All (n=1999)		By study areas				
			Control (n=997)		Intervention (n=1002)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Child was born at[a]							
Health Facility	659	33.3	338	34.3	321	32.3	*0.22*
Home	1229	62.1	608	61.8	621	62.4	
En route to facility	78	3.9	37	3.8	41	4.1	
In the field	3	0.2	0	0	3	0.3	
Other	10	0.5	1	0.1	9	0.9	
If health facility not used, reason why not[b]							
Abrupt labour pains/no time to reach clinic	351	27.7	172	27.9	179	27.5	
It was at night	331	26.1	170	27.6	161	24.7	*0.15*
Had no money at the time	101	8.0	46	7.5	55	8.4	
Delivered en route to facility	73	5.8	30	4.9	43	6.6	
Prefers delivering at home	66	5.2	25	4.1	41	6.3	
Health facility was very far	65	5.1	29	4.7	36	5.5	
No one to help her/was alone at home	63	5.0	33	5.3	30	4.6	
Prefers traditional birth attendants	57	4.5	28	4.5	29	4.4	
Health facility was closed during the weekend	36	2.8	17	2.8	19	2.9	
Confident she would not have problems	29	2.3	15	2.4	14	2.1	
Dislikes hospitals/injections/unfriendly staff	25	2.0	12	1.9	13	2.0	
First child was born at home	21	1.7	18	2.9	3	0.5	

Lack of transport services	13	1.0	6	1.0	7	1.1	
No/unaware of maternity services at clinic	11	0.9	5	0.8	6	0.9	
Other	27	2.1	11	1.8	16	2.5	
Who provided assistance with childbirth?[c]							
Traditional birth attendant	817	41.6	375	38.3	442	44.8	
Nurse	522	26.6	256	26.1	266	27.0	
Family member	200	10.2	102	10.4	98	9.9	
No one	177	9.0	97	9.9	80	8.1	
Doctor	133	6.8	81	8.3	52	5.3	*0.017*
Neighbour/other relative	107	5.4	62	6.3	45	4.6	
Other health facility staff	4	0.2	2	0.2	2	0.2	
Other	6	0.3	4	0.4	2	0.2	
Received vitamin A capsule first two months after delivery[d]	703	36.8	347	36.3	356	37.3	*0.63*

[a] Missing data for n=20 women, n=7 in the Intervention and n=13 in the Control groups; valid n=1979; [b] n=1269 with reference child provided reasons; n=652 in Intervention and n=617 in the Control group; [c] Missing data for n=33; n=15 in the Intervention and n=18 in the Control groups; valid n=1966; [d] n=1911 women with reference child responded; n=954 in Intervention and n=957 in the Control groups.

By wealth status (p value=0.06)   *by education level of women (p value=0.01)*
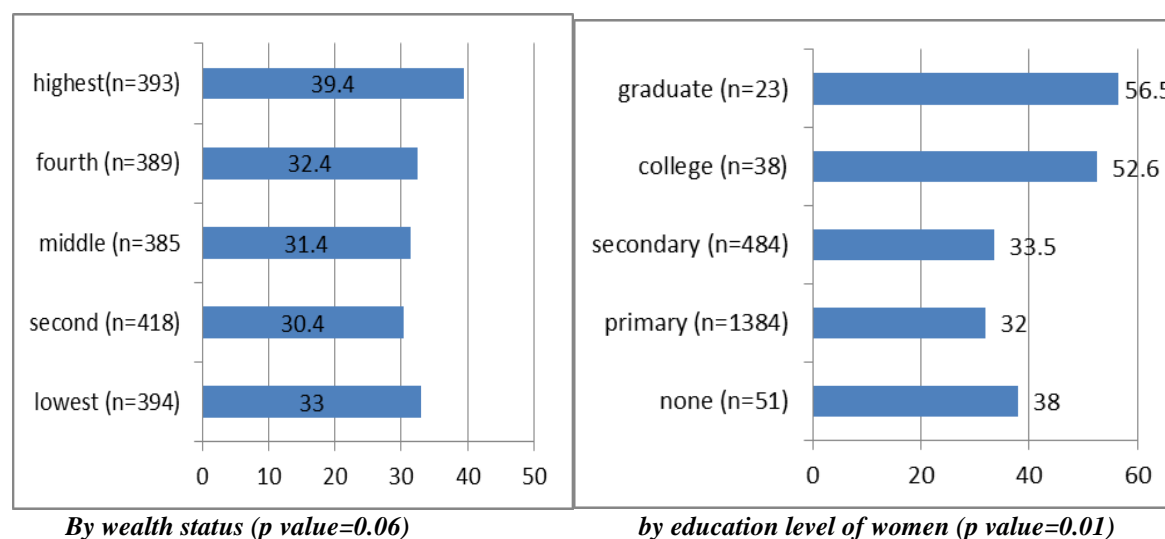
Figure 29: *Proportion of women who gave birth at a heath facility by wealth status and education level of the women.*

Except in Bunyala district, majority of the women in the other three districts gave birth at home. Kimilili had the highest proportion of women who reported giving birth at home (72%) while Bunyala had the lowest (46%). Approximately half of the women in Bunyala gave birth at a health facility. The most frequently stated reasons for not using the health facility during childbirth in all districts were because it was night and onset of abrupt labour pains leaving no time to reach the clinic. Lack of money also deterred a substantial proportion of the women from using the health facility for childbirth in all districts more so in Bungoma East.

For Kimilili, Bungoma North, and Bungoma East, majority of the women reported traditional birth attendants as the main personnel who provided assistance during childbirth. However, in Bunyala, majority of the women reported nurses and doctors as providing assistance during childbirth (36% and 15%, respectively), the highest proportion compared to other districts. Traditional birth attendants assisted only 20% of the women, while almost 17% of the women were unassisted during childbirth in Bunyala alone. Compared to other districts, the greatest proportion of women (53%) who reported receiving vitamin A capsule for the first two months after delivery resided in Bunyala as well while the lowest proportion (27%) was from Kimilili.

Table 63: *Maternity services utilization for delivery, by districts.*

	By districts							
	Kimilili (n=454)		Bunyala (n=176)		Bungoma North (n=1215)		Bungoma East (n=154)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Child was born at[a]								
Health Facility	113	25.1	85	49.1	421	35.0	40	26.3
Home	324	71.8	79	45.7	725	60.3	101	66.4
En route to facility	13	2.9	9	5.2	49	4.1	7	4.6
In the field	0	0.0	0	0.0	1	0.1	2	1.3
Other	1	0.2	0	0.0	7	0.6	2	1.3
If health facility not used, reason why not[b]								
It was at night	92	28.2	28	33.3	179	23.9	32	28.8
Abrupt labour pains/no time to reach clinic	85	26.1	19	22.6	227	30.3	20	18.0
Had no money at the time	22	6.7	7	8.3	59	7.9	13	11.7
Health facility was very far	20	6.1	2	2.4	38	5.1	5	4.5
Prefers traditional birth attendants	20	6.1	1	1.2	30	4.0	6	5.4
Health facility was closed during the weekend	15	4.6	1	1.2	16	2.1	4	3.6
Prefers delivering at home	15	4.6	0	0.0	48	6.4	3	2.7
No one to help her/was alone at home	15	4.6	0	0.0	36	4.8	3	2.7
Delivered en route to facility	12	3.7	8	9.5	48	6.4	5	4.5
First child was born at home	9	2.8	2	2.4	9	1.2	1	0.9
Dislikes hospitals/injections/unfriendly staff	7	2.1	1	1.2	12	1.6	5	4.5
Confident she would not have problems	6	1.8	3	3.6	17	2.3	3	2.7
No/unaware of maternity services at clinic	3	0.9	0	0.0	4	0.5	4	3.6
Lack of transport services	2	0.6	0	0.0	8	1.1	3	2.7
Other	6	1.8	1	1.2	17	2.3	3	2.7
Who provided assistance with childbirth?[c]								
Doctor	30	6.7	26	15.1	67	5.6	10	6.7
Nurse	77	17.1	61	35.5	351	29.4	33	22.0
Other health facility staff	2	0.4	0	0.0	2	0.2	0	0.0
Traditional birth attendant	225	50.0	35	20.3	484	40.5	73	48.7
Family member	51	11.3	9	5.2	118	9.9	22	14.7
Neighbour/other relative	24	5.3	12	7.0	67	5.6	4	2.7
No one	37	8.7	29	16.9	103	8.6	8	5.3
Other	4	0.9	0	0.0	2	0.2	0.0	0.0
Received vitamin A capsule first two months after delivery[d]	120	27.1	91	53.2	434	37.6	58	40.0

[a] Missing data for n=20 women, n=12 in Bungoma North, n=2 in Bungoma East, n=3 in Kimilili and n=3 in Bunyala districts, valid n=1979; [b] n=1269 provided reasons; n=748 in Bungoma North, n=111 In Bungoma East, n=326 in Kimilili and n=84 in Bunyala districts; [c] Missing data for n=33; n=19 in Bungoma North, and n=4 in Bungoma East, Kimilili, and Bunyala districts, each; valid n=1966; [d] n=1911 women with reference child responded; n=1153 in Bungoma North, n=145 in Bungoma East, n=442 in Kimilili and n=91 in Bunyala districts.

3.5.5. Nutrition practice and tradition

Overall, 44% of the women currently pregnant reported eating much less or somewhat less amount of food in their current pregnancy as opposed to before pregnancy. A further 27% of women reported eating the same amount of food while the remaining 26% consumed more or a

lot more quantity of food during their pregnancy compared to before pregnancy. The high proportion of women who reported inadequate food consumption in both study groups is worrying. Furthermore, there is significantly greater proportion of women in the Intervention group who consumed much less quantity of food compared to the Control group (21% vs. 16%, respectively).

A similar pattern was observed among women responding to food consumption during their previous pregnancy; most of them (49%) reported eating much less or somewhat less, 27%and 25%, to eating the same and more or a lot more, respectively. In addition, a significantly greater proportion of women in the Control group (29%) reported eating more or a lot more compared to those in the Intervention group (20%). Furthermore, 24% of the women across the study groups responded affirmatively to the practice of traditional dietary restrictions for pregnant and breastfeeding mothers. Overall, 23%, 18% and 13% of the women stated that pregnant women are prohibited from consuming eggs, milk, fish and meat, and offal respectively. Furthermore, 91 % of the women stated that cowpeas and cowpea leaves are prohibited for breastfeeding women. Still, few women, less than10%, stated that eggs, fish & meat and alcohol are prohibited for the breast-feeding women.

For currently and previously pregnancy women, the pattern of amount of food intake are similar and comparable across the districts. Majority of the women reported eating much less or somewhat less during pregnancy, one third or less of the women reported eating the same amount, and less than a quarter of the women reported eating more or a lot more amount of food during their pregnancy as compared to normal. Of the four districts, Bunyala had the highest proportion of women who reported eating less or somewhat less during their current pregnancy and previous pregnancy (52% and 57%, respectively). Similarly, it had the lowest proportion of women who reported eating the more or a lot more food during their current and previous pregnancy (19% and 11%, respectively).

Table 64: *Nutrition practice and tradition for pregnant and breastfeeding mothers, overall and by study areas*

	Overall (n=2761)		Control (n=1373)		Intervention (n=1388)		p
	n	*%*	*n*	*%*	*n*	*%*	
Compared to normal, how much food are you eating in your current pregnancy?[a]							
Much less	160	18.1	68	15.5	92	20.8	*0.06*
Somewhat less	260	29.5	142	32.3	118	26.6	
The same	234	26.5	125	28.5	109	24.6	
More	120	13.6	53	12.1	67	15.1	
A lot more	108	12.2	51	11.6	57	12.9	
Compared to normal, how much food did you eat in your previous pregnancy?[b]							
Much less	386	16.2	192	16.1	194	16.3	*0.001*
Somewhat less	772	32.4	407	34.2	365	30.6	
The same	631	26.5	338	28.4	293	24.6	
More	290	12.2	118	9.9	172	14.4	
A lot more	303	12.7	135	11.3	168	14.1	
Traditionally, pregnant and breastfeeding mothers prohibited from eating certain foods, yes[c]	669	24.3	330	24.0	339	24.5	*0.75*
Commonly prohibited foods for pregnant women[d]							
Eggs	127	23.1	61	22.8	66	23.4	*0.20*
Milk, fish, meat	100	18.2	49	18.3	51	18.0	
Offals	69	12.5	25	9.3	44	15.6	
Commonly prohibited foods for breastfeeding women[e]							
Cowpea and cowpea leaves	244	91.4	122	59.5	122	63.5	*0.36*
Eggs, fish and meat	27	6.8	17	8.3	10	5.2	
Alcohol	17	4.3	10	4.9	7	3.6	

[a] Missing data for n=48 in Intervention and n=50 in the Control group from those women who are currently pregnant, valid n=882; [b] Missing data for n=51 in Intervention and n=54 in the Control group from those women with previous pregnancy; valid n=2382; [c] Missing data for n=7 women in the Intervention group; valid n=2754; [d] n=550 women responded to the question; n=282 in the Intervention and n=268 women in the Control group; [e] n=397 women responded to the question; n-192 in Intervention and n=205 in the Control group

Approximately one quarter of the women in all the four districts agreed that traditionally, pregnant and breast feeding mothers were prohibited from eating certain foods. Eggs, milk, fish, and meat were reported as traditionally prohibited foods for pregnant women in all districts. Offals were also noted as one of the prohibited foods in all districts, except for Bunyala. Similarly, the majority of the women reported cowpeas across all districts as a traditionally restricted food during breastfeeding. A higher proportion of women in Bunyala noted eggs, fish, and meat to be traditionally restricted during breastfeeding compared to other districts.

Table 65: *Nutrition practice and tradition for pregnant and breastfeeding mothers, by districts.*

	Kimilili (n=620)	Bunyala (n=221)	Bungoma North (n=1706)	Bungoma East (n=214)

	n	%	n	%	n	%	n	%
Compared to normal, how much food are you eating in your current pregnancy?[a]								
Much less	33	16.7	7	11.3	108	19.3	12	19.4
Somewhat less	65	32.8	25	40.3	153	27.3	17	27.4
The same	48	24.2	18	29.0	155	27.7	13	21.0
More	28	14.1	6	9.7	71	12.7	15	24.2
A lot more	24	12.1	6	9.7	73	13.0	5	8.1
Compared to normal, how much food did you eat in your previous pregnancy?[b]								
Much less	76	14.0	35	17.3	250	17.1	25	14.0
Somewhat less	178	32.9	81	40.1	460	31.5	53	29.8
The same	156	28.8	63	31.2	358	24.5	54	30.3
More	58	10.7	9	4.5	194	13.3	29	16.3
A lot more	73	13.5	14	6.9	19	13.6	17	9.6
Traditionally, pregnant and breastfeeding mothers prohibited from eating certain foods, yes[c]	163	26.3	54	24.4	403	23.7	49	23.1
Commonly prohibited foods for pregnant women[d]								
Eggs	23	17.6	7	14.3	86	26.1	11	26.8
Milk, fish, meat	17	13.1	17	34.7	54	16.3	12	29.3
Offals	18	13.7	0	0	48	14.6	3	7.3
Commonly prohibited foods for breastfeeding women[e]								
Cowpea and cowpea leaves	66	65.3	16	57.1	143	60.1	19	63.3
Eggs, fish and meat	3	3.0	6	21.4	17	7.1	1	3.3
Alcohol	2	2.0	1	3.6	13	5.5	1	3.3

[a] Missing data for n=64 in Bungoma North, n=8 in Bungoma East, n=24 in Kimilili, and n=2 in Bunyala districts from those women who are currently pregnant, valid n=882; [b] Missing data for n=71 in Bungoma North, n=7 in Bungoma East, n=24 in Kimilili, and n=3 in Bunyala districts from those women who had previous pregnancies; valid n=2382; [c] Missing data for n=5 in Bungoma North and n=2 in Bungoma East; valid n=2754; [d] n=550 women responded to the question; n=329 in Bungoma North, n=41 in Bungoma East, n=131 in Kimilili and n=49 in Bunyala; [e] n=397 women responded to the question; n=238 in Bungoma North, n=30 in Bungoma East, n=101 in Kimilili and n=28 in Bunyala.

3.5.7. Breast and complementary feeding practices

Table 66: Child-feeding practices, overall and by study areas.

Overall, almost 40% of the women reported putting the baby to breast immediately or within the first hour after childbirth, 30% put the baby to the breast within the first day while the remaining 30% of the women reported putting the baby to the breast after the first day. There were no significant differences between the two study groups. On average, children were first given complementary food at 4.64 ± 2.05 months of age. This age was slightly greater for the Control group (4.84±1.9 months) compared to the Intervention group (4.44±2.2 months).Almost all the women (greater than 90%) in both study groups gave porridge to their children as the first food. Of these, 43% gave cereal porridge with nothing added, while the others added milk, and other types of foods to the porridge. A significantly greater proportion of women in the Control group (51%)provided cereal porridge with nothing else added as the first complementary food compared to that of the Intervention (36%).

Table 66: *Child-feeding practices, overall and by study areas.*

	All (n=1999)		Control (n=997)		Intervention (n=1002)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
How long after childbirth was the baby put to the breast?[a]							
Immediately	340	17.7	189	19.7	151	15.7	*0.13*
Within the first hour	422	22.0	209	21.8	213	22.1	
After first hour, within the first day	577	30.0	282	29.4	295	30.6	
After the first day	583	30.3	279	29.1	304	31.6	
Age of child when first given complementary foods, months[b]	4.64[1]	± 2.05[2]	4.84	± 1.9	4.44	± 2.2	*<0.001*
Most common first foods[c]							
Porridge	1805	91.9	914	92.8	891	90.9	*0.29*
Irish potato	34	1.7	16	1.6	18	1.8	
Avocado	21	1.1	12	1.2	9	0.9	
Bananas	18	0.9	9	0.9	9	0.9	
Other	87	4.4	34	3.5	53	5.4	
If porridge, specify type[d]							
Cereals and nothing else	721	42.8	322	35.9	399	50.8	*<0.001*
Cereals and milk	293	17.4	155	17.3	138	17.6	
Cereals and other energy and milk	168	10.0	98	10.9	70	8.9	
Cereals and proteins	92	5.5	47	5.2	45	5.7	
Commercially fortifies foods only	91	5.4	66	7.3	25	3.2	
Cereals and proteins and milk	55	3.3	30	3.3	25	3.2	
Other types	264	15.7	180	20.0	84	10.7	

[1]= mean [2]= standard deviation. [a] n=1922 valid responses; n=963 in the Intervention and n=959 in the Control group; missing data for n=77 cases; [b] n=1932 valid responses; n=968 in the Intervention and n=964 in the Control group; missing data for n=67 cases; [c] n=1965 valid responses; n=980 in the Intervention and n=985 in the Control group; missing data for n=34 cases; [d] n=1684 provided the type of porridge; n=786 in the Intervention and n=898 in the Control group

Table 67: Child-feeding practices, by districts

Child-feeding practices were similar across districts. However, Bunyala district had the highest proportion of women who reported putting the child to the breast immediately or within the first hour after birth (59%) while Kimilili had the lowest proportion of the same (34%). In addition, a greater proportion of women who put the child to the breast after the first day was highest in Kimilili (37%) and lowest in Bunyala district (11%).The average age at which the women reported first giving complementary foods to their children was comparable in Kimilili, Bungoma North, and Bungoma East (< 5months). It was however comparatively higher in Bunyala (5.45 ± 1.6 months).

Majority of the women, ranging from 84% in Bungoma East to 96% in Bunyala reported porridge as the first complementary food they gave to the children. Of these women, except for the case of Bunyala, most of them just gave porridge that composed primarily of cereals alone. In Bunyala districts, the majority of the women reported feeding varied types of porridge, 18% of

the women stated providing commercially fortified foods only, the highest proportion compared to other districts, and only 17% gave porridge made from cereals only. Generally, child-feeding practices were best in Bunyala district compared to the other districts.

Table 67: *Child-feeding practices, by districts.*

	By districts							
	Kimilili (n=454)		Bunyala (n=176)		Bungoma North (n=1215)		Bungoma East (n=154)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
How long after childbirth was the baby put to the breast?[a]								
Immediately	66	15.0	47	27.0	201	17.3	26	17.6
Within the first hour	82	18.7	56	32.2	239	20.6	45	30.4
After first hour, within the first day	127	28.9	52	29.9	352	30.3	46	31.1
After the first day	164	37.4	19	10.9	369	31.8	31	20.9
Age of child when first given complementary foods, months[b]	4.84[1]	± 1.9[2]	5.45	± 1.6	4.45	± 2.1	4.56	± 2.0
Most common first foods[c]								
Porridge	410	91.3	168	95.5	1101	92.5	126	84.0
Irish potato	7	1.6	3	1.7	21	1.8	3	2.0
Avocado	7	1.6	0	0	12	1.0	2	1.3
Bananas	6	1.3	2	1.1	7	0.6	3	2.0
Other	19	4.2	3	1.7	49	4.1	16	10.7
If porridge, specify type[d]								
Cereals and nothing else	185	46.4	28	16.7	467	44.3	41	66.1
Cereals and milk	66	16.5	10	6.0	208	19.7	9	14.5
Cereals and other energy and milk	51	12.8	1	0.6	112	10.6	4	6.5
Cereals and proteins	10	2.5	13	7.7	67	6.4	2	3.2
Commercially fortifies foods only	18	4.5	30	17.9	43	4.1	0	0
Cereals and proteins and milk	16	4.0	6	3.6	31	2.9	2	3.2
Other types	53	13.3	89	47.6	127	12.0	4	6.5

[1]is the mean [2] = standard deviation. [a] n=1922 valid responses; n=1161 in Bungoma North, n=148 in Bungoma East, n=439 in Kimilili and n=174 in Bunyala districts; missing data for n=77 cases; [b] n=1932 valid responses; n=1160 in Bungoma North, n=150 in Bungoma East, n=446 in Kimilili and n=176 in Bunyala districts; missing data for n=67 cases; [c] n=1965 valid responses; n=1190 in Bungoma North, n=150 in Bungoma East, n=449 in Kimilili and n=176 in Bunyala districts; missing data for n=34 cases; [d] n=1684 provided the type of porridge; n=1055 in Bungoma North, n=62 in Bungoma East, n=399 in Kimilili and n=168 in Bunyala districts.

