Report on the Combined Survey on the Food Fortification Project and Prevalence of Iodine Deficiency in Ghana.

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ABBREVIATIONS & ACRONYMS

CV – Coefficient of variation

DHMT- District Health Management Team

DHS-Demographic Health Survey

EA-Enumeration Area

FDB-Food and Drugs Board

FFP- Food Fortification Project

GAIN-Global Alliance for Improved Nutrition

GDHS- Ghana Demographic and Health Survey

GHS- Ghana Health Service

GSS-Ghana Statistical Service

HPLC – High pressure liquid chromatography

ICP-OES – Inductively coupled plasma optical emission system

IDD-Iodine Deficiency Disorders

IEC - International Electrotechnical Commission

ISO - Standard International Organization for Standardization

KAP-Knowledge Attitude and Practices

KHRC- Kintampo Health Research Centre

LI- Legislative Instrument

LIMS Laboratory Integrated Management System

MISC- Multiple Indicator Cluster Survey

MOH-Ministry of Health

NFFA-National Food Fortification Alliance

PPS-Population Proportionate to Size

QA-Quality assurance

QC-Quality control

UIE-Urinary Iodine Excretion

UNICEF- United Nations Children Fund

USI-Universal Salt Iodization

VAD-Vitamin A Deficiency

WHO- World Health Organization

WIFA-Women in Fertile Age Group

EXECUTIVE SUMMARY

The fortification of wheat flour with vitamin and minerals, cooking oil with vitamin A, and salt with potassium iodate are mandatory in Ghana and are part of a comprehensive and integrated program to address micronutrient deficiencies of public health significance. As these programs have been operational for several years and are at different stages of implementation, a survey was undertaken to provide relevant program information that policy makers and program implementers need to make informed decisions about the effectiveness of implementation and to re-strategize for improvement where necessary.

The overall aim of the survey was to generate the requisite data to assess the project performance in terms of household coverage, utilization and population reach of fortified wheat flour products, vegetable oil in and adequately iodized salt in Ghana, as well as to determine the prevalence of iodine deficiency by analyzing urinary iodine.

The objective of this study was to assess the progress of implementation of the Food Fortification Project (FFP), to determine coverage at household level, and track the outcome of social marketing and communication programs. The survey also provided the opportunity to assess the prevalence of iodine deficiency and determine the current coverage of households using adequately iodized salt. The survey was designed to obtain household data that allows the results to be interpreted for each of the three ecological zones (Southern, Middle and Northern). Individual interviews were conducted to elicit household data related to coverage with fortified food, practices and knowledge of benefits. The study included sampling refined vegetable oil, wheat flour and salt at the household level for determination of the respective levels of fortification with vitamin A, iron and iodine. Salt samples were analyzed using both the rapid test kit and titration method.

To assess iodine status, sampling was stratified, namely children aged 6 to 12 years and women in fertile age (WIFA) (15-49 years) and urine was collected from both groups for determination of urinary iodine (UI) excretion.

The questionnaire elicited information on the extent of knowledge about product fortification in order to investigate consumer understanding and attitudes related to the on-going mandatory fortification and salt iodization program. Information on wheat flour, vegetable oil and salt

purchased, type of flour products most commonly used, availability of iodized salt at the household as well as data on trends of utilization of oil were compiled.

1511 questionnaires were administered to 508, 494 and 509 women in the Northern, Middle and Southern zones of Ghana respectively. Key survey findings are summarized below

Summary of Key Findings

FFP-Knowledge

- Overall, knowledge about fortification among the 1511 respondents interviewed was rather low, as only 505 (33.4%) respondents stated they had heard of it. Knowledge was highest in