3.5.8. Preventative health services utilization for children

Table 68: *Preventative health services utilization for child, overall and by study areas.*

	All (n=1999)		By study areas				
			Control (n=997)		Intervention (n=1002)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Birth weight of child, grams[a]	3490.4[1]	± 797[2]	3417.0	± 823	3561.2	± 765	*0.014*
Vaccinations given, as noted on health card[b]							
BCG	1450	73.5	743	75.6	707	71.5	*0.09*
DPT1	1445	73.3	739	75.2	706	71.4	*0.16*
DPT2	1420	72.0	729	74.2	691	69.9	*0.08*

DPT3	1365	69.2	706	71.8	659	66.6	*0.027*
OPV0	1041	52.8	518	52.7	523	52.9	*0.023*
OPV1	1422	72.1	730	74.3	692	70.0	*0.07*
OPV2	1395	70.7	720	73.2	675	68.3	*0.024*
OPV3	1319	66.9	676	68.8	643	65.0	*0.19*
Measles	898	45.5	460	46.8	438	44.3	*0.37*
Vaccinations given, as recalled by mother[b]							
BCG	506	25.7	234	23.8	272	27.5	
DPT1	502	25.5	232	23.6	270	27.3	
DPT2	502	25.5	233	23.7	269	27.2	
DPT3	489	24.8	228	23.2	261	26.4	
OPV0	418	21.2	188	19.1	230	23.3	
OPV1	496	25.2	231	23.5	265	26.8	
OPV2	491	24.9	229	23.3	262	26.5	
OPV3	468	66.9	218	22.2	250	25.3	
Measles	354	18.0	166	16.9	188	19.0	
Year of measles vaccination[c]							
2009	10	1.0	0	0	10	2.0	*0.001*
2010	674	65.8	331	63.4	343	68.3	
2011	340	33.2	191	36.6	149	29.7	
Child received vitamin A capsule within the last year, yes[d]	1317	69.5	667	70.6	650	68.5	*0.32*
Most recent vitamin A capsule[e]							
2008	5	0.4	3	0.5	2	0.4	*0.10*
2009	14	1.3	4	0.7	10	1.9	
2010	621	55.8	310	53.7	311	58.1	
2011	472	42.4	260	45.1	212	39.6	

[1] = mean, [2] =standard deviation, [a] n=737 had child recorded birth weight; n=375 in the Intervention and n=362 in the Control groups; [b] n=1972 responded;, n=989 in the Intervention and n=983 in the Control groups; [c] Missing data for n=282 children who received measles vaccine. Valid n=1024; n=502 are in Intervention and n=522 in Control group; [d] n=1894 responded; n=949 in the Intervention and n=945 in the Control groups; [e] n=1112 responded; n=535 in the Intervention and n=577 in the Control groups.

The average birth weight for the surveyed children was 3490±797 grams, and it was significantly greater among the children in the Intervention areas (3561.2± 765) grams compared to those in the Control group (3417±823) grams. Overall, vaccination uptake, as noted on the child health card, ranged from a low of 46% for measles to a high of 74% for BCG. Uptake of DPT and OPV immunizations ranged from 69% to 73% and from 53% to 72%, respectively. Significantly, greater proportions of children in the Control groups were vaccinated on BCG, DPT1, OPV1 and OPV2 compared to the Intervention. Vaccination uptake as recalled by the mother were much lower (by almost three times) compared to those noted on the health care

Majority of the children (66%) received the measles vaccines in the year 2010 while only 33% received the vaccine in 2011. A significantly greater proportion of the children in the Intervention group (68%) compared to the Control group (63%) received the vaccine in 2010. Approximately 70% of the mothers reported that their child had received vitamin A capsule within the last year of the survey; 56% in the year 2010, followed by 42% in the year 2011.

Vaccinations given, as noted on the health card, were proportionately higher in Bunyala and Bungoma East compared to Bungoma North and Kimilili. Measles vaccinations across all districts were less than 50%, except for Bunyala where 63% of the children had been vaccinated. Measles vaccinations were primarily given in the years 2010 and 2011 in all districts; uptake was particularly high in 2010(range between 62% in Kimilili and 74% in Bunyala). Bunyala district had the highest proportion of children (78%) who received vitamin A capsule within the last year of the survey compared to a low of 68% in Kimilili. Vitamin A supplementation was most commonly received in the years 2010 and 2011 in all the districts.

Table 69*: Preventative health services utilization for child, by districts.*

	By districts							
	Kimilili (n=454)		Bunyala (n=176)		Bungoma North (n=1215)		Bungoma East (n=154)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Birth weight of child, grams[a]	3652[1]	± 1013[2]	3331	± 602	3450	± 735	3644	± 894
Vaccinations given, as noted on health card[b]								
BCG	334	74.7	155	88.1	836	69.8	125	82.2
DPT1	330	73.8	155	88.1	836	69.8	124	81.6
DPT2	322	72.0	154	87.5	821	68.6	123	80.9
DPT3	303	67.8	153	86.9	794	66.3	115	75.7
OPV0	216	48.3	125	71.0	595	49.7	105	69.1
OPV1	327	73.2	155	88.1	816	68.2	124	81.6
OPV2	318	71.1	154	87.5	800	66.8	123	80.9
OPV3	292	65.3	152	86.4	761	63.6	114	75.0
Measles	184	41.2	111	63.1	529	44.2	74	48.7
Vaccinations given, as recalled by mother[b]								
BCG	110	24.6	21	11.9	350	29.2	25	16.4
DPT1	109	24.4	21	11.9	348	29.1	24	15.8
DPT2	110	24.6	21	11.9	347	29.0	24	15.8
DPT3	106	23.7	21	11.9	338	28.2	24	15.8
OPV0	85	19.0	17	9.7	292	24.4	24	15.8
OPV1	108	24.2	21	11.9	343	28.7	24	15.8
OPV2	106	23.7	21	11.9	341	28.5	23	15.1
OPV3	101	22.6	19	10.8	325	27.2	23	15.1
Measles	71	15.9	18	10.2	245	20.5	20	13.2
Year of measles vaccination[c]								
2009	0	0	0	0	10	1.6	0	0
2010	123	62.1	86	73.5	402	64.4	63	74.1
2011	75	37.9	31	26.5	212	34.0	22	25.9
Child received vitamin A capsule within the last year, yes[d]	290	68.2	135	77.6	787	68.7	105	70.5
Most recent vitamin A capsule[e]								

2008	0	0	0	0	5	0.8	0	0
2009	2	0.8	2	1.6	6	0.9	4	4.4
2010	134	54.3	68	55.7	364	55.8	55	60.4
2011	111	44.9	52	42.6	277	42.5	32	35.2

[1] =mean [2] = standard deviation.[a] n=737 had child recorded birthweight; n=444 in Bungoma North, n=78 in Bungoma East, n=124 in Kimilili and n=91 in Bunyala districts; [b] n=1972 responded; n=1197 in Bungoma North, n=152 in Bungoma East, n=447 in Kimilili and n=176 in Bunyala districts; missing data for n=27 cases; [c] Missing data for n=282 children who received measles vaccine. Valid n=1024, of which n=624 are in Bungoma North, n=85 in Bungoma East, n=198 in Kimilili and n=117 in Bunyala; [d] n=1894 valid responses; 1146 in Bungoma North, n=149 in Bungoma East, n=425 in Kimilili and n=174 in Bunyala; [e] n=1112 responded; n=652 in Bungoma North, n=91 in Bungoma East, n=247 in Kimilili and n=122 in Bunyala.

3.5.9. Morbidity

Table 70: Morbidity, overall and by study areas

Overall, about half of all the surveyed children, had been ill with fever or a cough during the last two weeks prior to the survey. In addition, 25% and 17% of them had been sick with diarrhea and other illnesses, respectively. These proportions were comparable across the study groups except that significantly more children in the Intervention (50%) compared to the Control (45%) were ill with a cough. Approximately 14% and 3% of all the surveyed children had been hospitalized for illness and suffered from measles respectively since birth. These proportions were not statistically different between the study groups. Average age at which these children had been hospitalized for illness or suffered from measles was 9.78±4.2 months and was not significantly different across the study groups.

A quarter of the households reported having had a household member who suffered from along serious illness during the last 5 years prior to the survey; this proportion was slightly though significantly greater for the Intervention compared to the Control. In addition, approximately 10 per cent of the households in both the Control and the Intervention group reported having a household member who had suffered an illness and died during the last 5years prior to the survey.

Table 70*: Morbidity, overall and by study areas*

	Overall (n=1999)		By study areas				
			Control (n=997)		Intervention (n=1002)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
During the past two weeks, has the reference child been ill with a							
Fever	980	49.7	483	48.7	497	50.6	*0.40*
Cough	931	47.2	445	44.9	486	49.5	*0.041*
Diarrhea	491	24.9	241	24.3	250	25.5	*0.55*
Other illness	340	17.2	173	17.5	167	17.0	*0.79*
Since birth, the child required hospitalization for illness[b]	270	13.6	142	14.3	128	12.9	*0.35*
Since birth, the child suffered from measles[c]	62	3.1	36	3.6	26	2.6	*0.20*
Age (months) at hospitalization or measles episode[d]	9.78[1]	± 4.2[2]	10.47	± 4.6	8.75	± 3.3	*0.11*
In the last 5 years, has a household member							

suffered from[e]						
A long, serious illness	714	26.1	336	24.5	378	27.6	*0.06*
An illness resulting in death	279	10.2	134	9.8	145	10.6	*0.48*

[1]= mean, [2] = standard deviation. [a] n=1973 responded; n=982 in Intervention and n=991 in the Control groups; [b] n=1983 responded; n=992 in Intervention and n=991 in the Control groups; [c] n=1978 responded; n=988 in Intervention and in the Control groups; [d] Mean ± SD. Missing data for n=2 in the Intervention group; valid n=60; [e] n=2738 responded; n=1369 in the Intervention and in the Control groups, each.

Table 71: Morbidity, by districts

The proportion of the children who had been ill with a cough, diarrhea or other illnesses during the last two weeks prior to the survey was comparable across the districts. However, a high of 54 % in Bunyala compared to a low of 42% in Bungoma East, of the children were reported to have been ill with fevers during the last two weeks prior to the survey. Similarly, in all the four districts, the proportion of children who had since birth been hospitalized for illness and suffered from measles was highest in Bunyala district, 15% and 5%, respectively. Furthermore, in all the four districts, the proportion of households that during the last 5 years prior to the survey had a member who suffered from a long, serious illness or one who died from an illness was highest in Bunyala.

Table 71*: Morbidity, by districts*

	By districts							
	Kimilili (n=454)		**Bunyala (n=176)**		**Bungoma North (n=1215)**		**Bungoma East (n=154)**	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
During the past two weeks, has the reference child been ill with a								
Fever	215	47.7	95	54.0	608	50.7	62	42.2
Cough	184	40.8	91	51.7	585	48.8	71	48.3
Diarrhea	113	25.1	50	28.4	293	24.4	35	23.8
Other illness	81	18.0	40	22.7	194	16.2	25	17.0
Since birth, the child required hospitalization for illness[b]	59	13.1	26	14.8	164	13.6	21	13.8
Since birth, the child suffered from measles[c]	15	3.3	8	4.6	33	2.7	6	4.0
Age (months) at hospitalization or measles episode[d]	9.60[1]	± 4.0[2]	10.0	± 4.9	10.19	± 4.3	7.40	± 2.3
In the last 5 years, has a household member suffered from[e.]								
A long, serious illness	150	24.3	71	32.1	440	26.0	53	25.5
An illness resulting in death	56	9.1	31	14.0	179	10.6	13	6.3

[1] = mean, [2] = standard deviation .[a] n=1973 responded; n=1199 in Bungoma North, n=147 in Bungoma East, n=451 in Kimilili and n=176 in Bunyala districts; [b] n=1983 responded; n=1204 in Bungoma North, n=152 in Bungoma East, n=451 in Kimilili and n=176 in Bunyala districts; [c] n=1978 responded; n=1203 in Bungoma North, n=149 in Bungoma East, n=451 in Kimilili and

n=175 in Bunyala districts; [d] Mean ± SD. Missing data for n=1 in Bungoma North and Bungoma East, each; valid n=60; [e] n=2738 responded; n=1692 in Bungoma North, n=208 in Bungoma East, n=617 in Kimilili and n=221 in Bunyala districts

3.6. Nutritional status

3.6.1. Description

3.6.1.1. Maternal weight and BMI

Table 72: Maternal weight and body-mass index, overall and by study areas.

Overall, the average body mass weight index for the non- pregnant women was 21.9±3.2 kg/m^2 and it was almost the same for both study groups. 10% of non-pregnant women were underweight (BMI <18.5 kg/m^2; this was close to the prevalence of 9.7% reported for women aged 15-49 in Western Kenya by the 1999 DHS. This proportion was higher for the women in the Control group (12%) compared to those in the Intervention group (9%). Three quarters of the women were within the normal weight range while approximately 12% and 2% of the women were overweight and obese, respectively; these proportions were almost the same in the study groups.

Average weight of the pregnant women was 58.7±8.9 kg for those in their first trimester, 60.7±9.7 kg for those in the second trimester and 62.3±8.1 kg for those in the third trimester of their pregnancy. The average weight for those in their second and third trimester was significantly greater among women in the Intervention group compared to those in the Control group.

Table 72*: Maternal weight and body-mass index, overall and by study areas.*

| | All (n=1778) | | By study areas | | | | |
| | | | Control (n=883) | | Intervention (n=895) | | *p* |
	n	*%*	*n*	*%*	*n*	*%*	
BMI of non-pregnant women[a]							
Mean (SD)	21.9	3.2	21.8	3.1	22.0	3.3	*0.11*
Category of women							
Underweight (BMI<18.5 kg/m^2)	180	10.1	101	11.5	79	8.9	*0.11*
Normal (BMI=18.5-24.9kg/m^2)	1332	75.3	651	74.0	681	76.3	
Overweight(BMI=25-29.9kg/m^2)	217	12.3	111	12.6	106	11.9	
Obese (BMI≥30kg/m^2)	42	2.4	16	1.8	26	2.9	
Weight of pregnant women (mean ± SD)							
First trimester[b]	58.7	8.9	59.2	9.7	58.1	8.0	*0.44*
Second trimester[c]	60.7	9.7	59.7	8.6	61.6	10.5	*0.07*
Third trimester[d]	62.3	8.1	61.7	7.2	63.0	8.9	*0.07*

[a]missing n=7; 1 in the Intervention and 6 in the Control. [b]valid n is 83 and 77 in Control and Intervention, respectively; [c] valid n is 173 and 202 in Control and Intervention, respectively; [d] valid n is 229 and 210 in Control and Intervention, respectively.

Table 73: Maternal weight and body-mass index, by districts.

The average BMI of the non-pregnant women was almost the same across the four districts (22kg/m^2). However, the proportion of underweight women varied widely; it was highest in Kimilili (12%) and lowest in Bunyala (6%). Similarly, 83% of the women in Bunyala, the highest in the four districts, were within the normal weight range compared to 74% in Kimilili. The proportion of overweight women ranged from 13% in Bungoma North to 10% in Bungoma East. The weight of the pregnant women in all the trimesters were comparable across the four districts,

Table 73*: Maternal weight and body-mass index, by districts*

	By districts							
	Kimilili (n=397)		Bunyala (n=157)		Bungoma North (n=1081)		Bungoma East (n=143)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
BMI of non-pregnant women[a]								
Mean (SD)	21.7[1]	3.0[2]	21.9	2.6	21.9	3.3	22.4	3.5
Category of women								
Underweight BMI<18.5 kg/m^2	49	12.4	9	5.7	110	10.2	12	8.4
Normal (BMI=18.5-24.9kg/m^2)	292	74.1	129	82.7	780	74.3	111	77.0
Overweight(BMI=25-29.9kg/m^2)	47	11.9	16	10.3	140	13.0	14	9.7
Obese (BMI≥30kg/m^2)	6	1.5	2	1.3	27	2.5	7	4.9
Weight of pregnant women (mean ± SD)								
First trimester	59.7	11.3	59.0	5.3	58.4	8.5	57.4	6.3
Second trimester	58.0	7.6	58.5	6.8	61.9	10.7	59.0	5.8
Third trimester	61.9	7.3	60.5	9.3	62.9	7.7	59.7	12.5

[1]is the mean, [2] is the standard deviation. [a] missing n=7; 3 in Kimilili and 4 in Bungoma North.

3.6.1.2. Children's nutritional status

3.6.1.5.1. Distribution of anthropometric indices

As shown in ***table 74,*** missing or flagged values for anthropometric indices represented 1.6%, 1.4%, and 1.2% for weight-for-length, length-for-weight and weight-for-age, respectively.

Table 74*: Missing and flagged values for anthropometric indices*

Indices	Missing values		Flagged values		Total	
	n	*% (out of 1999)*	*n*	*% (among children with anthropometric values)[2]*	*n*	*% (out of 1999)[3]*
Weight/Length z-score (OMS)[1]	29	1.4	3	0.1	32	1.6
Length/Age z-score (OMS)	24	1.2	4	0.2	28	1.4
Weight/Age z-score (OMS) [1]	25	1.2	0	0.0	25	1.2

[1]Weight/length and Weight/Age z-scores were not computed for the 22 children with oedema.
[2]% flagged should be below 1% (WHO, 1995)
[3] % of missing values should be below 10% as planned.

Mean (SD) of for weight-for-length, length-for-age and weight-for-age was -0.69 (1.15), -1.15 (1.35) and -1.42 (1.22), respectively (***figure 29***).

a. Weight/Length z-score
n=1935
Mean = -0.69
Standard deviation = 1.15
Skewness = 0.02
Kurtosis = 0.39

b. Length/Age z-score
n=1956
Mean = -1.15
Standard deviation = 1.35
Skewness = 0.16
Kurtosis = 1.07

c. Weight/Age z-score
n=1942
Mean = -1.42
Standard deviation = 1.22
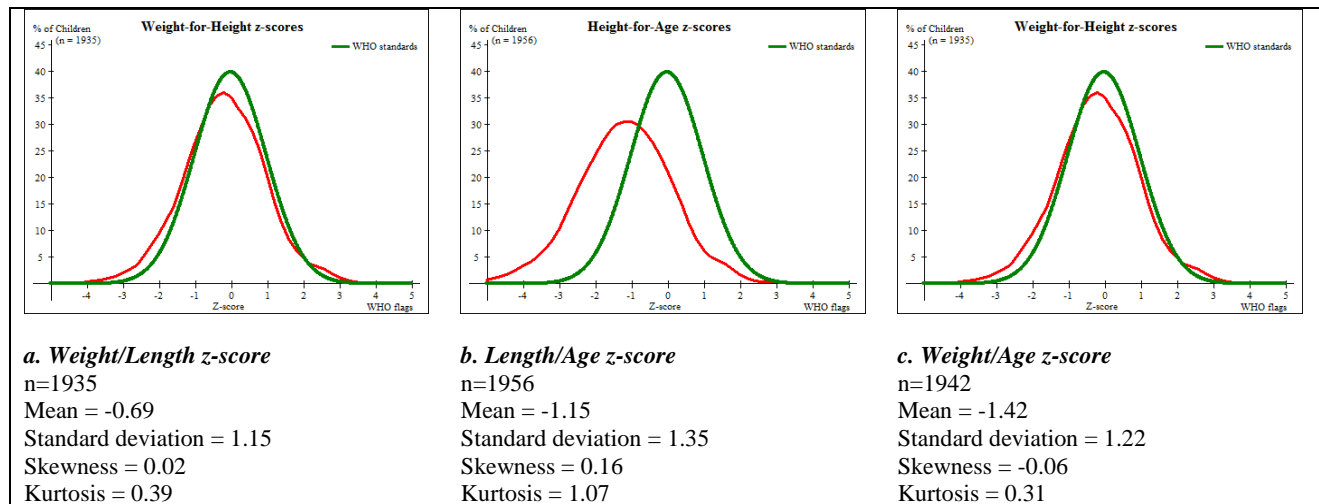Skewness = -0.06
Kurtosis = 0.31

Figure 30: *Distribution of anthropometric indices.*

3.6.1.5.2. Prevalence of malnutrition

Table 75: Children's nutritional status, overall and by study areas

Overall, stunting affected 25% of children, with 8% being severely stunted. Underweight affected 14% of children, with 4% being severely underweight. Wasting on the other hand, affected 7% of the children, with 2% being severe wasting. More children in the Control areas were stunting and underweight compared to those in the Intervention areas.

As an indication, according to the Kenyan demographic and health survey (DHS) conducted in 2008-09, the prevalence of stunting, underweight and wasting among children aged 0-59 months was 34%, 12% and 2% in Western Kenya. Though these proportions are not comparable because of age differences, we could note that stunting in Kenyan children aged 6-23 months ranges from 23% for the age sub-group of 6-8 months to 46% for the age sub-group of 18-23 months; wasting ranges from 11% for the age sub-group of 6-8 months to 5% for the age sub-group of 18-23 months.

Table 75*: Children's nutritional status, overall and by study areas*

| | All (n=1999) | | By study areas | | | | *p* |
| | | | Control (n=997) | | Intervention (n=1002) | | |
	n	*%*	*n*	*%*	*n*	*%*	
Stunting (n=1956)							
No	1465	74.9	715	72.7	750	77.2	*0.07*
Moderate	341	17.4	187	19.0	154	15.8	
Severe	150	7.7	82	8.3	68	7.0	
Underweight (n=1942)							
No	1666	85.8	824	84.1	842	87.5	*0.08*
Moderate	201	10.4	112	11.4	89	9.3	
Severe	75	3.9	44	4.5	31	3.2	
Wasting (n=1935)							
No	1833	93.1	911	92.4	922	93.8	*0.30*
Moderate	97	4.9	56	5.7	41	4.2	
Severe	39	2.0	19	1.9	20	2.0	

Table 76: Children's nutritional status, by districts

Of the four districts, Bunyala had the highest proportions of stunting, underweight, and wasting children (29%, 15%, and 6%, respectively) while Bungoma East had the lowest proportions of the same (20%, 10%, and 7%, respectively).This was mainly due to the poor nutritional status and high morbidity rates.

Table 76: *Children's nutritional status, by districts*

	By districts							
	Kimilili (n=454)		Bunyala (n=176)		Bungoma North (n=1215)		Bungoma East (n=154)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Stunting								
No	328	73.9	125	71.0	891	75.3	121	79.6
Moderate	83	18.7	36	20.5	201	17.0	21	13.8
Severe	33	7.4	15	8.5	92	7.8	10	6.6
Underweight								
No	381	86.4	150	85.2	1001	85.1	134	89.9
Moderate	38	8.6	20	11.4	131	11.1	12	8.1
Severe	22	5.0	6	3.4	44	3.7	3	2.0
Wasting								
No	411	92.4	165	93.8	1114	93.2	143	93.5
Moderate	22	4.9	10	5.7	58	4.9	7	4.6
Severe	12	2.7	1	0.6	23	1.9	3	2.0

3.6.2. Children's nutritional status by individual, maternal and household characteristics

Table 77: Children's nutritional status by individual, maternal and households' characteristics

Stunting and underweight among the children was associated with the caretaker's status regarding pregnancy and her level of education. Wasting, on the other hand, was associated with age of the caretaker, principal activity of the caretaker, household size, and education level of the household head and the wealth status of the household. The proportions of stunting and underweight among children whose mothers were pregnant (38% and 25%, respectively) was significantly higher than of children with non-pregnant mothers (24% and 13%, respectively). The prevalence of stunting and underweight among the children was also higher for children whose caretakers had primary level education or lower compared to those whose caretakers had more than primary education level.

Significantly higher proportions of wasting children were reported among children whose caretakers were aged more than 25 years compared to those aged ≤25 years (8% vs. 5%, respectively). Similarly, the prevalence of wasting among children was significantly lower among children whose caretakers' principal activity is agriculture than those whose caretakers' principal activity is otherwise. Wasting was also significantly higher among children from households with more members (4-15 members) compared to those with less than 4 members (9%vs. 5%, respectively). In addition, the prevalence of wasting was significantly lower among children whose household heads had higher education levels.

Table 77: *Children's nutritional status by individual, maternal and households' characteristics*

	Stunting			Underweight			Wasting		
	n	*%*	*p*	*n*	*%*	*p*	*n*	*%*	*p*
Child's age									
Category of caretaker			<0.001			<0.001			0.13
Pregnant	76	38.2		48	24.5		19	9.5	
Non-pregnant	415	23.6		228	13.1		117	6.6	
Status of caretaker			0.74			0.08			0.66*
Mother	470	25.1		259	13.9		130	6.9	
Other	19	26.8		15	21.1		6	8.2	
Age (years)[1]			0.35			0.33			0.009
≤25	212	26.2		107	13.3		42	5.2	
>25	275	24.4		165	14.8		94	8.3	
Currently enrolled in formal schooling			0.53			0.11			0.78
No	474	25.3		260	14.0		131	6.9	
Yes	14	21.9		13	21.0		5	7.8	
Highest level of formal education completed			0.015			0.016			0.74
Primary or lower	377	26.6		216	15.4		101	7.1	
Higher than primary	111	21.2		57	11.0		35	6.7	
Marital status			0.34			0.66			0.20
Married monogamous	396	25.8		210	13.8		108	7.0	
Married polygamous	42	25.6		25	15.2		8	4.8	
Single	37	21.8		29	17.1		11	6.5	
Other	13	18.1		9	12.9		9	12.5	
Is currently involved in growing sweetpotatoes			0.12			0.31			0.44
No	68	29.3		38	16.3		19	8.2	
Yes	420	24.6		235	13.9		117	6.8	
Agriculture is principal activity			0.80			0.34			0.05
No	379	25.6		215	14.7		115	7.7	
Yes	96	25.0		49	12.8		19	4.9	
Has sold agriculture or livestock products last year			0.56			0.40			0.20
No	123	24.2		77	15.3		42	8.2	
Yes	365	25.5		196	13.8		94	6.5	
Has undertaken salaried employment last year			0.87			0.08			0.45
No	464	25.2		265	14.5		131	7.1	
Yes	24	24.5		8	8.2		5	5.1	

	n	%	p	n	%	p	n	%	p
Has done casual labour last year			*0.09*			*0.55*			*0.72*
No	257	23.7		148	13.8		74	6.8	
Yes	231	27.0		125	14.7		62	7.2	
Has been involved in informal business last year			*0.48*			*0.99*			*0.92*
No	410	24.9		232	14.2		116	7.0	
Yes	78	26.8		41	14.2		20	6.8	
Has been involved in some other form of self employment	355	25.5	*0.53*			*0.66*			*0.33*
No	133	24.2		198	14.4		102	7.3	
Yes				75	13.6		34	6.1	
Household size (number of members)			*0.79*			*0.33*			*0.002*
0-3	239	25.4		126	13.4		48	5.1	
4-15	252	24.9		150	15.0		88	8.6	
Age of household head (years)			*0.99*			*0.09*			*0.27*
16-35	237	25.0		122	12.9		59	6.2	
36-93	246	25.0		152	15.6		74	7.5	
Sex of household head			*0.10*			*0.14*			*0.09*
Female	31	19.7		16	10.3		16	10.1	
Male	460	25.6		260	14.5		120	6.6	
Highest level of formal education completed by household head			*0.48*	180	15.2	*0.13*			*0.043*
Primary or lower	318	26.7		96	12.7		94	7.8	
Higher than primary	173	22.7					42	5.5	
Household wealth quintiles			*0.93*			*0.33*			*0.72*
Lowest	92	23.2		56	14.1		26	6.6	
second	93	22.8		59	14.3		22	5.6	
Middle	85	27.0		48	15.2		19	6.1	
fourth	108	27.5		74	18.9		32	8.2	
Highest	89	21.9		43	10.7		18	4.5	

3.6.3. Children's nutritional status by individual, maternal knowledge about health and nutrition, dietary practices and morbidity

Table 78: Children's nutritional status by maternal knowledge about health and nutrition, dietary practices and morbidity

Stunting was significantly lower among the children who had attained the minimum acceptable diet in comparison with those who had not (22% vs. 27%, respectively). Underweight was associated with morbidity of the children; the prevalence of underweight was higher among children with reported fever (16%vs.12%) and diarrhoea (17%vs. 13%) in the previous 2 weeks prior to the interview. Wasting on the other hand was weakly associated with women's knowledge about health seeking behaviour & childcare and about orange-fleshed= 0.08 and 0.09, respectively); the higher the knowledge levels, the lower the proportion of wasting of the children.

Table 78: *Children's nutritional status by maternal knowledge about health and nutrition, dietary practices and morbidity*

Women knowledge about health seeking behaviours and			0.11			0.14			0.08
child care	178	28.0		103	16.4				
Lowest	171	24.5		94	13.6		56	8.7	
Middle	142	23.1		78	12.7		44	6.3	
Highest							36	5.8	
Women knowledge about nutrition and vitamin A			0.26			0.07			0.98
Lowest	152	24.7		101	16.4			7.1	
Middle	194	27.1		101	14.2		44	6.8	
Highest	145	23.3		73	11.9		49	6.8	
							43		
Women knowledge about orange-fleshed sweetpotato			0.56			0.42			0.09
Lowest	212	24.3		125	14.5		69	7.9	
Middle	134	26.8		77	15.5		37	7.4	
Highest	133	24.5		69	12.7		27	4.9	
Children with minimum dietary diversity			0.77			0.31			0.46
No	260	25.4		137	13.5		67	6.5	
Yes	231	24.8		139	15.0		69	7.3	
Children with minimum acceptable diet			0.039			0.30			0.76
No	345	26.7		191	14.9		89	6.8	
Yes	145	22.4		85	13.2		47	7.2	
Fever in the last fortnight			0.63			0.018			
No	238	24.6		118	12.3				
Yes	247	25.6		154	16.1				
Cough in the last fortnight			0.45			0.86			0.45
No	249	24.4		142	14.1		66	6.4	
Yes	236	25.9		130	14.3		67	7.3	
Diarrhea in the last fortnight			0.09			0.044		6.4	0.22
No	350	24.1		191	13.3		94	8.1	
Yes	135	28.0		81	17.0		39		

Table 79: Validation of dried-blood-spot/DBS as a matrix using matching serum-DBS samples[$]

The validation experiment demonstrated that the correlation between RBP and CRP values of matching serum and DBS analysed on the same microwell plate was excellent. The relationship between serum and DBS RBP and CRP respectively, was used to obtain factors to correct DBS RBP and CRP values to serum RBP and CRP values respectively. Serum values were divided by their matching DBS values to obtain a set of correction factors. The median of these correction factors was then applied to all DBS for RBP and CRP, respectively. The validation data is summarized in Table 102.

Table 79: *Validation of DBS as a matrix for RBP and CRP*

	RBP	CRP
Correlation between serum and DBS	0.85	0.93
Mean serum (95% CI)	1.09 (0.95-1.24 μmol/L)	2.19 (1.37-3.01) mg/L
Mean unadjusted DBS (95% CI)	0.74 (0.63-0.85) μmol/L	0.88 (0.57-1.19) mg/L
Correction factor	1.439	2.363
Mean adjusted DBS (95% CI)	1.06 (0.90-1.22) μmol/L	2.08 (1.34-2.81) mg/L

VAD is determined by low levels of the retinol binding protein (RBP) that is RBP value of 0.825 μmol/L which is biologically equivalent to 0.7 μmol/L of retinol (Gorstein et al, 2008) while subclinical inflammation is determined by higher levels of C-reactive protein (CRP) that is if the CRP levels are greater than 0.5 *mg/L.* Mean (geometric± SD) level of RBP was adequate in this population (1.56±0.79μmol/L); there were significant differences in levels between Control and Intervention sites (1.64±0.93 μmol/L vs. 1.48±0.62μmol/L, respectively; P<0.0001).The level (geometric mean) of CRP was within normal range (1.06±4.95 *mg/L*) and did differ by study site (Control: 1.21±4.89*mg/L* vs. Intervention: 0.93±4.97*mg/L*; P=0.0006).

The prevalence of vitamin A deficiency (VAD), as indicated by low RBP of <0.823 µmol/L, among the children was 18.30% and did not differ significantly by study site The prevalence of inflammation, indicated by CRP was lower than expected; this did not differ by study site (Table 80)**.**

Table 80: *Prevalence of vitamin A deficiency and subclinical inflammation among subsample of young children, overall and by study areas*[$]

	All (n=1816)		By study areas#				
			Control (n=900)		Intervention (n=916)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Vitamin A deficient (VAD)*							
	271	18.29	133	18.37	138	18.21	0.93
CRP > 5*mg/L*							
	334	18.39	176	19.56	158	17.25	*0.20*

[$] Data reported for children with both RBP and CRP.
* RBP <0.825 µmol/L which is biologically equivalent to 0.7 µmol/L of retinol; values have been adjusted for the influence of subclinical inflammation (CRP ≤ 5*mg/L*).
# Values available for VAD were: Control (n=724) and Intervention (758).

There were no significant differences (P=0.34) between the levels (geometric mean ± SD) ofRBP in children in Bunyala district (1.56±1.18 µmol/L), Bungoma North (1.54±0.75 µmol/L), Bungoma East (1.53±0.55 µmol/L) and Kimilili (1.62±0.76 µmol/L) districts.

Between districts, the prevalence of VAD was highest for Bunyala (29%) compared to Kimilili (14%), Bungoma North (19%), and Bungoma East (11%). These are consistent with lower Vitamin A median frequency in Bunyala (see table 64 above). Bungoma East had the highest prevalence of subclinical inflammation as indicated by elevated CRP (>5 *mg/L*) among the four districts with Bungoma North having the least prevalence (Table 81)

Table 81: *Prevalence of vitamin A deficiency and subclinical inflammation among subsample of young children in western Kenya, by districts*[$]

	By districts#							
	Kimilili (n=407)		Bunyala (n=169)		Bungoma North (n=1097)		Bungoma East (n=143)	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Vitamin A deficient (VAD)*								
	46	14.2	35	29.2	178	19.3	12	10.6
CRP > 5*mg/L*								
	82	20.2	49	29.0	173	15.8	30	21.0

[$] Data reported for children with both RBP and CRP.

[*] RBP <0.825 µmol/L which is biologically equivalent to 0.7 µmol/L of retinol; values have been adjusted for the influence of subclinical inflammation (CRP ≤ 5*mg/L*)

[#] Values available for VAD were: Kimilili (n=325), Bunyala (n=120), Bungoma North (n=924) and Bungoma East (n=113).

3.3. Households' farming and crop production

3.3.1. Land cultivated

3.3.1.1. Total land cultivated

Table 82: *Total land cultivated (hectare) in upland and lowland during 2009/2010, by study areas*

Type of land	Study area	Mean	Standard deviation	Median	Minimum	Maximum
Upland	Control (n=1179)	0.56	0.50	0.40	0.01	4.05
	Intervention (n=1205)	0.66	0.93	0.40	0.00	16.19
	All (n=2384)	0.61	0.75	0.40	0.00	16.19
Lowland	Control (n=383)	0.45	0.44	0.40	0.00	4.05
	Intervention (n=322)	0.46	0.70	0.20	0.00	8.00
	All (n=705)	0.45	0.57	0.32	0.00	8.00

Areas are calculated for household that cultivated in 2009/2010 crop seasons. For uplands, there were 25 and 33 missing values in Control and Intervention areas, respectively; among those who responded, 169 in Control areas and 150 in Intervention areas have not cultivated. For lowlands, there were 78 and 92 missing values in Control and Intervention areas, respectively; among those who responded, 915 in Control areas and 974 in Intervention areas have not cultivated.

In overall, the average land cultivated in the Uplands was 0.61 ha. Among the Control group it was 0.56 hectares ranging from 0.01 ha to 4.05 ha and the median was 0.4 ha, while among the Intervention group it was 0.66 ha with a range of between 0 ha to 16.2 ha and a median of 0.4 ha. Comparatively less area of land was cultivated in the Lowlands. Overall the average was 0.45 ha. For the Control group it was 0.45 ha with a range of 0 ha to 8 ha while for the Intervention group it was 0.46 ha ranging from 0 ha to 8 ha. The median of the land cultivated in the lowlands was 0.40 ha for the Control group and 0.20 ha for the Intervention group.

Average cultivated land in the uplands ranged from 0.52 ha in Bunyala to 0.78 ha in Bungoma East. The area varied widely in Bungoma North from 0 ha to approximately 16.2 ha. The median was approximately 0.40 ha in all the districts. Cultivated land in the lowlands ranged between 0.43 ha to 0.50 ha in Bungoma East and Kimilili districts respectively. The median was 0.40 ha for Kimilili and Bunyala each and was 0.20 ha for Bungoma North and Bungoma East each.

Table 83: *Total land cultivated (hectare) in upland and lowland during 2009/2010, by districts*

Type of land	District	Mean	Standard deviation	Median	Minimum	Maximum
Upland	Kimilili(n=546)	0.55	0.46	0.40	0.02	4.05
	Bunyala(n=179)	0.52	0.49	0.40	0.01	2.83
	Bungoma North (n=1465)	0.62	0.81	0.40	0.00	16.19
	Bungoma East (n=190)	0.78	1.06	0.45	0.01	10.52
Lowland	Kimilili (n=179)	0.45	0.49	0.40	0.00	4.05
	Bunyala (n=85)	0.50	0.43	0.40	0.00	2.02
	Bungoma North (n=383)	0.44	0.65	0.20	0.00	8.00
	Bungoma East (n=55)	0.43	0.44	0.20	0.00	2.02

3.3.1.2. Total land cultivated for sweetpotato

Table 84: *Total land (hectare) planted sweetpotato during 2009/2010 in either upland or lowland, by study areas.*

	Mean	Standard deviation	Median	Minimum	Maximum
Control (n=1212)	0.08	0.15	0.04	0.00	2.02
Intervention (n=1347)	0.11	0.38	0.04	0.00	5.67
All (n=2559)	0.10	0.30	0.04	0.00	5.67

Average land area in which sweetpotatoes were planted was about 0.1 ha. It was slightly higher for the Intervention group (0.11ha) than the Control group (0.08ha). The range for the Intervention group (0.0 ha to 5.7ha) was wider compared to the Control group (0.0 ha to 2.0ha). The median was 0.04ha for both groups.

Table 85: *Total land (hectare) planted sweetpotato during 2009/2010 in either upland or lowland, by districts.*

	Mean	Standard deviation	Median	Minimum	Maximum
Kimilili (n=572)	0.09	0.17	0.04	0.00	2.02
Bunyala (n=164)	0.04	0.06	0.02	0.00	0.40
Bungoma North (n=1608)	0.10	0.31	0.04	0.00	5.67
Bungoma East (n=215)	0.17	0.46	0.10	0.00	4.04

Total land under sweetpotato ranged from 0.04 ha in Kimilili to 0.1 ha in Bungoma North. Of the four districts the greatest variance was in Bungoma North between 0 ha and 5.7 ha. The median was 0.04 ha each in Kimilili and Bungoma East, 0.02 ha in Bunyala and was 0.10 in Bungoma East.

Table 86: *Total land (hectare) planted sweetpotato during 2009/2010, by type of land.*

Type of land	Mean	Standard deviation	Median	Minimum	Maximum
Near house (n=305)	0.10	0.37	0.03	0.00	4.86
Upland (n=1889)	0.10	0.30	0.04	0.00	5.67
Lowland (n=365)	0.09	0.15	0.04	0.00	2.00

Of the households who planted sweetpotatoes 74% planted in the uplands, 14% in the lowlands and the remaining 12% planted near the house. Average land size near the house that was under sweetpotatoes was 0.10 ha with a range of between 0.0 ha and 4.9 ha and a median of 0.03 ha. Average land size planted sweetpotatoes in the uplands was 0.10 ha with a range of 0 ha and 5.7 ha and a median of 0.04 ha. Lastly, average land under sweetpotatoes in the lowlands was 0.09 ha with a range of between 0.0 ha and 2.0 ha and a median of 0.04 ha.

3.3.2. Households involvement and main crop produced

Table 87: *Households that produced different crops during 2009/2010 crop seasons, by study areas.*

	Overall		By study areas				
	(n=2623)		Control (n=1299)		Intervention (n=1324)		p
	n	%	n	%	n	%	
Maize	2560	97.6	1277	98.3	1283	96.9	
Beans	2439	93.0	1209	93.1	1230	92.9	
Sweetpotato	2400	91.5	1149	88.5	1251	94.5	
Bananas	1980	75.5	926	71.3	1054	79.6	
Cassava	1600	61.0	789	60.7	811	61.3	
Groundnuts	797	30.4	395	30.4	402	30.4	
Sorghum	732	27.9	353	27.2	379	28.6	
Rice	32	1.2	32	2.5	0	0.0	

A total of 138 households did not have any farming activity during 2009/2010 cropping year, hence not analysed.

Almost all households produced maize, beans and sweetpotatoes during the 2009/2010 crop season. In overall, approximately 98%, 93% and 92% of the households produced maize, beans and sweetpotatoes respectively. These proportions were not very different between the two study groups but the proportion among the Intervention group that produce sweetpotatoes was (95%) being slightly higher than of the Control group (86%).

Table 88: *Households that produced different crops during 2009/2010 crop seasons, by districts*

	By districts							
	Kimilili (n=591)		Bunyala (n=214)		Bungoma North (n=1612)		Bungoma East (n=206)	
	n	%	n	%	n	%	n	%
Maize	582	98.5	210	98.1	1568	97.3	200	97.1
Beans	548	92.7	203	94.9	1493	92.6	195	94.7

Sweetpotato	530	89.7	152	71.0	1519	94.2	199	96.6
Bananas	475	80.4	91	42.5	1256	77.9	158	76.7
Cassava	363	61.4	138	64.5	998	61.9	101	49.0
Groundnuts	248	42.0	52	24.3	403	25.0	94	45.6
sorghum	106	17.9	127	59.3	446	27.7	53	25.7
Rice	0	0.0	32	15.0	0	0.0	0	0.0

In all the four districts at least 92% and 97% of the households produced beans and maize respectively during the 2009/2010 crop season. Proportion of households that produced sweetpotatoes ranged from 71% in Bunyala to 97% in Bungoma East.

3.3.3. Importance of the main crop produced amongst households

The most important crops to households are maize (79 %) and beans (57%) , while current varieties of sweet potato ranked around third (39%) following maize and beans. See annex 9 for details for maize and beans.

3.3.3.1. Importance of sweetpotato to households

Table 89: *Importance of sweetpotato amongst households that produced it during 2009/2010 crop seasons, by study areas*

	Overall (n=2400)		By study areas				
			Control (n=1149)		Intervention (n=1251)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Most important	203	8.5	103	9.0	100	8.0	
2nd most important	471	19.6	230	20.0	241	19.3	
3rd most important	929	38.7	428	37.2	501	40.0	
4th most important	470	19.6	235	20.5	235	18.8	
5th most important	239	10.0	113	9.8	126	10.1	
6th most important	59	2.5	32	2.8	27	2.2	
7th most important	12	0.5	6	0.5	6	0.5	

Of the household producing sweetpotatoes, only few households ranked it as the most and as the second most important crop (about 9% and 20%, respectively). A large proportion of the households ranked it third (39%). The rankings were not very different between the two groups and across the four districts apart from the case of Bunyala district where a relatively low proportion (8%) ranked it either first or second most.

Table 90*: Importance of sweetpotato amongst households that produced it during 2009/2010 crop seasons, by district*

	By districts							
	Kimilili (n=530)		Bunyala (n=152)		Bungoma North (n=1519)		Bungoma East (n=199)	
	N	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Most important	56	10.6	4	2.6	131	8.6	12	6.0
2nd most important	117	22.1	8	5.3	296	19.5	50	25.1
3rd most important	179	33.8	38	25.0	641	42.2	71	35.7
4th most important	114	21.5	50	32.9	268	17.6	38	19.1
5th most important	48	9.1	37	24.3	135	8.9	19	9.5
6th most important	11	2.1	13	8.6	33	2.2	2	1.0
7th most important	3	0,6	2	1,3	6	0,4	1	0.5

3.3.4. Person who decide how much to grow of the sweetpotato

Table 91: *Person who decides how much to grow of the sweetpotato, by study areas*

	Overall (n=2552)		By study areas				
			Control (n=1211)		Intervention (n=1341)		*p*
	N	*%*	*n*	*%*	*n*	*%*	
Husband	488	19.1	210	17.3	278	20.7	
Wife	1711	67.0	823	68.0	888	66.2	
Both husband and wife	133	5.2	59	4.9	74	5.5	
Other	220	8.6	119	9.8	101	7.5	

For majority of the households, about 67%, the decision on how much of the sweet potato to grow was made by the wife. Husbands only made this decision in 20% of the households and in 5% of the households jointly with the wives. The trend was almost the same for the two study groups.

3.3.5. Methods of planting sweetpotato

Table 92*: Distribution of households that plant sweetpotatoes using different methods, by study areas*

	Overall (n=2568)		By study areas				
			Control (n=1218)		Intervention (n=1350)		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Grow in ridges	302	11.8	107	8.8	195	14.4	
Grow in mounds	2269	88.4	1108	91.0	1161	86.0	
Grow in flats	119	4.6	49	4.0	70	5.2	

Some households had planted sweetpotatoes using more than one method.

Growing sweetpotatoes in mounds was the most common planting method in majority of the households that produce sweetpotatoes (approximately 88%). This proportion was slightly higher among the Control group (91%) compared to the Intervention group (86%). Very few households reported growing sweetpotatoes in flats (approximately 5%) and were about the same for both

study groups. However, slightly more of the non-participating households (14%) grew sweetpotatoes in ridges compared to the participating households (9%).

3.3.6. Type of sweetpotato planted

Table 93: *Distribution of households according to types of sweetpotatoes planted, by study areas.*

	Overall (n=2560)		By study areas				p
			Control (n=1211)		Intervention (n=1349)		
	n	%	n	%	n	%	
White-fleshed sweetpotato	837	32.7	425	35.1	412	30.5	
Yellow-fleshed sweetpotato	1659	64.8	773	63.8	887	65.7	
Orange-fleshed sweetpotato	63	2.5	13	1.1	49	3.7	

The Yellow fleshed sweetpotato was the mostly grown type and it was grown by about 65% of the respondents. Orange -fleshed Sweet Potato was only grown by about 3% of the respondents and most of them were in the Intervention group (49 households) compared to 13 participating households. The remaining 33% of the households grew the white fleshed sweetpotato variety and this proportion was relatively higher among the Control group (35%) compared to the Intervention group (31%).

Highest proportion of orange-fleshed sweetpotato producers in all the four districts was in Bungoma East (14%) while the lowest was in Bungoma North where only 5% of the households produced it. The yellow fleshed sweetpotato was produced by almost all the households in the entire four districts with a range of 83% in Bunyala to 95% in Bungoma North. The white fleshed sweetpotato variety was also grown by most households ranging from 73% in Bungoma North to 95% in Bunyala.

Table 94: *Distribution of households according to types of sweetpotatoes planted, by districts.*

	By districts							
	Kimilili (n=573)		Bunyala (n=164)		Bungoma North (n=1608)		Bungoma East (n=215)	
	n	%	n	%	n	%	n	%
White-fleshed sweetpotato	454	79.2	156	95.1	1 178	73.3	163	75.8
Yellow-fleshed sweetpotato	541	94.4	136	82.9	1 533	95.3	190	88.4
Orange-fleshed sweetpotato	23	4.0	9	5.5	79	4.9	31	14.4

3.3.7. Source of sweetpotato planting vines

Table 95: *Distribution of households according to their source of sweetpotato planting vines, by study areas.*

	Overall		By study areas				p
	(n=2551)		**Control (n=1211)**		**Intervention (n=1340)**		
	n	*%*	*n*	*%*	*n*	*%*	
Free from female neighbour/ relative	1328	52.1	638	52.7	690	51.5	
Own farm	1047	41.0	481	39.7	566	42.2	
Bought from female neighbour/ relative	92	3.6	49	4.0	43	3.2	
Free from male neighbour/ relative	61	2.4	25	2.1	36	2.7	
Bought from male neighbour/ relative	11	0.4	9	0.7	2	0.1	
Bought from trained multiplier	7	0.3	5	0.4	2	0.1	
Free from government or NGO	3	0.1	2	0.2	1	0.1	
Bought from government or NGO	1	0.0	1	0.1	0	0.0	
Other	1	0.0	1	0.1	0	0.0	

Approximately 52% and 41% of the households reported sourcing the planting sweetpotatoes vines from a female neighbor/relative for free and from own farm, respectively. These proportions were not substantially different between the Intervention and the Control groups and also across the four districts except in Bunyala district where a relatively higher proportion (78%) of the households reported sourcing the vines from female neighbor/relatives for free. About 4% of the respondents bought from any of the three sources and less than 1% bought from a trained multiplier

Table 96: *Distribution of households according to their source of sweetpotato planting vines, by districts*

	By districts							
	Kimilili (n=572)		**Bunyala (n=164)**		**Bungoma North (n=1604)**		**Bungoma East (n=211)**	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Free from female neighbor/ relative	303	53.0	128	78.0	790	49.3	107	50.7
Own farm	235	41.1	20	12.2	714	44.5	78	37.0
Bought from female neighbour/ relative	14	2.4	6	3.7	59	3.7	13	6.2
Free from male neighbour/ relative	11	1.9	5	3.0	33	2.1	12	5.7
Bought from male neighbour/ relative	6	1.0	1	0.6	3	0.2	1	0.5
Free from government or NGO	2	0.3	0	0.0	1	0.1	0	0.0
Bought from trained multiplier	1	0.2	2	1.2	4	0.2	0	0.0
Bought from government or NGO	0	0.0	1	0.6	0	0.0	0	0.0
Other	0	0.0	1	0.6	0	0.0	0	0.0

3.3.8. Quantities of sweetpotato produced

Table 97: *Distribution of households according to monthly sweetpotato production (in kg per hectare) in 2010, by study area*

		Overall	By study areas		
		(n=2925)	Control (n=1443)	Intervention (n=1482)	p
During major months of harvest	Mean	609.6	511.3	705.3	
	Standard deviation	1162.8	1008.6	1288.7	
	Median	-	156.8	261.3	
	Minimum	0.0	0.0	0.0	
	Maximum	17640.0	14700.0	17640.0	
During minor months of harvest	Mean	318.9	277.5	359.1	
	Standard deviation	830.8	648.0	975.0	
	Median	-	58.8	54.4	
	Minimum	0.0	0.0	0.0	
	Maximum	13065.6	11760.0	13065.6	
Total sweetpotato harvested	Mean	928.5	788.9	1064.5	
	Standard deviation	1588.3	1293.9	1820.1	
	Median	-	392.0	494.3	
	Minimum	0.0	0.0	0.0	
	Maximum	19992.0	14745.0	19992.0	

Timing of sweet potato harvests are set out in Annex 8, in which the months of major and minor harvest can be observed. During the major months of harvest, the average output of sweetpotatoes was approximately 610 kg per hectare with a range of 0 to 17,640 kg while the average during the minor months was about 319 kg ranging from 0 to about 13,070 kg. Average quantities of sweet potatoes harvested during the year were approximately 930 kg. The highest sweetpotatoes yields were reported in Bungoma East district with an average output of 1285 kg for the whole 2009/2010 crop season.

Table 98: *Distribution of households according to quantities of sweetpotato produced (in kg per hectare) in 2010, by districts.*

| | | By districts | | | |
		Kimilili (n=668)	Bunyala (n=230)	Bungoma North (n=1796)	Bungoma East (231)
During major months of harvest	Mean	601.0	181.9	633.8	872.2
	Standard deviation	1178.5	388.3	1199.2	1237.8
	Median	217.7	0.0	217.7	435.5
	Minimum	0.0	0.0	0.0	0.0
	Maximum	14700.0	2743.9	17640.0	9799.2
During minor months of harvest	Mean	295.9	193.1	331.5	412.2
	Standard deviation	661.4	343.7	902.6	1001.8
	Median	58.8	32.7	51.5	60.0
	Minimum	0.0	0.0	0.0	0.0
	Maximum	9799.2	2352.0	13065.6	8820.0
Total sweetpotato harvested	Mean	896.9	375.0	965.4	1284.5
	Standard deviation	1472.8	525.5	1677.3	1760.6
	Median	445.4	196.0	470.4	705.6
	Minimum	0.0	0.0	0.0	0.0
	Maximum	14745.0	2874.6	19992.0	11760.0

3.3.9. Sweetpotato selling

Table 99: *Distribution of households according to quantities of sweetpotato production sold in 2010, by study area.*

| | Overall | | By study areas | | | | P |
| | (n=2568) | | Control (n=1218) | | Intervention (n=1350) | | |
	n	%	n	%	n	%	
Did not sell at all	1010	39.3	534	43.8	476	35.3	
Sold less than 10%	26	1.0	15	1.2	11	0.8	
Sold between 10-24%	157	6.1	78	6.4	79	5.9	
Sold between 25-49%	353	13.7	149	12.2	204	15.1	
Sold half	254	9.9	119	9.8	135	10.0	
Sold between 50-74%	463	18.0	197	16.2	266	19.7	
Sold greater than 75%	296	11.5	120	9.9	176	13.0	
Sold all	9	0.4	6	0.5	3	0.2	

About 60% of all the households reported to have sold at least 10% of their sweetpotatoes production while the remaining 40% just produced for subsistence use. The proportion of respondents who produced only for subsistence use was relatively higher among the Control

group (44%) compared to that of the Intervention group (35%). Approximately 40% of all households sold at least half of their sweetpotato produce and this proportion was higher for the Intervention group (43%) than for the Control group (36%).

Table 100: *Distribution of households according to how money earned from sweetpotato sales was spent.*

	Overall (n=1552)		By study areas				P
			Control (n=679)		Intervention (n=873)		
	n	*%*	*n*	*%*	*n*	*%*	
Household expenditure	1362	87.8	620	91.3	742	85.0	
Farm inputs	647	41.7	292	43.0	355	40.7	
School fees	353	22.7	142	20.9	211	24.2	
Land preparation	344	22.2	153	22.5	191	21.9	
Hospital bill	141	9.1	56	8.2	85	9.7	
Bought chicken	121	7.8	59	8.7	62	7.1	
Bought sheep	87	5.6	36	5.3	51	5.8	
Bought clothes	46	3.0	16	2.4	30	3.4	
Bought a cow	40	2.6	12	1.8	28	3.2	
Furniture purchase	39	2.5	19	2.8	20	2.3	
Leisure	27	1.7	9	1.3	18	2.1	
Started a business/ boost business	25	1.6	11	1.6	14	1.6	
Loan payments	23	1.5	13	1.9	10	1.1	
Lease or rent land	21	1.4	4	0.6	17	1.9	
Rent payment	2	0.1	1	0.1	1	0.1	

Households used the proceeds earned from sale of sweetpotatoes on more than one use. Majority of them, about 88%, used the money on household expenditures. And about 42% used it on farm inputs, 23% used it on school fees and 22% for land preparation.

4.   SUMMARY AND CONCLUSIONS

4.1.   Caveats and Limitations

Users of this information should take in to account the following caveats and limitations;

1.) Data was analysed as reported by the various respondents. Missing values were not replaced before data analysis. However, each table has a footnote which shows the missing number of respondents in cases where some data were missing.

2.) Most data presented in this report are retrospective and based on self-report and ability to recall by the various respondents.

3.) Data collected on consumption of various food groups may be biased for just a particular season when the survey was carried out; some seasonal foods were available and not others.

4.2.   Summary of findings

Household characteristics

Education of survey respondents; Average years of formal education were 8 years for the women. Only 3% were uneducated and 4% were enrolled in formal schooling. Among the household heads, average years of formal education among were 9 years; 40% of them had more than primary school level of education while 2% had no formal education. Education levels of the women and of the household head were positively associated with the household wealth status.

Household status: Almost 9 in every 10 households were male headed. Average household size was approximately 5 people. Average age among the pregnant women was 26 years and for the caretakers it was 29 Years.

*Involvement in Agriculture***:** Agriculture is the main activity for most of the women (75% and 80% of the pregnant women and caretakers, respectively). 83% and 88% of the pregnant women and caretakers respectively grew sweetpotatoes. About 64% and 74% of the pregnant women and caretakers respectively had been involved in commercial agriculture during the 1 year period preceding the survey; these proportions were significantly higher in the Intervention region compared to the Control

Housing characteristics: Ninety per cent of the main houses were mud-walled and un-cemented. Almost all the households used firewood or charcoal for cooking and tin-lamp or lantern for lighting. Except for Bunyala where 46% of the households used borehole during the rainy season, main sources of drinking water for most households were roof catchment, protected

spring and well. During the wet seasons, most households' main source of drinking water was either protected spring, well or stream. However, in Bunyala 62% of the households used borehole water.

Asset ownership: Most of the households owned a radio or a cassette player (88%) and a telephone or a mobile phone (71%). The wealth index did not differ significantly across the four districts under survey.

Radio use: The most popular radio stations varied across the districts. In Kimilili and Bungoma North districts, Mulembe was most popular (37% of the households in each district listen to it). In Bungoma East, most households (37%) listened to West FM. However, in Bunyala District most popular radio stations are Bulala FM and Citizen Radio (proportion of households that listen to these stations was 36%, each). Only households in Bunyala District reported to be listening to Bulala FM and Ramogi FM.

Women knowledge

*On nutrition and Vitamin A:*Sixty three per cent of the women were aware that eating the correct amount of food was good for child growth. Approximately 78% of the women recognized fruits and vegetables as the main sources of Vitamin A foods and only 1% recognized OFSP as a protective food. Almost all women (90%) had heard of vitamin A prior to the survey. Of which, 39%, were able to list at least one source of vitamin A rich food, 32% of the women listed two 11% of the women were able to list three and the remaining18% were unable to give any correct source of Vitamin A rich foods . Health care units and schools were the primary sources of information regarding vitamin A rich foods for larger proportions of the women (65% and 56%, respectively). Women knowledge on nutrition and vitamin A was comparable across the study groups.

On health seeking behaviour and child care practices: About 83% and 76% of the women noted that eating good quality food frequently and attending ANC clinics, respectively, were among the most important steps to ensure healthy pregnancy. 79% of the women were aware that attending ANC should commence within the first four months of pregnancy. The average ideal number of ANC visits reported was 5 times. Women knowledge on child care practices immediately after birth was limited; only less than 1% of the women were aware that taking a Vitamin A capsule is important after birth and 26% aware that breast feeding a baby immediately after birth is important. On average the women noted 26months as the ideal age to stop breastfeeding a child, 2 months, 5 months and 9months as the ideal age to introduce water, complementary foods and sweetpotatoes, respectively in a child's diet. For most of them, 70%, health centres were their primary source of information. Women in the Control areas were significantly more knowledgeable on health seeking behaviour and child care compared to those in the Intervention areas.

On Sweet potato: Generally, women's knowledge concerning the value of deep orange-fleshed sweetpotato variety was relatively low; 88% had no idea about the value of OFSP and only 9% knew about the Vitamin A content of the variety. Women knowledge about sweetpotatoes was comparable across the study areas.

Households' farming and crop production

Farming practices: Most households (88%) cultivated fields in the uplands compared to the lowlands (28%). Average cultivate land in the uplands was higher (0.61 hectares) compared to the Lowlands (0.45 hectares). About half of the villages in the Intervention and Control areas were covered by an agricultural Control during the 12 months preceding the survey; most of which were based on extension on how to grow crops (96%), seed provision (78%) and assistance with fertilizer (53%). Only 4% of all the villages (all of them were in the Control area) reported been covered by an Control that promoted sweetpotatoes.

Sweetpotato production: Average land under sweetpotatoes per household was 0.1 hectares. Almost all the households, 92%, planted sweetpotatoes during the 2009/2010 crop season; across the districts, this proportion ranged from 71% in Bunyala to 97% in Bungoma East. Majority of these households ranked it as the third most important crop to maize and beans. Most commonly grown sweetpotato type was the yellow fleshed (65%), followed by the white fleshed (33%). Only 3% grew the OFSP. Majority of the households, sourced SP planting vines from a female neighbour or relative for free (52%) and from own farm (41%). Less than 1% bought from a trained vine multiplier. Most of them, 88%, planted sweetpotatoes in mounds. In most of the households, 67% of the decision on how much of the sweetpotato to grow was made by the women. Sixty percent of the households reported to have sold at least 10% of their sweetpotato production while the remaining 40% produced for subsistence use only.

Health and Nutrition

Consumption of various food groups: The mostly consumed food groups among the pregnant women, caretakers and children aged 6-23 months included; cereals and tubers, vegetables and milk. Pulses were the least consumed food group. Consumption of sweetpotatoes was also relatively low (average of 1.7 different day per week); OFSP was the least consumed type (average of 0.1 different days in a week).

Consumption of Vitamin A foods: Vitamin A deficiency in the area is a cause of worry. The mean HKI frequency score among the pregnant women (2.9 days in a week), caretakers (2.9 days in a week) and children aged between 6 and 23 months (3.3 days in a week) were considerably below the HKI threshold that requires the frequency to be more than 6 days in a week. Similarly, the frequency of consuming Vitamin A rich animal source foods was also below the threshold requirement of more than 4 days per week; it was 1.6 days per week, each among the caretakers and the children aged 6 and 23 months and1.5 days per week among the pregnant women. In

addition, the prevalence of VAD among the children as indicated by level of RBP <0.825μmol/L was moderately high (approximately 18%). Prevalence of VAD as indicated by both the HKI Vitamin A food frequency score and RBP was especially highest in Bunyala. The results also show that half of the villages in the Intervention and Control areas were covered by a vitamin A supplementation campaign during the 12months preceding the survey.

Nutritional status: Dietary diversity score (DDS) range was from 0 to10 for the adults and from 0 to 7 for the children aged between 6 and 23 months. Just over half of the women had a DDS of either 5 or 6. Nutrition levels of the children were generally low, only 47% and 33% of the children had attained the minimum DDS and acceptable diet (as defined by WHO), respectively. Nutritional levels of women and children were particularly low in Bunyala District.

Antenatal service utilization: Of the surveyed pregnant women, 60% sought ANC for their current pregnancy. However, almost all the women who were previously pregnancy sought ANC service during those pregnancies. Sixty four percent of these women attended ANC at least 4 times and an additional 27% attended 3 times. Most of the women, that is 66% and 61% in their current and previous pregnancy respectively, first sought ANC while in their second trimester of their pregnancy. This is contrary to their knowledge on when a woman should first attend ANC. Lack of money, not experiencing problems with pregnancy, lack of knowledge and not wanting to expose pregnancy early were among the top reported reasons for not seeking ANC earlier. Only<1% cited being afraid of HIV testing as a reason for not attending ANC early. Three quarters of the women were satisfied with the ANC services.

Nutritional counselling and health practice: About two thirds of the women who went to the health centre for ANC were given nutritional advice on breast feeding, diet and child feeding. However, only 6% were given advice on OFSP. About 70% of the villages, in both study areas had nutrition or health education meetings outside health facilities during the12 months preceding the survey.

Maternity service utilization and child care practices: Of all the surveyed women, only 33% gave birth in a health facility, majority of them, 62%, gave birth at home. The proportion that gave birth in a health facility is lower than the one reported by the 2008-09 KDHS of 43%. Commonly reported reasons for not delivering at a health facility include; abrupt labour pain or no time to reach clinic (28%) and being at night (26%). From the study we find that majority of the births, 42%,were assisted by the traditional birth attendants, which was higher than the national average of 28% reported by the 2008-09 KDHS.

Childcare and preventative measures: Thirty percent of the women reported that they breastfed the baby 1 day after birth. In addition, a low of 18% reported that they breastfed the baby immediately after birth. On average, children were first given complementary food at 4.6 months of age. Ninety percent of the women gave porridge to the children as the first food. Of these, 43% gave cereal porridge with nothing added, while the others added milk, and other types of

foods to the porridge. Overall, vaccination uptake on major childhood illness, as noted on the child health card, ranged from a low of 46% for measles to a high of 74% for BCG

Morbidity of the children: among the children aged 6-23 months, about half of them had been ill with fever or cough, 25% had suffered from diarrhoea and 17% from other illnesses in the two weeks preceding the survey. Morbidity rates of the children were comparatively high in Bunyala District.

Nutritional status of the women: Mean BMI among the non-pregnant women was 22kg/m^2, Three quarters of the women were within the normal BMI range, 10% were underweight and the remaining 15% were overweight. Proportion of underweight women was lowest in Bunyala (6%) and highest in Kimilili (12%). Among the pregnant women the average weight of the women was 58.7kg, 60.7 kg and 62.3 kg in the first, second and third trimester, respectively.

Nutritional status among the children; Overall, stunting affected 25% of children, with 8% being severely stunted. Underweight affected 14% of children, with 4% being severely underweight. Wasting on the other hand, affected 7% of the children, with 2% being severe wasting. Prevalence of stunting, underweight and wasting in children was highest in Bunyala compared to the other districts. Overall, the prevalence of VAD among the children, as indicated by level of the retinol binding protein (RBP) of less than 0.825µmol/L, and we found it to be approximately 18%.

4.3. Implications of baseline findings for key stakeholders

4.3.1. Project

- There are low levels of knowledge on OFSP in both the Control and Intervention areas, and, communication campaigns in the community could sensitize households on the nutritional value and benefits of OFSP.

- To date, very few farmers have sourced vines from trained vine multipliers, and the underlying reasons for this they were not widely available. Hopefully with more available with the project they will become the preferred source of OFSP planting material.

4.3.2. Ministry of Health (MoH)

- Given the high prevalence of VAD in the study, community there is need for multiple approaches to improve children's micronutrient status. This includes better methods of vitamin A supplementation among the women and children aged between 6-23 months, food based strategies and educating and sensitizing women on consuming Vitamin A rich

foods, and strengthening information and education at the health centres, as women cited these as their primary source of information about Vitamin.

- Low rates of health facility births suggest the need to identify strategies and actions to increase the demand for these services among women, as well as to increase the number of maternity wards in the study area, since one of the top reasons for not delivering is related to distance of the facility.

- The report reveals a low knowledge level on childcare practices. This is an indication that they are a need for improved information, communication and education on infant and young child feeding and care practices. In addition, there is a wide disparity between what is known and what is actually practiced which may suggest the need for supportive follow-up at the community and facility level.

4.3.3. Ministry of Agriculture (MoA)

- A possible food based solution to address Vitamin A deficiency in the community could be policies and programs that promote the production of vitamin A riche foods and additional high quality crops, such as OFSP.

- To complement agriculture strategies, other actions may include food fortification of currently processed foods to increase the content of micronutrients, such as Vitamin A, iron and other micronutrients.

- In spite of the fact that almost every household in the area produced sweetpotatoes, agriculture extension Controls focusing on sweetpotatoes are limited and hence the low knowledge levels on sweetpotatoes production and nutritional content. There is need to work closely with the ministry extension services to improve their knowledge of sweetpotato and that they include sweetpotato as an important crop to provide training and information on in their normal duties.

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6.   LIST OF APPENDICES

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5 – Variables included in wealth index analysis
6 – Knowledge scoring system
7 – Distribution of household knowledge scores
8- Timing of sweetpotato harvest

Annex1 – listing F

MAMA SASHA: VILLAGE LISTING	DISTRICT:	DIVISION:	DATE: __/__/2011	Page:
LOCATION:	SUB-LOCATION:	VILLAGE:		
ENUMERATOR:	NAME OF GUIDE & PHONE NO.:		SUPERV:	

We define a household as all those eating together and a member of your household as being someone who has been here at least 3 months

			Grows sweet-potato?	Grows OFSP?	We now want to find out about who is residing in your hh full-time.								Number of women expecting	NAME OF WOMAN THAT MAY BE	Type**:	Consent		House quality	Call-back **** needed?
LIST NO.	NAME OF HOUSEHOLD (HH) HEAD / FIRST NAME + LAST NAME (FAMILIAR NAME) / USE CAPITAL LETTERS & WRITE CLEARLY / IF NO ONE IS HOME, TRY & GET NAME & WRITE (NOT HOME)	SEX			No. of infants less than 5 months	No. of Children 6 to 23 months	No. of Children 2 to 12 years	No. of Men 13 yrs & above	No. of Women 13 yrs & above	Confirm TOTAL HH Size	Birthdate of child 6-23 months old (see below*) Day / Month / Year			QUALIFIED TO PARTICIPATE IN THE STUDY / FIRST + LAST NAME	0-N/A / 1-PG / 2-MC / 3-POT	Form Signed / 0-No / 1-Yes	if refused Reason why refused ***	1-Poor / 2-Fair / 3-Good	0-No / 1-Yes
		1- M / 2- F	0- No / 1-Yes	0- No / 1-Yes															

(rows for data entry — blank)

*Birthdate must be within accepted range: For listing done in April: must fall between May (06) 2009 & October (9) 2010;

Type: 1) PG (Pregnant Woman) 2) MC (Mother and Child pair invited to join study) 3) POT (Potential mother & child pair or pregnant woman not yet selected) **Remember: Select ALL expectant mothers & every other MC pair

***Reasons for refusal: 1) Don't want blood and/or other measurements taken 2) No time 3) Am ill 4) See no benefit 5) Religion forbids me 6) Just not interested 7) Cannot agree without permission 8) Other, specify

****Call-back (return visit) is needed if no one was at home or selected woman was not present. Get cell phone number if possible & write on the back. **DATE OF DATA ENTRY:** __/__/2011 **DIGITIZER:**

Page 2 – GPS data form for selected households

MAMA SASHA: SELECTED HHS	DISTRICT:		DIVISION:					DATE: / / 2011 Page:
LOCATION:		SUB-LOCATION:		VILLAGE:				
PERSON TAKING GPS READING:								

										TAKE GPS READING ONLY IF SELECTED:			
ENUM. NO.	LIST NO.	NAME OF HOUSEHOLD (HH) HEAD FIRST NAME + LAST NAME (FAMILIAR NAME) USE CAPITAL LETTERS & WRITE CLEARLY IF NO ONE IS HOME, TRY & GET NAME & WRITE (NOT HOME)		NAME OF WOMAN WHO AGREED TO PARTICIPATE IN THE STUDY FIRST + LAST NAME		Date for Interview Day Mon	Time of Interview	Assigned Identification Number	LATITUDE (Location of main dwelling) Degrees Minutes		LONGITUDE (Location of main dwelling) Degrees Minutes		Elevation or Altitude (meters)
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Annex 2 -Questionnaire

MAMA SASHA

BASELINE SURVEY DATA COLLECTION FORMS

English Version

MAMA SASHA WESTERN KENYA BASELINE SURVEY MARCH-APRIL 2011

A. HOUSEHOLD IDENTIFICATION AND STATEMENT OF AGREEMENT

A01	DISTRICT	
A02	DIVISION	
A03	LOCATION	
A04	SUBLOCATION	
A05	VILLAGE	
A06	HOUSEHOLD (HH) NUMBER (hhid)	
A07	STATUS OF HEAD OF THE HH	*1- MAN*
		2- WOMAN WITH THE SUPPORT OF A NON-RESIDENT MAN
		3- WOMAN WITHOUT THE SUPPORT OF A MAN
A08	CELL PHONE NUMBER	**0 7**
A08B	Phone No. Owner 1- Respodent 2- HH member 3- Neighbor	
A09	ENUMERATOR'S NAME	
A10	NAME OF SELECTED WOMAN:	IDNO:
A11	TEMPORARY IDENTIFICATION NUMBER (FROM LISTING FORMS)	* *
A12	CATEGORY OF WOMAN: 1- PREGNANT WOMAN 2- MOTHER-CHILD PAIR 3- BOTH	
A13	*IF PREGANT WOMAN:* Please tell us how many months you are pregnant 99-N/A	
A14	**SELECTED FOR BLOOD SAMPLING:** *(Every child in the mother child pair and every* 0-No 1-Yes	
	1st and 2nd Mother of the 3 mother child pair will be selected for blood sampling)	
A15	*WERE THE GPS COORDINATES OBTAINED DURING THE VILLAGE CENSUS?* 0-No 1-Yes	
	IF NOT PLEASE ENSURE THAT IT IS COLLECTED BEFORE LEAVING THE VILLAGE.	
A16	GPS COORDINATES SOUTH	:
A17	EAST	:
A18	ELEVATION METERS	

		DAY	MONTH	YEAR
A19	DATE OF THE 1ST INTERVIEW		/	/
A20	TIME OF THE INTERVIEW START:	:		
A21	END:	:		
A22	NAME OF THE SUPERVISOR			
A23	CALL-BACK (FILLED IN BY SUPERVISOR) 0- NO 1- YES			
	DESCRIBE THE PROBLEMS ENCOUNTERED:			

		DAY	MONTH	YEAR
A24	DATE FOR THE SECOND INTERVIEW		/	/
	LAST APPROVAL			

		DAY	MONTH	YEAR
A25	DATE FOR THE FIRST DATA ENTRY		/	/
A26	NAME OF 1ST DIGITIZER			

		DAY	MONTH	YEAR
A27	DATE FOR THE SECOND DATA ENTRY		/	/
A28	NAME OF 2ND DIGITIZER			

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B. HOUSEHOLD MEMBERS WITH AN AGE EQUAL TO OR ABOVE 60 MONTHS

VILL: | | | | | HHID: | | | | Pg

We would like to ask you questions about each member of your household. We will start with those members over five years.

List the names of everyone considered to be a member of this household who have lived here at least 3 months during 2010.

rshead	01- head	05- Step child	11- parent in law
	02- Spouse	06- Parent	12- Son/Daughter in law
	03- son/daughter	07- brother/sister	13- Worker
	04- grandchild	09- nephew/niece	14- Other relative
		10- Brother/sister in-law	15- No relation

IDEN-TIFICA-TION NO.	NAME			Sex 1-M 0-F	Relationship with the head of the HH (see codes)	Year born	How many months in the last 12 months has this person been living at home 0- No 1- Yes	is ... currently enrolled in formal schooling (codes below)	Highest level of formal education completed	Marital Status 1- Single 2-Married Monogamous 3- Marital Union 4- Polygamous 5- Divorced or Separated 6- Widowed	Is currently involved in growing sweet-potatoes? 0- No 1- Yes	Is agriculture his/her principle or secondary activity 99- Not applicable 1- Principal 2- Secondary	Since the Beginning of 2010, has this person:
													Sold agricultural or livestock products? 0- No 1- Yes	Undertaken salaried employment? 0- No 1- Yes	Done casual labour? 0- No 1- Yes	Been involved in informal business? 0- No 1- Yes	Been involved in some other form of self-employment (e.g. fishing, wood cutting, masonry)? 0- No 1- Yes

IDNO	First		Middle		Last		Sex	rshead	yrborn	mhome	school	educ	mstatus	growsp	agract	soldagr	salary	cslabor	infmbus	selfemploy

Education levels (educ)

0=pre school				8= old form 1	9= old form 2	10= old form 3	11= old form 4	
1= std 1	3= std 3	5= std 5	7= std 7	9= new form 1	11= new form 3	12= old form 5	15= college 1	17= college 3
2= std 2	4= sts 4	6= std 6	8= std 8	10= new form 2	12= new form 4	13= old form 6	16= college 2	19= graduate

C. DEMOGRAPHIC OF MEMBERS OF HOUSEHOLD WHO ARE LESS TO 60 MONTHS OF AGE (5 YEARS)

VILL: | | | HHID: | | Pg 3

Now, we are going to ask you about the children in your household that are under five years of age. Please get the health card for children you have in this age group.

(Use 99=N/A)

Child Ident. Number	First and Middle Name		Surname	Sex 1-M 0-F	Date of Birth			AGE (in months)	Has a health card ? 0- No 1- Yes	If Yes: How many registered visits	Child's mother Name	ID No. from (Sec.B) 87-non-resident 88-Dead	If caregiver not mother IDNO of main female caregiver	Child's father: Name	ID No. from (Sec.B) 87-non-resident 88-Dead	If father not resident IDNO of male caregiver
					88- Does not know											
					DAY	MONTH	YEAR									
chdid	First	Middle	Surname	chsex	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12
3 1																

D. HOUSEHOLD LEVEL DIETARY DIVERSITY AND YOUNG CHILD DIET DIVERSITY

Now we will ask you questions about the type of foods you ate in your household yesterday.   *If there is a* **child 6-23 months of age** *in the household, record his/her name here. If there is more than one, choose the oldest.*

Name: _____   ID Number: | | | |

Yesterday, did your household consume at least a tablespoon (15 gm minimum) per person of any of the following kinds of food?

First ask the question for the whole household for a category of food.   Then if there is a reference child, ask: **Did (name of reference child) consume this type of food?**

		Household 0-No 1-Yes	Reference Child 0-No 1-Yes			Household 0-No 1-Yes	Reference Child 0-No 1-Yes
D01	Any starchy staple, like maize, cassava, cooking banana, sweetpotato			D07	Any other kind of fish, meat or poultry, like beef, chicken, or pork		
D02	A type of sweetpotato that is orange inside (enumerator, show the OFSP picture)			D08	Any dark green leafy vegetables		
D03	Any legumes or nuts, like beans, groundnuts, seeds, soybean			D09	Any vegetables that are orange inside, like pumpkin or carrot		
D04	Any dairy products like milk, youghurt or cheese			D10	Any fruits that are orange inside, like mango or papaya		
D05	Any organ meat like liver or heart			D11	Any other kind of fruits or vegetables		
D06	Any eggs			D12	Any source of fat, like cooking oil, coconut milk, or butter		

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E. WOMEN´S KNOWLEDGE ABOUT NUTRITION & VITAMIN A

VILL: ☐☐☐   HHID: ☐☐☐   **Pg 4**

Now we are going to ask you some questions regarding your opinions about the kinds of foods you eat. **(Write down the full response.)**

E01	What makes a child grow?	Does the answer mention:			
		E01A	Eating sufficient amounts of foods?	0- No 1- Yes 8- Don´t know	☐
		E01B	Eating lots of different kinds of foods?	0- No 1- Yes 8- Don´t know	☐
		E01C	Child does not get sick often?	0- No 1- Yes 8- Don´t know	☐

E02	Have you ever heard of Vitamin A? 0- No 1- Yes ☐	E03	if yes, When did you first hear of vitamin A?	if remembers year record year; 8888 if does not remember	Year: ☐☐☐☐

If E02=0, skip to E08

1- Over 10 years ago   2- Over 5 years ago, but less then 10   3- 2-5 years ago   4- last year   5- just recently   8- can't remember   99-NA

E04	Why is Vitamin A important for us?	Does the answer mention that it:	E04A Prevents disease? ☐	E04B Protects the eyes? ☐	E04C Any other correct fact? ☐
					0- No 1- Yes 8- Don't know

E05	Please give me 3 examples of foods rich in Vitamin A. ☐ ☐ ☐		
	Refer to the code list	Determine the number of foods that are correct:	☐

E06	Where did you learn the names of Vitamin A rich foods?	If the response below is mentioned, fill in the box with "1"; if not mentioned fill in "0".

01-Radio, programme in local language	☐	04-Community Health Worker/Health extensionist	☐	07-Female Friend	☐	10-Male Relative	☐	13- School	☐
02-Radio, programme in English		05-Health Unit		08- Male Friend		11-Sign in the market/elsewhere		14-Other	
03- Radio programme in Kiswahili		06-Local Leader		09-Female Relative		12-Religious Leader		Specify _____	

E07	if more than one choice was selected in E06, Among these which was the most important source of information? (use codes provided in E06)	☐

E08	Can you tell me the three key food groups? 0-No 1-Yes ☐	Does the answer mention: 0- No 1-Yes	**E08A** Energy-giving foods? ☐	**E08B** Body-building foods? ☐	**E08C Protective** foods? ☐

E09	What are the main sources of energy?	Does the answer mention:	E09A	Cereals (maize, millet, sorghum, ..), sweetpotatoes, cassava? ☐	E09D	Beans, groundnuts? ☐	0- No 1-Yes 8- Don't know
			E09B	Orange-fleshed sweetpotato (OFSP)?	E09E	Eggs, milk, meat and fish?	
			E09C	Fat (margarines, vegetable oils, butter, etc)?	E09F	Fruits and vegetables?	

E10	What are the main body building foods?	Does the answer mention:	E10A	Cereals (maize, millet, sorghum, ..), sweetpotatoes, cassava? ☐	E10D	Beans, groundnuts? ☐	
			E10B	Orange-fleshed sweetpotato (OFSP)?	E10E	Eggs, milk, meat and fish?	
			E10C	Fat (margarines, vegetable oils, butter, etc)?	E10F	Fruits and vegetables?	

E11	What are the main protective foods?	Does the answer mention:	E11A	Cereals (maize, millet, sorghum, ..), sweetpotatoes, cassava? ☐	E11D	Beans, groundnuts? ☐	
			E11B	Orange-fleshed sweetpotato (OFSP)?	E11E	Eggs, milk, meat and fish?	
			E11C	Fat (margarines, vegetable oils, butter, etc)?	E11F	Fruits and vegetables?	

E12 Please tell me the five most important things a pregnant woman should do to ensure that she stays healthy during her pregnancy and that here baby is born healthy:

1. _____　2. _____　3. _____

4. _____　5. _____

Does the answer mention: **E12A** Eating well (good quality foods eating frequently)　**E12B** Avoid drinking alcohol　**E12C** Do not smoke　**E12D** Attend Ante-natal clinic visits

0-No 1-Yes 8-Don't know　**E12E** Take iron tablets or iron syrup　**E12F** Protect from malaria with nets and/or drugs　**E12G** Check HIV status　**E12H** Other

E13 When should a pregnant woman start going to the ante-natal clinic?

Does the answer mention: 0- No　1- Yes　**E13A** As soon as she thinks she is pregnant　**E13B** 1st antenatal visit should be no later than 4 months

E14 How many times should a pregnant woman attend the ante-natal clinic before her child is born?

E15 Please tell me at least 3 different activities or services that happen when a woman attends an ante-natal clinic:

Does the answer mention: **E15A** A health check-up (blood pressure & tests)　**E15B** Weighing to see if weight gain is adequate　**E15C** Advice on how to eat well　**E14D** Get medicines & vaccinations

E16 What should a mother do immediately after her baby is born?

Does the answer mention: **E16A** Hold the baby and ensure baby's skin touches mother's skin　**E16B** Breastfeed the baby　**E16C** Mother should take a Vitamin A capsule

E17 When a baby is born, is it good or bad to give the first milk (the colostrum)?　0- Bad 1- Good 8- Don't know

E18 If the mother is healthy, what do nurses recommend about breastfeeding for the infant?

(Looking for exclusive breastfeeding: only breastmilk-no food; no water for 6 months)　Correct? 0- No 1- Partially 2- Completely

E19A At what age should a baby be given water for the first time?　**E19B** *indicate the units using codes: 1-days 2- weeks 3-months 4- years*

E20A At what age should a baby be given other foods such as porridge for the first time?　**E20B** *indicate the units using codes: 1-days 2- weeks 3-months 4- years*

E21A At what age should a baby be given sweetpotato for the first time?　**E21B** *indicate the units using codes: 1-days 2- weeks 3-months 4- years*

E22A If the mother and the child have no special problems, a mother should breast feed her child until what age?　**E22B** *indicate the units using codes: 1-days 2- weeks 3-months 4- years*

E23A How many times should a **breastfed child 6-8 months old** be fed porridge or other foods per day?　88- don't know

E24 How many times should a **1 year old breast fed child** be fed other foods?

E25 Where did you learn about child feeding? (From which persons or other sources do you get advice or information concerning how best to feed your chilld?)　***Do NOT read the list!* Code "1" if mentioned and "0" if not mentioned**

a-Health Center　b-Extension Agent　c-Mosque/Church　d-Husband　e-Mother　f-Mother-in-law　g-Other male relative　h-Other female relative

i-Other Male　j- Other Female　k-Radio　l-School　m-Traditional Healer　n-Trained health volunteer/promoter　o-Do not know　p- N/A

F. ATTITUDES

VILL: ☐☐☐☐   HHID: ☐☐☐☐   Pg 6

We would like to tell you a few brief stories about other women and men living in Western Kenya and are going to ask you if you agree or disagree with the actions they have taken in these stories or the opinions they have.

(You can strongly agree or disagree with the stories we are telling or if you are less certain agree, disagree, or even say that you have no opinion one way or the other about the action being taken.)

Codes: 1- Strongly agree   2- Agree   3- Neither agree nor disagree   4- Disagree   5- Strongly Disagree

F01	Dinah gives her 8 month old child maize porridge with a little sugar 3 times per day. The child also breast feeds. The child rarely cries so Dinah knows she has enough to eat and will grow well.	☐
F02	Sam is upset with his wife because instead of giving him ugali every day, some days she makes rice, other days sweetpotato, and once a week cassava. These foods do not provide the same energy as ugali. Sam feels it is best to follow tradition and eat ugali every day. Do you agree with Sam?	☐
F03	When Willis turned 4 months old, his mother Susan decided that mashed pumpkin would be a good food for him to start eating at that age because it is soft when mashed and a bit sweet.	☐
F04	Emily feeds everyone in her household sweetpotato for breakfast because it is more nutritious than bread.	☐
F05	Martha has a two month old baby. It is very hot and dry this February and the baby is acting thirsty. Martha feels her breast milk is not enough given the heat, so is also giving small cups of water to her baby throughout the day.	☐
F06	Mary's 2 year old child seems to be bumping into chairs and tables in the house, especially during the night. The nurse at the clinic advises Mary to give the child an egg. However, Mary's mother in-law disagrees with the nurse saying that by tradition eggs should not be given to young children. Mary decides that she must follow the nurses advice and starts giving eggs to her child.	☐
F07	Dorothy has just found out that she is pregnant. She is going to try and avoid gaining too much weight during her pregnancy because she knows that if the baby is large she will have a difficult delivery.	☐
F08	It is mango season and Susan's 1 year old child just loves eating the ripe mango. However, when Susan saw that the color of the child's faeces was turning a different color and the child was having more frequent bowel movements, she decided to stop giving mango to her child.	☐
F09	Poko is in her 9th month of pregnancy. She has had several children before. Every day she goes to the family farm to labor and stay until evening. However, this time, her husband says she should stop cultivating the last month of her pregnancy and just do housework. He will hire some extra labor to help in the field. Poko says the money could be spent on other things. Do you agree with the husband that it is important to cut down on the amount of hard work you do during the last month of pregnancy?	☐
F10	Raogo has a running diarrhea every day. His mother Lidia is very concerned. Her mother-in-law advises her to cut down on the amount of breast milk she is giving to the child to help stop the diarrhea.	☐
F11	Lusike has heard of people growing a new kind of sweetpotato that is orange on the inside. She will not grow it however, because she is not sure where the orange color comes from.	☐
F12	Nancy is 4 months pregnant. Her friend Poko is encouraging her to go to the ante-natal clinic. But Nancy says she is busy and usually goes in in her 6th month which is soon enough to get all the important treatments needed before the baby comes. Do you agree with Nancy?	☐

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G. HEALTH AND NUTRITION PRACTICE

VILL: ☐☐☐☐ HHID: ☐☐☐ **Pg 7**

Now we would like to learn more about you and what you do when it comes to using your local health services.

G00 *Note the category of the interviewee for this page:* 1- Pregnant woman with no previous pregnancy 2- Pregnant woman with an older child 3- Mother & child pair for this survey. 4- Pregnant & Mother child pair ☐

(Instructions for woman that is currently pregnant): **We would like to ask you about your current use of health services for this pregnancy *as well as for your pregnancy just before this one.*** *Fill in Current + Previous*

(Instructions for a women that is enrolled as a Mother-child pair.) We would like to ask you about the use of health services for the time when you were carrying the child _____ *Fill in Previous*

		Current:	*Previous:*
G01 Did you go to any health facility for antenatal care? .... 0- No 1- Yes 8- Don't remember		☐	☐

If no, skip to G12

G02A *If went to health facility:* What is the name of the health facility? Current: _____ Prev: _____ ☐☐ ☐☐

				Current		Previous	
G02B	Is this health facility run by the government or run privately?	1- Government 2- Private (e.g. church) 3- Do not know		☐ Unit		☐ Unit	
G02C	How many minutes does it take you to get to this health facility from your house?	Unit 1- Walking 2-by Bicycle 3- by Car		☐☐ ☐		☐☐ ☐	
G02D	Does this health facility have a maternity ward for giving birth?	0- No 1- Yes 8- Don't remember		☐		☐	
G02E	*If does have maternity unit:* Do you plan to give birth here or did you give birth here for your last pregnancy?	0- No 1- Yes 8- Don't remember		☐		☐	
G02F	*if does NOT have maternity unit:* What is the name of the maternity ward that you might use or have used?	7- Did not give birth at health facility					

Current: _____ Prev: _____ ☐☐ ☐☐

G03 How many months pregnant were you when you received antenatal care from the health facility for the first time? 87- have not yet gone (PG woman) 88- can't remember 99- never used ☐☐ ☐☐

G04 *If the response to G03 was greater than 5 months, ask:* Why did you not go earlier in your pregnancy? _____ ☐ ☐

G05 *For current pregnancy:* How many times have you received ante-natal care so far? *For previous pregnancy:* Home many times did you receive ante-natal care in total? .... ☐ ☐

G06 I am going to go through a short list and ask if any of the following activities were done at least once during all of your ante-natal care visits: 0- No 1- Yes 8- Don't remember 9- N/A

For the current pregnancy:	**G06A1** Weight was taken	**G06B1** Height was taken	**G06C1** A tight cloth on your arm for blood pressure	**G06D1** Blood sample	**G06E1** Urine sample
For the previous pregnancy:	**G06A2** Weight was taken	**G06B2** Height was taken	**G06C2** A tight cloth on your arm for blood pressure	**G06D2** Blood sample	**G06E2** Urine sample

	Current:	*Previous:*
G07 For some or all of these tests above, how often did the health worker discuss the results of these tests with you? 0- Never 1- Rarely 2-Occasionally 3- Regularly 4- Always 8-Do not remember	☐	☐

Were you ever given any information or counseled at the health facility or by a community health worker associated with the facility about:

G08	Breastfeeding?	0- Never 1- Yes, facility only 2- Yes, community worker only 3- Yes, both 8- Do not remember	☐	☐
G09	How you should eat during your pregnancy at the health facility ?	0- Never 1- Yes, facility only 2- Yes, community worker only 3- Yes, both 8- Do not remember	☐	☐
G10	How you should feed your young child?	0- Never 1- Yes, facility only 2- Yes, community worker only 3- Yes, both 8- Do not remember	☐	☐
G11	Why you should grow or eat the sweetpotato that is orange inside?	0- Never 1- Yes, facility only 2- Yes, community worker only 3- Yes, both 8- Do not remember	☐	☐
G12	Were you ever given or did you buy any iron tablets or syrup?	0- No 1- Yes 8- Don't remember	☐	☐
G13	Did you ever take any drugs to prevent you from getting malaria during your pregnancy?	0- No 1- Yes 8- Don't remember	☐	☐
G14	Were you ever given any injection in the arm to prevent the baby from getting convulsions after birth (tetanus)?	0- No 1- Yes 8- Don't remember	☐	☐
G15	Did you take any drug for intestinal worms during your pregnancy?	0- No 1- Yes 8- Don't remember	☐	☐
G16	Did you eat (*Are you eating*) less, more, or the same amount of food during your pregnancy as you would normally eat?	1- much less 2- somewhat less 3- the same 4- more 5- lots more	☐	☐

G. HEALTH AND NUTRITION PRACTICE, cont.

VILL: ☐☐☐   HHID: ☐☐☐   **Pg 8**

G17 Are their any traditions that prohibit certain foods being eaten either by pregnant women or women who are breastfeeding?   0- No 1- Yes 8- Don't remember ☐

G18 *if yes,* List the foods that pregnant women are not supposed to eat. **G18A** _____ ☐☐ **G18B** _____ ☐☐ **G18C** _____ ☐☐

G19 *if Yes,* List the foods breastfeeding women are not suppost to eat. **G19A** _____ ☐☐ **G19B** _____ ☐☐ **G19C** _____ ☐☐

Questions G20 to G33A are in relation to the child we talked about earlier (Mother-Child pair). *Copy the name of the child and idno from Section D.* **For Pregnant Women, skip to G34A! Don't forget it!**

Name of reference child: _____   ID Number: ☐☐

G20 Where did you give birth to this child?   1- Health facility   2- Home   3- En route to facility   4- In the field 5- Other, specify _____ ☐

G21 *if the health facilities were not used,* Why did you not use the health facilities? _____ ☐

G22 Who assisted with the delivery of your child?   1- Doctor 2- Nurse 3- Other health facility staff person 4- Traditional birth attendant 5- Family member 6- Neighbor/other relative 7- No One 8- Other _____ ☐

G23 During the first two months after you delivered, did you receive a vitamin A capsule?   0- No 1- Yes 8- Don't remember _____ ☐

G24A In your opinion, were the quality of the **ante-natal service**s you received poor, fair, good or excellent? 1- poor 2- fair 3-good 4- excellent 9- N/A ☐   **G24B** What was the quality of the **maternity services?** ☐

G25A If ante-natal services were **poor or fair** : Please explain why the ante-natal services are **poor or fair.** ☐
Does the answer mention: (0-No 1-Yes) **G25A** Unfriendly personnel ☐ **G25** Closed most of the time ☐ **G25C** Frequently no medicine available ☐ **G25D** Long waits ☐ **G25E** No qualified staff ☐

G25 B If ante-natal services were **good or excellent** , what did you like about them?
Does the answer mention: (0-No 1-Yes) **G25F** Good reception ☐ **G25G** Short waiting time ☐ **G25H** Very nice health staff ☐ **G25I** Good health care provided ☐ **G25J** Got all medicines needed ☐

G26A If maternity services were **poor or fair** : Please explain why maternity services are **poor or fair**.
Does the answer mention: (0-No 1-Yes) **G26A** Unfriendly personnel ☐ **G26B** Closed at night/weekends ☐ **G26C** Frequently no medicine available ☐ **G26D** Long waits ☐ **G26E** No qualified staff ☐

G26 B If maternity services were **good or excellent,** what did you like about them?
Does the answer mention: (0-No 1-Yes) **G26F** Good reception ☐ **G26G** Short waiting time ☐ **G26H** Very nice health staff ☐ **G26I** Good health care provided ☐ **G26J** Got all medicines needed ☐

G27 Please record the birthweight if it is on the card.   9.99- child not weighed ☐☐.☐ kgs or ☐☐☐☐ gms *If no birthweight: first weight & when taken:*

G28 Indicate with a "1" if the child received the vaccines, 0 if did not receive, and a "2" if the mother says the child received but there is no card. *Use 88 if doesn't remeber dates:*
BCG ☐ DPT1 ☐ DPT2 ☐ DPT3 ☐ OPV0 ☐ OPV1 ☐ OPV2 ☐ OPV3 ☐ Measles ☐ Date of Measles vaccination: day ☐☐ mon ☐☐ yr ☐☐

G29A Has the child received a vitamin A capsule within the last year?   0- No 1- Yes 8- Don't remember ☐   **G29B** Date of most recent capsule: day ☐☐ mon ☐☐ yr ☐☐

G30 How long after birth did you put (*name*) to the breast?   1- immediately 2- within the first hour   3- after the first hour, but within the first day   4- after the first day   8- Don't remember ☐

G31A How old was this child when you gave him/her the first porridge or other solid food? ☐☐   **G31B** What was this first food? _____
Unit: 1-month, 2-week ☐   **G31C** If porridge specify type _____

G32A During the past two weeks, has (*name*) ever been ill with?   0- No 1- Yes Fever? ☐ **G32B** a cough? ☐ **G32C** diarrhea? ☐ **G32D** other illness? ☐

G33A Since he/she was born, has he/she ever surfered from a serious illness that required hospitalization?   0- No 1- Yes ☐ **G33B** And from measle 0- No 1- Yes ☐ **G33C** *if yes,* at what age (months) ☐☐

G34A During the past 5 years, has anybody in your household suffered from a serious illness that lasted very long?   0- No 1- Yes ☐ **G34B** from an illness (sudden or prolongued) that resulted in dealth? 0- No 1- Yes ☐

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H. FREQUENCY OF CONSUMPTION OF VITAMIN A RICH FOODS DURING PAST 7 DAYS

VILL: [ ][ ][ ] HHID: [ ][ ][ ] Pg 9

Now we have a few more questions regarding your child (*name*) and how often he/she has eaten certain foods during the past week.

We are also interested in learning if you ate those foods as well.

H01	Is the *reference child* still breastfeeding?	0- No 1- Yes	[ ]
H02	*If not:* At what age did the child stop breast feeding?	88- don't know Months	[ ]
	[88- don't know]		
H03	How many times yesterday did the child receive food?		[ ]
H04	*If the child is NOT breastfeeding:* How many times yesterday did the child receive milk from a cow, goat, or from a package?		[ ]

Explain to the participant that you want the number of DAYS, not the number of times.

During the past 7 days, how many days did the *child* eat *(name of the food)* ?

Meaning, how many days, starting with the last day *(specify the day)*, did the child eat *(food)* remembering that if the child, for instance, ate the food at lunch and at dinner on the same day, that just counts as 1 day.

NUMBER OF DAYS THE FOOD WAS CONSUMED OVER THE PAST 7 DAYS

Num.	NAME OF THE FOOD	CHILD ID	MOTHER'S ID
		H05	H06
1	Cassava - fresh or flour		
2	Maize		
3	Whole chillies		
4	Sukumawiki (kale)		
5	Pumpkin leaves (Sebebe)		
6	Sweet potato leaves		
7	Amarantha leaves (Terere/Mchicha/Dodo)		
8	Dark green leaves (of all kinds)		
9	Cows milk/goats milk/powdered/condensed		
10	Carrots		
11	Ripe mango		
12	Pumpkin		
13	Ripe papaya		
14	Ugali made of sorghum/millet/maize		
15	Rice		
16	Pumpkin or other seeds		
17	White fleshed sweetpotato		
18	Orange-fleshed sweetpotato (OFSP)		
19	Yellow-fleshed sweetpotato		

NUMBER OF DAYS THE FOOD WAS CONSUMED OVER THE PAST 7 DAYS

Num.	NAME OF THE FOOD	CHILD ID	MOTHER'S ID
		H05	H06
20	Eggs with yolk		
21	Small fish (omena) FRESH (with intact liver)		
22	Small fish (omena) DRIED (with intact liver)		
23	Small fish (omena) SOUP ONLY		
24	Groundnut or cashew nut		
25	Chicken		
26	Liver - from any animal		
27	Meat from cow/pig/sheep/rabbit/rat		
28	Butter		
29	Beans (all kinds)		
30	Wheat/biscuits/cookies/bread		
31	Cod liver oil		
32	Food fried in oil or with oil		
33	Vitamin A fortified margarine (BLUEBAND) or oil added		
34	Prawn/crab		
35	Coconut milk		
36	Cerelac (fortified packaged cereal)		
37	LACTOGEN		
38	Any other cereal		
39	Blood added as an ingredient (Mutura)		

H07	FOR THE **CHILD** IF CONSUMED ANY TYPE OF SWEETPOTATO:	
	On a typical day, how much sweetpotato does (name) eat during the entire day?	
	H07A Number of roots [ ][ ].[ ] **H07B** Size: 1-Very Small 2-Small 3-Medium 4- Large [ ]	
H08	FOR THE **MOTHER** IF CONSUMED ANY TYPE OF SWEETPOTATO:	
	On a day when you eat sweetpotato, how much do YOU typically eat during the entire day?	
	H08A Number of roots [ ][ ].[ ] **H08B** Size: 1-Very Small 2-Small 3-Medium 4- Large [ ]	
H09	If consumed OFSP, was it available from (1- Your field 2- the market 3- Other 9- N/A) ? .... [ ]	
H10	Specify other _____	

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I. CROP PRODUCTION

VILL: ☐☐☐ HHID: ☐☐☐ **Pg 10**

Now we would like to learn about what crops you grow on your farm.

I01	In 2009/2010 cropping seasons, how many fields were cultivated by this HH? Uplands ☐☐☐	Lowlands ☐☐
I02	Please estimate the total area of the land cultivated in the uplands and lowlan Uplands ☐☐☐.☐☐ Units ☐	Lowlands ☐☐☐.☐☐ Units ☐
	note: this includes own land and any rented or borrowed land	**Unit codes:** 1- M^2 2- Acres 3- Hectares
I03	In 2009/2010 cropping seasons did you contract full time or part time workers to help with your agricultural/livestock activities?	
	0- No 1- Temporary workers 2- Full-time workers 3- Both	☐

Which of the following crops were produced or sold by your HH during the 2009/2010 seasons?

Food crop? (please recode the crop name first and then put the code on the box provided)

	Did your HH PRODUCE this crop in 2009? 0- No 1- Yes	Did your HH SELL this crop 0- No 1- Yes	Which is the most important crop for the HH Rank all in order (1 =highest) 99= N/A
I04	**I05**	**I06**	**I07**
01- Maize			
02- Rice			
03- Sorghum			
04- Cassava			
05- Sweet potato			
06- Beans			
07- Groundnuts			
08- Bananas			

I08 Which of the crop was the most productive during the 2009/2010 season ? .... ☐☐

(Use the codes found in the table on the left)

If the most productive was Not sweetpotato, then fill the following:

(In this section please fill one of them either with the hust or without husk)

I09	Quantity WITH HUSK	☐☐☐☐☐☐	I11	WITHOUT HUSK or in GRAIN	☐☐☐☐☐
I10	Unit of measure		I12	Unit of measure	....

(Units of measure codes are below)

I13 Which of the crops was the second most productive during the year 2009/2010 ? .... ☐☐

(Use the codes found in the table on the le ....

If the second most productive was Not sweetpotato, then fill the following:

I14	Quantity WITH HUSK	☐☐☐☐☐	I16	WITHOUT HUSK or in GRAIN	☐☐☐☐
I15	Unit of me		I17	Unit of measure	....

I18 Which of the crops was the third most productive during the year 2009/2010 ? .... ☐☐

(Use the codes found in the table on the ....

If the third most productive was Not sweetpotato, then fill the following:

I19	Quantity WITH HUSK	☐☐☐☐☐	I21	WITHOUT HUSK or in GRAIN	☐☐☐☐
I20	Unit of measure		I22	Unit of measure	....

OTHER CROPS

other crops	Did your HH PRODUCE this crop in 2009/2010? 0- No 1- Yes	Did your HH SELL this crop in 2009/2010? 0- No 1- Yes	How many are still productive? (only for crops 18 to 46)
I23	**I24**	**I25**	**I26**
11- Tobacco			
12- Paprika			
13- Chillies			
14- Pineapple			
15- Sunflower			
16- Sesame			
17- Sugar cane			
18- Cashew nut			
19- Coconut			
26- Mangoes			
23- Papaya			
46- Guava			

Don't forget the number of trees!

UNIT OF MEASURE

01- KG	02- UNIT	13- 5Lr CAN
03- 100 KG BAG (EQUIVALENT IN MAIZE)		14- 1Lr CAN
04- 90 KG BAG (EQUIVALENT IN MAIZE)		15- TONS
05- 70 KGS BAG (EQUIVALENT IN MAIZE)		16- OX CART
06- 60 KG BAG (EQUIVALENT IN MAIZE)		17- GOROGORO
07- 50 KG BAG (EQUIVALENT IN MAIZE)		18- DEBE
08- 25 KG BAG (EQUIVALENT IN MAIZE)		19- BUNCHES
09- 10 KG BAG (EQUIVALENT IN MAIZE)		
10- 25Lr CAN		
11- 20Lr CAN		
12- 10Lr CAN		

Now, we would like to talk to you in greater detail about your sweetpotato crop that was planted and harvested in 2010 as well as any planted in late 2009 and harvested in early 2010.

J01 How many different sweetpotato field does your household have in upland areas?	**J01A** In the upland areas	**JI01B** in lowland areas?
J02 Of these sweetpotato fields, how many do you have the principle responsibility for managing?	**J02A** In upland areas:	**J02B** in lowland areas?

J03 *(If manages own plots:)* Do you have to ask your husband or someone else for permission to use the land that you manage?   0- No 1-Yes

J04 Who decides how much to grow of Sweetpotato?   1- Husband 2- Wife 3-Both 4-Other   **J05** Do you plant on ridges, mounds or on the flat? **J05 A** Ridge   **J05B** Mounds   **J05C** Flats

J04B *if other, specify:*   *(0-No, 1-Yes)*

J06	J07	J08	J09	J10	J11	J12	J13	J14	J15	J16	J17 During the past 12 months, please	During the major harvest month of ..		During the minor harvest months	
Field Number	Location of plot	Area of the plot (Quantity)	Area Units	Plot has WFSP?	Plot has YFSP?	Plot has OFSP?	Est. Total No. Different varieties	Inter-cropped?	Crop Code for Inter-crop (Sec I)	Sources of the planting vines (see codes)	tell us in which months that your hh harvested large quantities of SP or or which you harvested minor quantities for consumption or for sale	J18 How many time your hh harvest per day?, per week?, or per month?	J19 Each time your hh harvests, how much did it harvest? (Units codes are below)	J20 How many times did your hh harvest per day?, per week?, or per month?	J21 Each time your hh harvest, how much did it harvest? (Units codes are below)
												Times / Unit	Qty / Units	Times / Units	Qty / Units
	1-near house						on plot			0- No harvest		1- day		1- day	
	2-upland		1- M²	0-No	0-No	0-No		0-No		1- Months of minor harvest		2- Week	(codes	2- Week	(codes
	3-lowland		2- acre 1-Yes	1-Yes	1-Yes		1-Yes			2- Months of major harvest		3- Month	below)	3- Month	below)
			3- Ha 8-DK	8-DK	8-DK		8-DK			Jan Feb Marc Apr May June July Aug Sept Oct Nov Dec				4- Units	

Units of Measure					Sources of Vines		
01- Kg	05- 70 Kgs Bag	09- 10 Kg Bag	13- 5 Ltr Can	17- Gorogoro	1- Own farm	4- Bought from male neighbor/relative	7- Bought from government or NGO
02- Numbers	06- 60 Kg Bag	10- 25 Ltr Can	14- 1 Ltr Can	18- Debe	2- Free from male neighbor/relative	5- Bought from female neighbor/relative	8- Free from trained multiplier
03-100 Kg Bag	07- 50 Kg Bag	11- 20 Ltr Can	15- Tons	19- Other-Specify	3- Free from female neigbor/relative	6- Free from government or NGO	9- Bought from trained multiplier
04- 90 Kg Bag	08- 25 Kg Bag	12- 10 Ltr Can	16- Ox Cart				10- Other

J22 If you had 10 roots representing all of your sweetpotato produced in 2010, how many of those roots would be white-fleshed, how many yellow-fleshed and how many orange-fleshed?

J22A   white-fleshed   **J22B**   yellow-fleshed   **J22C**   orange-fleshed   *Check for consistency with J10, J11, and J12!*

J23 How much of your sweetpotato production did you sell last year?   1- none at all   2- less then 10%   3- Between 10-25%   4- Between 25-50%   5- Half   6- 50-75%   7- greater than 75%   8-all

J24 Tell me the three most important ways that you spent the money that you earned from selling sweetpotato.   *(Put 1 when mentioned and 0 if not mentioned, and 99 if not applicable)*

J24a School fees	J24b Furniture	J24c Pay Hospital bill	J24d Pay rent	J24e Pay Dowry	J24f Leisure	J24g Land preparation	J24h Buy farm inputs	J24i Pay Loan	J24j Household expenditure

J24k Others specify

K. SWEETPOTATO KNOWLEDGE AND PRACTICE

Now we would like to learn more about how you cultivate sweetpotato.

K01 Who is the most knowledgeable person about Sweetpotato in the household?   IDNo. ☐☐

K02 Please tell me what causes the holes in these sweetpotatoes (Show the picture of weevil infested root)

1- Insect kind not specified   2- Sweetpotato weevil   3- Lack of rain   4- Infection/rot   5- Animal/pest   6- Do not know   7- Other (specify) _____   ☐

K03 Have your sweetpotatoes ever suffered from the problem in the picture?   0-No   1- Yes   99- Not applicable   ☐

K04 If yes, is the problem a major or an ocassional problem?   0- Minor   1-Major   99- Not applicable   ☐

K05 If yes, does this problem force you to harvest your SP field earlier than you would like?   0- No   1- Yes   99- Not applicable   ☐

K06 What methods have you used to try and control or avoid this problem?   *(Please put a 1 if mentioned and 0 if not)*

K06A Choose varieties that resist attack ☐   **K06B** Disinfect vines ☐   **K06C** Hilling up ☐   **K06D** Select clean vines to plant ☐   **K06E** Rotate field ☐

K06F Harvest early ☐   **K06G** Other: ☐   Specify:

K07 Do you think this plant is healthy or sick?   (Show healthy plant)   1- Healthy 2- Sick 8- Don't Know ....   ☐

K08 Do you think this plant is healthy or sick?   (Show medium virus plant)   1- Healthy 2- Sick 8- Don't Know ....   ☐

K09 If the respondent says that the plant is sick, what is it suffering from?   1- Virus 2- Disease (general) 3- Drought 4- Insect damage 5- Other (specify) _____ 8- Don't know 99-N/A   ☐

K10 How many times do you grow sweetpotato in the same plot before you plant another crop or fallow?   *(Please put number of the space provided but if do not rotate put a 99 on the box)* ....   ☐

K11 Which part of the SP vine is best to use for planting?   1- Top 2- Middle 3- Bottom 4- Top and middle 5- All parts ....   ☐

K12 Why did you indicate that part being better?   1- Better output 2- Less diseases 3- Easier to cut 4- More vigorous growth after planting ....   ☐

K13 Do you normally plant more than one cutting in one hole?   1- Yes 0- No ....   ☐

K14 Do you use manure, or fertilizer, or both to produce sweetpotato roots?   0- Neither 1- Manure only 2- Fertilizer only 3- Both fertilizer and manure ....   ☐

K15 Do you use any manure, or fertilizer, or both to increase the number of vines you produce for planting materials?   0- Neither 1- Manure only 2- Fertilizer only ....   ☐

K16 Do you know the value of **deep orange fleshed SP variety**? *If so, can you please tell me.* 0- Do not know the value   1- mentions vitamin A 2- mentions good health 3- mentions something else   ☐

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K. SWEETPOTATO KNOWLEDGE AND PRACTICE, cont.

VILL: [ ][ ][ ]   HHID [ ][ ][ ]   **Pg 13**

K17 When do you normally start planting sweetpotatoes?   1-Before it starts raining,

2-within a week of the start of the rains   3-Latter than a week after it starts raining   [ ]

K18 If K17=3, why? _____

_____

K19 Do you plant sweetpotato several times during one season?   1- Yes   0- No   ....   [ ]

K20 If No, Why Not?   (Please put a 1 if mentioned and a 0 if not mentioned)

1- Lack of planting material	2- Cannot depend on rain	3- Spread out production	4- Lack of labor
5- Different varieties have different maturing period	6- To conserve planting materials	7- Other (specify)	

K21 Do you conserve SP vines during the dry period?   1- Yes   0- No   ....   [ ]

K22 If yes, what do you do to conserve the SP vines?

(Please put a 1 if mentioned and 0 if not mentioned)

1- Plant vines in fenced lowlands area or swamp	[ ]	2- Plant vines in lowland/swamp area not fenced	[ ]
3- Keep vines in a small plot near the house and water them	[ ]	4- Keep the vines under the shade of other	
5- Keep vines under shade of other crops and do not water	[ ]	crops and water them	
6- Do not harvest part of the existing field	[ ]	7- Plant near a bathroom	[ ]
8- Burried roots	[ ]	9- Other (specify)_____	[ ]

K23 If No, how do you get your SP vine material after a long dry period?

(Please put a 1 if mentioned and 0 if not mentioned)

1- Buy vines	....	[ ]	2- Borrow from neghbors	[ ]
2- Ask relatives for vines	....	[ ]	4- Left over roots re-sprouts in the field	[ ]

K24 Have you ever stored sweetpotato root whole and fresh after harvest?   1- Yes   0- No   ....   [ ]

(Please put a 1 when mentioned and zero if not mentioned or 99 if Not applicable)

	1- Pile in a house	2- In a sack	3- In a pit	4- Wooden crates linned and covered by wood shavings	5-Other Specify
K25 If Yes, how did you store them?					
K26 Maximum period of storage					
K27 Unit of period (codes below)					
Period units: [ ][ ][ ]	1- Days	2-weeks	3-months		

K28 Do you ever dry sweetpotatoes for storage?   1- Yes   0- No   ....   [ ]

K29 If yes, which method did you use   1- Chipped and dried   2- Boiled, chipped and dried   [ ]

3- Other specify

K30 If yes, how long did you store dry sweetpotato?

Length of period stored   Days [ ]   Weeks [ ]   Months [ ]

K31 Have you stopped growing any varieties in the **past 5 years**?

1- Yes   0- No   ....   [ ]

K32 If yes, how many?   ....   [ ][ ]

K33 If yes, **name one** variety you discontinued? _____   [ ][ ]

K34 If yes, what was the reason you discontinued the variety?_____

_____

_____

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L. SWEETPOTATO PREFERENCES AND PRACTICE

VILL: ☐☐☐   HHID: ☐☐☐   Pg 14

L01 I am going to read for you a list of traits about sweetpotato. Please tell me whether the characteristics is not important to you at all, or somewhat important when deciding what kinds of SP to grow in your farm.

Desirable attribute	Relative importance
	1- Likes the trait
	2- Dislikes the trait
	3- Not important
Planting characteristics	
1- Early maturing, that is the variety has some roots in less than 4 months	
2- Resists diseases	
3- High yielding	
4- Easy to establish when there is little rain	
5- Once it is growing it is easy to keep if the rains stop in the in the middle of the rain season	
6- Easy to conserve vines during the long dry period	
7- Vines spread out when they grow	
8- Gives lots of roots and lots of vines at the same time	
Post harvest	
9- Easy to store in the ground	
Cooking characteristics	
10- Cooks quickly	
11- Roots tastes good	
12- Leaves tastes good	
13- Very little sugary	
14- Very sugary	
15- Not watery	
Appearance	
16- Red skin	
17- White skin	
18- White fleshed	
19- Yellow fleshed	
20- Orange fleshed	

L02 What are the three varieties that you grow that are your favorites?

Which desirable characteristics do they have (use list under L01 for codes)

Name of variety	Skin Color (codes below)	Flesh Color (codes below)	Characteristics			
			#1	#2	#3	#4
L02	L03	L04	L05A	L05B	L05C	L05D

Skin colors: 1- White 2- Cream 3- Red 4- Purplish 5- Brownish 6- Yellowish

Flesh colors: 1- White 2- Cream 3- Light Yellow 4- Deeper Yellow 5- Light Orange 6- Deeper Orange 7- Purple

L06	Do you give SP leaves and vines to your livestock?	1- Yes	0- No	☐
L07	Do you sell sweetpotato leaves?	1- Yes	0- No	☐
L08	Do you ever dry SP leaves for later consumption?	1- Yes	0- No	☐
L09	Have you ever heard of **sweetpotato sillage**	1- Yes	0- No	☐
	(SP leaves and vines cut and fermented to be used later by animals)?			
L10	If Yes to L09, have you ever prepared the sweetpotato silage?	1- Yes	0- No	☐

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M. HOUSEHOLD ASSETS & RADIO USE

VILL: [ ][ ][ ] HHID [ ][ ][ ] **Pg 15**

M01 At present, how much/many of the following does this household own that are usable/repairable?

(Instructions: For value per unit, ask how much they would pay for the asset if they have to buy it in its current state)

Asset	Qty	Value per unit (Kshs)	If value per unit is unknown ask for total value	Owner 0- Woman 1- Man 2- Both man &wom 3-Child	Asset	Qty	Value per unit (Kshs)	If value per unit is unknown ask for total value	Owner 0- Woman 1- Man 2- Both man &wom 3-Child
M01	M02	M03	M04	M05	M01	M02	M03	M04	M05
1- Storage facility for crop					18- Saw				
2- Water tank					19- Spray pump (back pack)				
3- Radio/ cassette player					20- Motorized water pump				
4- TV					21- Mechanical water pump				
5- Telephone/Mobile					22- Drip irrigation equip.				
6- Solar panels					23- Other irrigation equip.				
7- Gas cooker					24- Cart				
8- Bicycle					25- Plough				
9- Wheelbarrow					26- Harrow, tiller, ridger, weeder				
10- Milking equipment					27- Motor cycle				
11- Chaff cutter					28- Car/truck				
12- Sewing/knitting machine					29- Tractor				
13- Borehole or well					30- Generator				
14- Posho mill					31- Watering can				
15- Sheller					32- Axes				
16- Other agro-processing equip.					33- Watch				
17- Weighing machine					34- Cows				
					35- Sheeps				
					36- Goats				

Now, I am going to ask you a few questions about whether and how you listen to the radio

M06 Last month, how many times did you listen to the radio? 1= Every day 2= 3 to 4 times per week 3= 1-2 times per week 4= Irregularly 5= Did not listen 8= Do not know .... [ ]

M07 What is the station you listen to most often? 1- National radio 2-Provincial level radio 3-Community level radio 8- Do not know 9- Not applicable, do not listen .... [ ]

M08 What is the name of the station you usually listen to often? Most listened (Station 1) _____ [ ]   2nd most listened (Station 2) [ ]
(Check codes from radio station list given) 3rd most listened (Station 3) _____ [ ]

M09 At what time of day do you usually listen to the radio? 1-First thing in the morning [ ] 2-Later in the morning [ ] 3-Afternoon [ ]
(Put a 1 if mentioned and 0 if not mentioned and 99 if N/A) 4-Evening [ ] 5-After dinner [ ] 6-Varies, no specific time [ ] 9- Not applicable [ ]

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N. HOUSEHOLD ASSET CHARACTERISTICS

VILL: ☐☐☐☐   HHID ☐☐☐   Pg 16

(Observe or ask about the following)

Main housing

N01 What is the roofing material of the households' main house?

1- Grass   2- Iron sheet   3- Tiles   4- Other (specify) _____   ☐

N02 What is the wall material of the main house?

1- Mud   2- Bricks/Stones   3- Iron sheets   4- Wood   5- Plastered   6- Other (specify) _____   ☐

N03 What is the floor material of the main house?

1- Earth   2- Cement   3- Wood   4- Tiles   5- Other (specify) _____   ☐

N04 Who owns the house?

1- Man of the house   2- Woman of the house   3- Jointly owned   4- Other HH member   5- Owned by non- resident relative   6- Rented   7- Other _____   ☐

N05 Does the household have their own toilet?

1- Yes   0- No   ☐

N06 What type of a latrine is it?

1- Pit latrine   2- Flush toilet   3- Compost or Eco-toilet   4- Outdoor unwalled   5- Other (specify)_____   ☐

N07 What is the main source of your water during the wet season?

1- Pond   2- Dam/sand dam   3- Lake   4- Stream/river   5- Unprotected spring   6- Protected spring   7- Well   8- Borehole   9- Water tank   ☐

10- Roof catchment   11- Piped water into the compound   12- Piped water outside the compound   13- Water hawker-cart

14- Bodaboda   15- Other (specify) _____

N08 What is the distance (in Km and minutes) to main source of water for domestic use during wet seasons?   1- Distance in minutes ☐☐   2- Distance in Km ☐☐.☐

(Unit codes: 1=Walking, 2=by bicycle, 3=by car)   Unit ☐

N09 What is the main source of water during the dry season?

1- Pond   2- Dam/sand dam   3- Lake   4- Stream/river   5- Unprotected spring   6- Protected spring   7- Well   8- Borehole   9- Water tank   ☐

10- Roof catchment   11- Piped water into the compound   12- Piped water outside the compound   13- Water hawker-cart

14- Bodaboda   15- Other (specify) _____

N10 What is the distance (in Km and minutes) to main source of water for domestic use during dry seasons?   1- Distance in minutes ☐☐   2- Distance in Km ☐☐.☐

(Unit codes: 1=Walking, 2=by bicycle, 3=by car)   Unit ☐

N11 What is the main cooking fuel in this household?

1- Firewood   2- Charcoal   3- Paraffin   4- Solar power   5- Biogas   6- LPG Gas   7- Electricity   8- Animal dung   9- Other (specify) _____   ☐

N12 What is your Main type of lighting in the main house?

1-Tin lamp   2- Lantern   3- Pressure lamp   4- Wood fuel   5- Solar power   6- Electricity   7- Rechargeable lamps   7- Other (specify) _____   ☐

END TIME: ☐☐ : ☐☐

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P. ANTHROPOMETRY & BLOOD SAMPLING

VILL: ☐☐ HHID ☐☐☐ **Pg 17**

Respodent Tel: _____

INSTRUCTIONS: P01 DATE OF MEASURE ☐☐ / ☐☐ / ☐☐ P02 MEASURER: ☐☐ P03 ASSISTANT: ☐☐

Weigh all children between 6 TO 23 months old. The child should be undressed when being weighed

Measure the length of children aged between 6 to 23 months old. TIME ☐☐ : ☐☐

Measure the height and weight of the mother or equivalent caregiver

1. REFERENCE CHILD: (INFORMATION FROM THE PREVIOUS QUESTIONNAIRE)

IDNO.	Child´s Name	Sex 1-M 2-F	Date of Birth 88- don´t know			Age (in completed months)	Is he/she a twin? 0-No 1-Yes
			Day	Month	Year		
P04	P05	P06	P07	P08	P09	P10	P11

Blood sampling

P33 IDNO of person taking sample ☐

0-No 1-Yes

P34 Blood sampling for child needed? ☐
P35 Blood sampling for child obtained? ☐
P36 Blood sampling for woman needed? ☐
P37 Blood sampling for woman obtained? ☐

SUPERVISOR:

2. INFORMATION AND HEIGHT OF MOTHER OR PRIMARY CAREGIVER

WOMEN: WEIGHT (0,1 kg) OEDEMA Mother´s clothes Ornaments

IDNO.	NAME	Is she pregnant 0-No 1-Yes	If yes: How many months?	Has she taken her iron sulfate pill within the last 2 weeks 0-No 1-Yes	1 Measurement Mother Alone	2 Measurement Child	Does the child have oedema? 0-No 1-Yes	1- Light weight (<0,5 kg) 2- Medium weight (0,5-1,5 kgs)	Child's clothes 0- Undressed 1- Underwear 2- Light clothes	0- No 1- Yes	Child´s WEIGHT within normal limits 0- No 1- Yes
P12	P13	P14	P15	P16	P17	P18	P19	P20	P21		P22

5. MOTHER'S HEIGHT / 6. CHILD´S LENGTH

HEIGHT (0,1 CM) OR LENGTH Measurement type SUPERVISOR: SUPERVISOR: RECORD THE Z-SCORES:

HEIGHT (0,1 CM) 1 Measurement	2 Measurement	1 Measurement	2 Measurement	1- Child lying down 2- Child standing	1-Length 2-Height	Is the height or length of the child within normal limits 0- No 1- Yes	If there is a measurement outside of normal limits, re-estimate date of birth Re-estimated date of birth DAY MONTH YEAR			WEIGHT-FOR-AGE	HEIGHT-FOR-AGE	WEIGHT FOR HEIGHT
P23	P24	P25	P26	P28	P29	P30	P31	P32	P33	P34	P35	P36

Average length child P27

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Annex 3 – Equipment checklist by team

General per Supervisor (week supply)
180 questionnaires
70 PG consent forms
140 MC consent forms
20 Master sheets
15 new household listing forms
1 Daily progress form
All respondents list
Original supervisor census listing
1 Notebook for problem recording
1 Codesheet
1 copy of the Kiswahili version of the questionnaire (for reference)
10 box folders per questionnaire
10 payment sheets
1 box of plain paper

General per team
1 Big box
2 Files
1 Big stapler
1 Paper punch
1 Scissors
1 Lamp
2 Tents
2 Tents walls
2 Mats
2 Tables
15 Chairs
1 Ink
1 Biscuits and water

Per enumerator
1 Clipboard
5 HB pencil
1 Eraser
1 Plastic folder with codesheets
1 Pencil sharpener
1 Post-it small size

List of villages

Per anthropometry team
1 Scale with bag
1 Standard weight
1 Flat board
2 Length board
20 Clothes for board
2 Rain coats
1 Screw driver
1 Calculator
1 Laptop
1 Calibration form
2 Simplified field tables
1 Flash disk

Annex 4 – Approval letters by ERBs

Annex5 – Variables included in wealth index analysis.

	VARIABLES	Valid n	As continuous variable		As categorical variable	
			Median (Range)	Mean (SD)	Categories	%
1	Household size (number of family members)	2761	4.0 (1-15)	4.0 (2.0)	0=1-3; 1=4-15	0-(49.0); 1-(51.0)
2	Age of household head	2724	35.0 (19-93)	38.1 (12.1)	0=16-35; 1=36-93	0-(50.9); 1-(49.1)
3	Sex of household head	2761			0-F; 1-M	0-(8.2); 1-(91.8)
4	Highest education level of household head	2761			0-Preschool; …; 22-University	
					0-Primary; 1-Secondary and higher	0-(59.7); 1-(40.3)
5	Agriculture is the principal activity of the household head	2761			0-No; 1-Yes	0-(50.3); 1-(49.7)
6	Household head has sold agriculture or livestock product last year	2761			0-No; 1-Yes	0-(32.5); 1-(67.5)
7	Household head has undertaken salaried employment last year	2761			0-No; 1-Yes	0-(76.4); 1-(23.6)
8	Household head has done casual labour last year	2761			0-No; 1-Yes	0-(54.4); 1-(45.6)
9	Household head has been involved in informal business last year	2761			0-No; 1-Yes	0-(85.9); 1-(14.1)
10	Household head has been involved in some other form of self employment last year	2761			0-No; 1-Yes	0-(68.5); 1-(31.5)
11	Total number of fields cultivated last year	2588	3 (0-13)	3.0 (1.7)	0-None to 2; 3-13	0-(43.7); 1-(56.3)
12	Total area cultivated last year (acres)	2564	1 (0-500)	1.9 (11.2)	0-Less than one; 1-One and more	0-(36.5); 1-(63.5)
13	Number of storage facility for crop	2761	0 (0-3)	0.3 (0.4)	0-None; 1-One and more	0-(75.1); 1-(24.9)
14	Number of water tank	2761	0 (0-3)	0.1 (0.3)	0-None; 1-One and more	0-(92.1); 1-(7.9)
15	Number of radio/ cassette player	2761	1 (0-6)	0.9 (0.4)	0-None; 1-One and more	0-(12.5); 1-(87.5)
16	Number of TV	2761	0 (0-3)	0.2 (0.4)	0-None; 1-One and more	0-(81.5); 1-(18.5)
17	Number of Telephone/Mobile	2761	1 (0-7)	1.0 (0.9)	0-None; 1-One and more	0-(28.8); 1-(71.2)
18	Number of solar panels	2761	0 (0-2)	0.1 (0.2)	0-None; 1-One and more	0-(94.6); 1-(5.4)
19	Number of gas cooker	2761	0 (0-2)	0.0 (0.1)	0-None; 1-One and more	0-(98.3); 1-(1.7)
20	Number of bicycle	2761	1 (0-4)	0.6 (0.5)	0-None; 1-One and more	0-(37.7); 1-(62.3)
21	Number of wheelbarrow	2761	0 (0-2)	0.1 (0.3)	0-None; 1-One and more	0-(88.8); 1-(11.2)
22	Number of milking equipment	2761	1 (0-4)	0.0 (0.2)	0-None; 1-One and more	0-(97.8); 1-(2.2)
23	Number of chaff cutter	2761	0 (0-1)	0.0 (0.1)	0-None; 1-One and more	0-(99.5); 1-(0.5)
24	Number of sewing/knitting machine	2761	0 (0-2)	0.1 (0.3)	0-None; 1-One and more	0-(93.9); 1-(6.1)

25	Number of borehole or well	2761	0 (0-1)	0.3 (0.4)	0-None; 1-One and more	0-(72.9); 1-(27.1)
26	Number of posho mill	2761	0 (0-2)	0.0 (0.1)	0-None; 1-One and more	0-(99.4); 1-(0.6)
27	Number of sheller	2761	0 (0-1)	0.0 (0.0)	0-None; 1-One and more	0-(100.0); 1-(0.0)
28	Number of other agro-processing equip.	2761	0 (0-1)	0.0 (0.0)	0-None; 1-One and more	0-(100.0); 1-(0.0)
29	Number of weighing machine	2761	0 (0-1)	0.0 (0.0)	0-None; 1-One and more	0-(100.0); 1-(0.0)
30	Number of saw	2761	0 (0-1)	0.0 (0.1)	0-None; 1-One and more	0-(81.6); 1-(18.4)
31	Number of spray pump (back pack)	2761	0 (0-3)	0.1 (0.3)	0-None; 1-One and more	0-(88.3); 1-(11.7)
32	Number of motorized water pump	2761	0 (0-1)	0.0 (0.0)	0-None; 1-One and more	0-(99.9); 1-(0.1)
33	Number of mechanical water pump	2761	0 (0-1)	0.0 (0.1)	0-None; 1-One and more	0-(99.5); 1-(0.5)
34	Number of drip irrigation equip.	2761	0 (0-1)	0.0 (0.0)	0-None; 1-One and more	0-(99.8); 1-(0.2)
35	Number of other irrigation equip.	2761	0 (0-1)	0.0 (0.0)	0-None; 1-One and more	0-(99.8); 1-(0.2)
36	Number of carts	2761	0 (0-2)	0.0 (0.2)	0-None; 1-One and more	0-(95.2); 1-(4.8)
37	Number of plough	2761	0 (0-7)	0.2 (0.5)	0-None; 1-One and more	0-(83.7); 1-(16.3)
38	Number of harrow, tiller, ridger, weeder	2761	0 (0-12)	0.1 (0.6)	0-None; 1-One and more	0-(96.9); 1-(3.1)
39	Number of motorcycle	2761	0 (0-2)	0.0 (0.2)	0-None; 1-One and more	0-(95.2); 1-(4.8)
40	Number of car/truck	2761	0 (0-2)	0.0 (0.1)	0-None; 1-One and more	0-(99.3); 1-(0.7)
41	Number of tractor	2761	0 (0-2)	0.0 (0.0)	0-None; 1-One and more	0-(99.9); 1-(0.1)
42	Number of generator	2761	0 (0-1)	0.0 (0.2)	0-None; 1-One and more	0-(97.6); 1-(2.4)
43	Number of watering can	2761	0 (0-3)	0.1 (0.2)	0-None; 1-One and more	0-(95.0); 1-(5.0)
44	Number of axes	2761	0 (0-3)	0.7 (0.5)	0-None; 1-One and more	0-(30.0); 1-(70.0)
45	Number of watch	2761	0 (0-5)	0.4 (0.5)	0-None; 1-One and more	0-(65.8); 1-(34.2)
46	Number of cows	2761	0 (0-21)	1.3 (1.8)	0-None; 1-One and more	0-(48.0); 1-(52.0)
47	Number of sheeps	2761	0 (0-20)	0.5 (1.2)	0-None; 1-One and more	0-(78.2); 1-(21.8)
48	Number of goats	2761	0 (0-20)	0.2 (0.9)	0-None; 1-One and more	0-(90.4); 1-(9.6)
49	Roofing material of the households' main house	2758			1-grass; 2-iron sheet/tiles	1-(15.4); 2-(84.6)
50	Wall material of the households' main house	2759			1-Mud; 2-Other	1-(91.2); 2-(8.8)
51	Floor material of the households' main house	2757			1-Earth; 2-Cement/tiles	1-(90.7); 2-(9.3)
52	Household own by one HH member	2651			0-No; 1-Yes	0-(3.9); 1-(96.1)
53	Household has toilets	2759			0-No; 1-Yes	0-(11.3); 1-(88.7)
54	Household main cooking fuel	2759			0-other; 1-solar power, gas, electricity	0-(99.8); 1-(0.2)
55	Household main type of lighting	2756			0-other; 1-solar power, electricity	0-(98.1); 1-(1.9)
56	Piped water for drinking	2732			0-No; 1-Yes	0-(92.2); 1-(7.8)

Annex 6 – Knowledge scoring system

6.1 – Knowledge about nutrition

#	Variables included	Quote
	What makes a child grow?	
1	Eating sufficient amounts of food	1
2	Eating different kinds of food	1
3	Child does not get sick often	1
	Can identify three food groups	
	If yes, and mentioned	
4	*Energy-giving foods*	1
5	*Body-building foods*	1
6	*Protective foods*	1
	Main energy foods	
7	Cereals, sweetpotatoes, cassava	1
8	Orange-fleshed sweetpotato	1
9	Fats (margarines, butter, etc.)	1
10	Beans, groundnuts	0
11	Eggs, milk, meat and fish	-0,5
12	Fruits and vegetables	0
	Main body-building foods	
13	Cereals, sweetpotatoes, cassava	-0,5
14	Orange-fleshed sweetpotato	-0,5
15	Fats (margarines, butter, etc.)	-0,5
16	Beans, groundnuts	1
17	Eggs, milk, meat and fish	1
18	Fruits and vegetables	-0,5
	Main protective foods	
19	Cereals, sweetpotatoes, cassava	-0,5
20	Orange-fleshed sweetpotato	1
21	Fats (margarines, butter, etc.)	1
22	Beans, groundnuts	0
23	Eggs, milk, meat and fish	1
24	Fruits and vegetables	1

6.2 – Knowledge about vitamin A

Ever heard of vitamin A?	Quote
no	0
yes	1
Why is Vitamin A important?	
Prevents disease	
no	0
yes	1
Protects the eyes	
no	0
yes	1
Any other correct fact	
no	0
yes	1
Give three foods rich in Vitamin A	
None correct	0
1 correct	1
2 correct	2
All 3 correct	3

6.3 – Knowledge about health seeking behaviours

Most important things to ensure healthy pregnancy	Quote
Eating well (quality foods eaten frequently)	1
Avoiding alcohol	1
Not smoking	1
Attending ANC clinics	1
Taking iron tablets/syrup	1
Prevent malaria with nets/drugs	1
Check HIV status	1
Time to start attending ANC clinic	
No later than 4 months pregnancy	1
As soon as pregnancy is suspected	2
No. of times pregnant woman should attend ANC clinic	
<3 times	0
≥4 times	1
Services that occur at ANC visit	
Health check-up (BP and tests)	1
Weight taken	1
Nutritional advice	1
Given medication& vaccines	1

6.4 – Knowledge about child care

Immediately after birth, the mother should	Quote
Hold the baby (ensure skin contact)	
No	0
Yes	1
Breastfeed the baby	
No	0
Yes	1
Take a vitamin A capsule	
No	0
Yes	1
Feeding the baby colostrum after birth	
Bad or don't know	0
Good	1
Able to define exclusive breastfeeding	
Not correct	0
Partially correct	1
Completely correct	2
Age to introduce water	
<6 months	0
>6 months	1
6 months	2
Age to introduce complementary foods	
<6 months	0
>6 months	1
6 months	2
Age to introduce sweetpotato	
<6 months	0
>6 months	1
6 months	2
Age to breastfeed baby until	
<24 months	0
>24 months	1
24 months	2
A breastfed 6-8mo. old should be fed CFs	
<2	0
≥2	1
A breastfed 1 yr. old should be fed CFs	
<3	0
≥3	1

6.5 – Knowledge about orange-fleshed sweetpotato

What causes the holes in these sweetpotatoes	
Other	0
Insect, kind not specified	1
Sweetpotato weevil	2
Identified the healthy plant as healthy	1
Identified the sick plant as sick	1
The problem is caused by	
Other	0
Virus or disease in general	1
Which part of the SP vine is best to use for planting	
Top	1
Other parts	0
Do you normally plant more than one cutting in one hole	
Yes	0
No	1
Value of deep orange fleshed SP variety	
Do not know	0
Good health	1
Vitamin A content	2

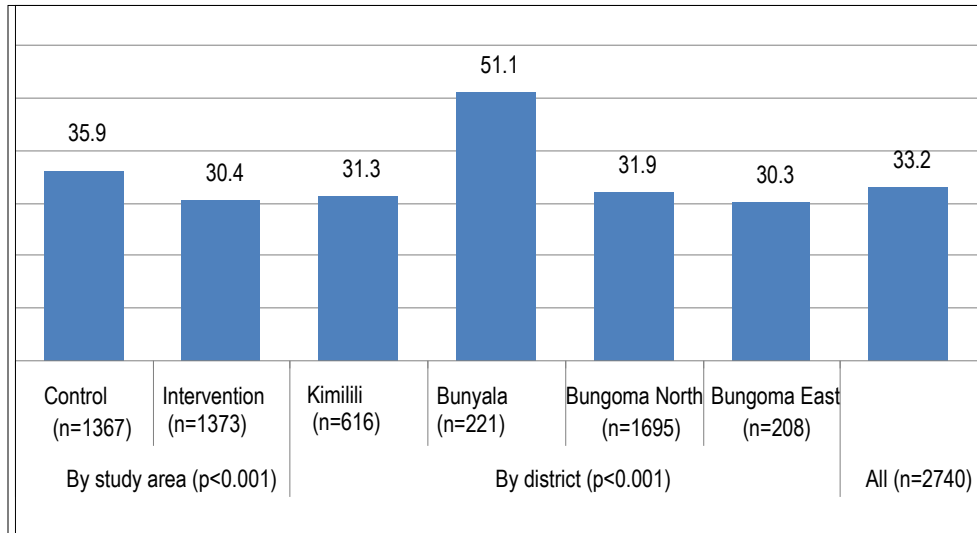# Annex 7- Distribution of households' knowledge scores by study area and districts
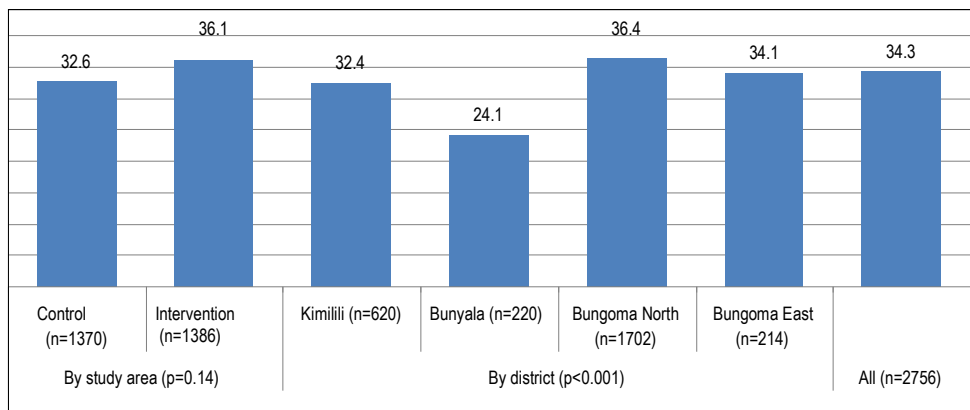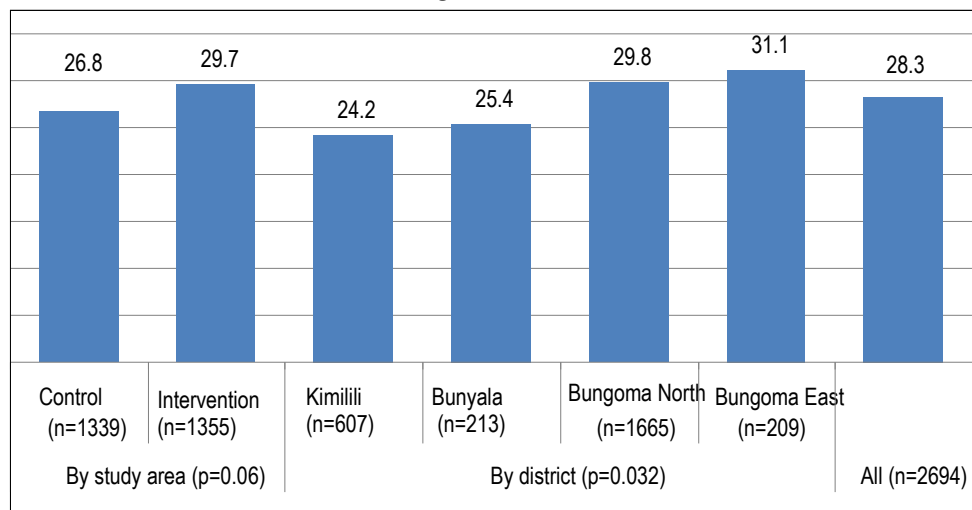

A – Knowledge score about nutrition
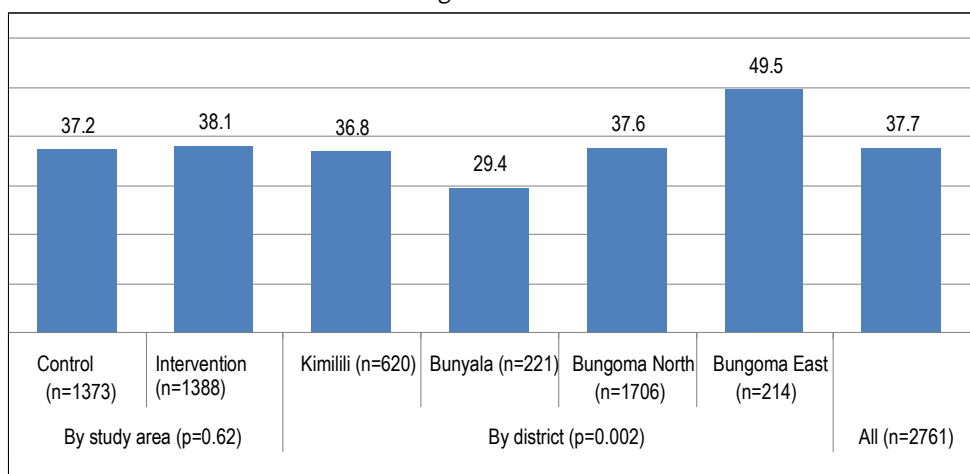
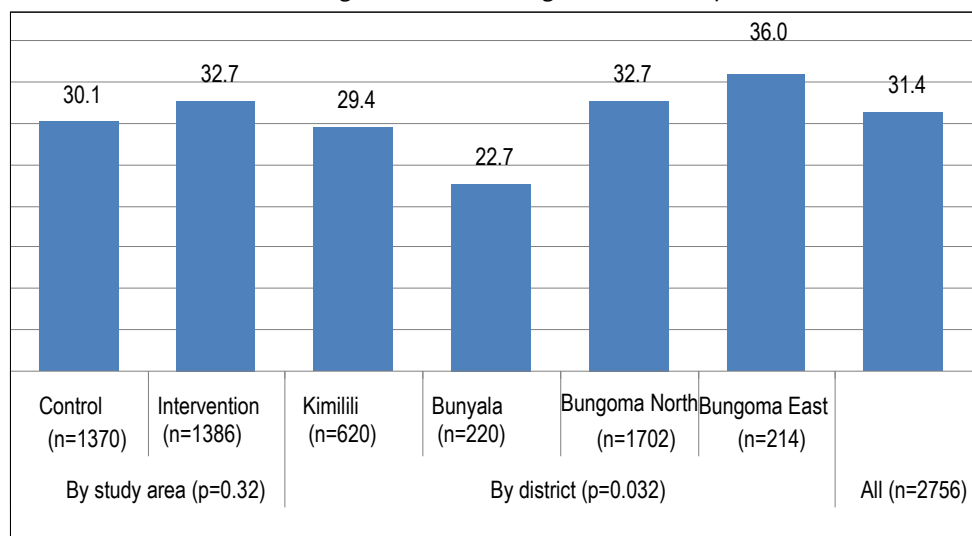B – Knowledge score about vitamin A
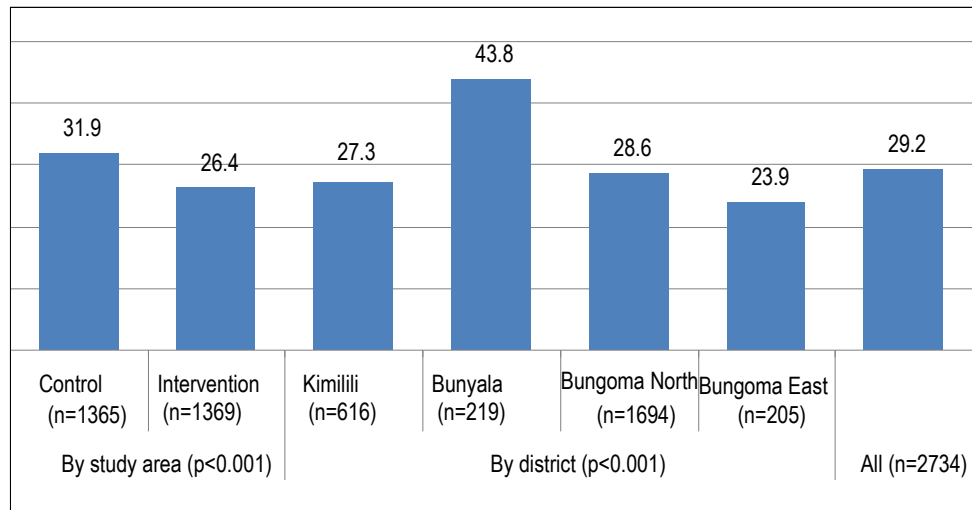

C – Knowledge score about health seeking behaviours

35.9	30.4	31.3	51.1	31.9	30.3	33.2
Control (n=1367)	Intervention (n=1373)	Kimilili (n=616)	Bunyala (n=221)	Bungoma North (n=1695)	Bungoma East (n=208)	
By study area (p<0.001)		By district (p<0.001)				All (n=2740)

D – Knowledge score about child care

26.8	29.7	24.2	25.4	29.8	31.1	28.3
Control (n=1339)	Intervention (n=1355)	Kimilili (n=607)	Bunyala (n=213)	Bungoma North (n=1665)	Bungoma East (n=209)	
By study area (p=0.06)		By district (p=0.032)				All (n=2694)

E – Knowledge score about orange-fleshed sweetpotato

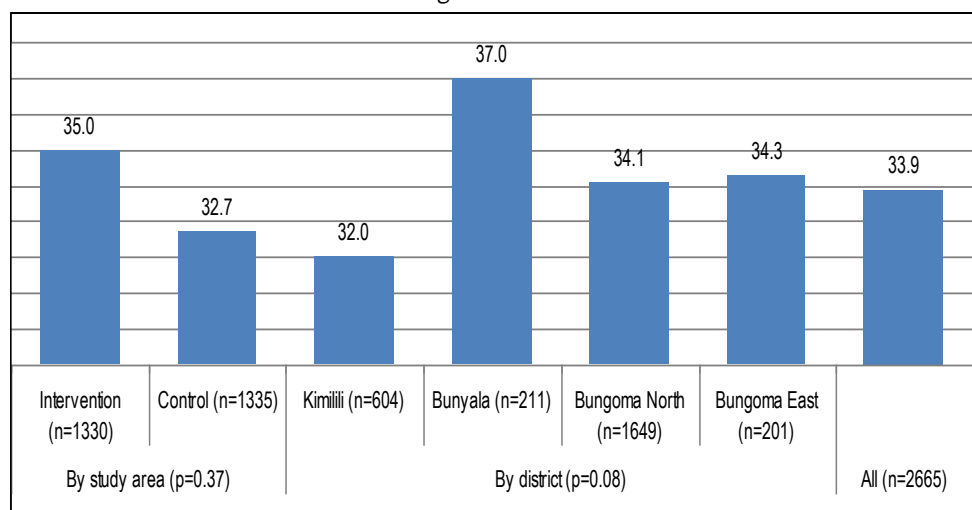|						
30.1	32.7	29.4	22.7	32.7	36.0	31.4
Control (n=1370)	Intervention (n=1386)	Kimilili (n=620)	Bunyala (n=220)	Bungoma North (n=1702)	Bungoma East (n=214)	
By study area (p=0.32)		By district (p=0.032)				All (n=2756)

F – Combined knowledge score about nutrition and vitamin A

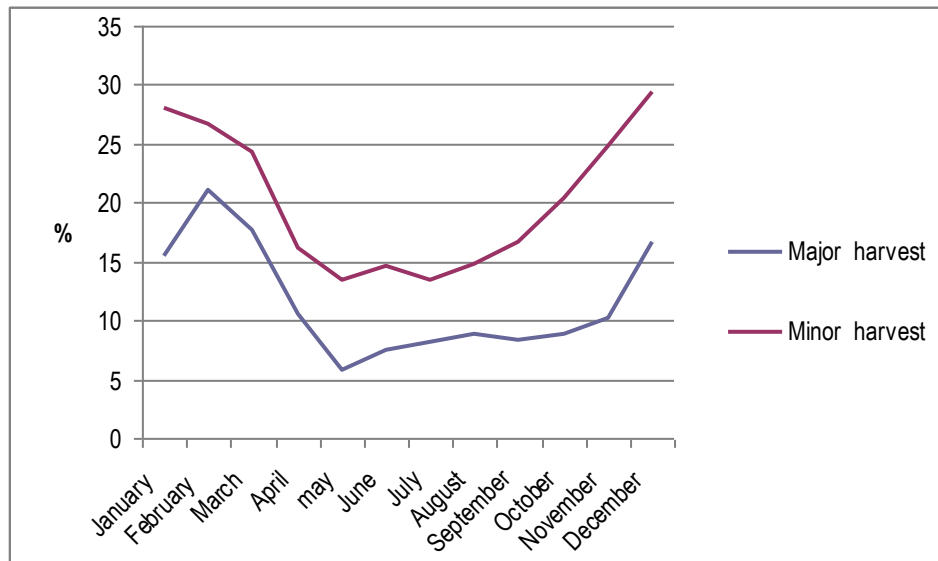G – Combined knowledge score about health seeking behaviours and child care
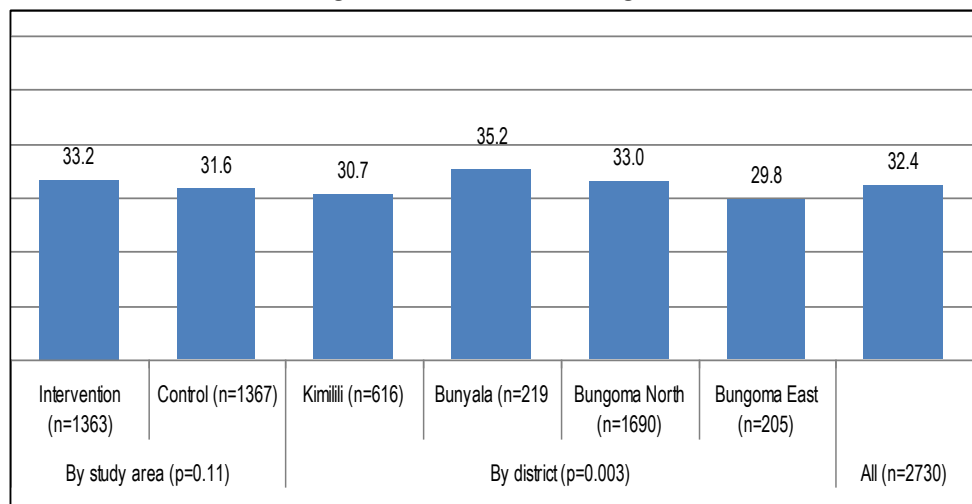
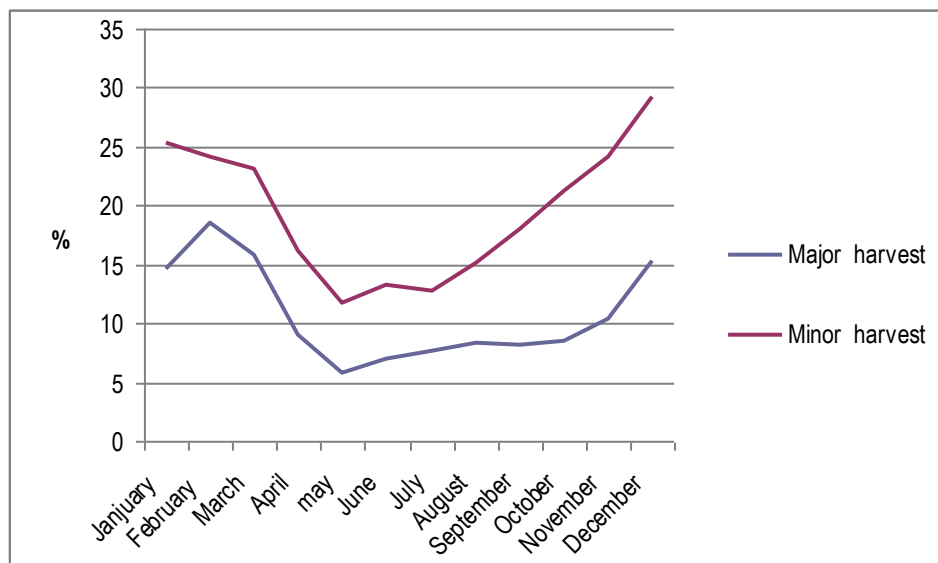H – Combined knowledge score about health and nutrition

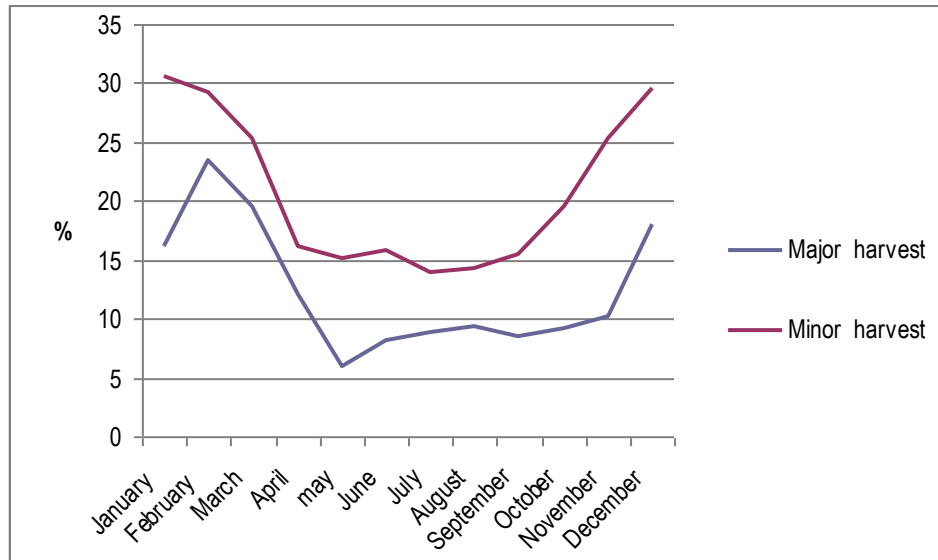I – Global knowledge score about health, nutrition and orange-fleshed sweetpotato

Annex8 -timing of sweet potato harvest

A – Overall (n=2925)

B – Control areas (n=1443)

C – Intervention areas (n=1482)

Distribution of households that had different months as months of major or minor harvest of sweetpotato during 2009/2010 crop seasons, by study areas.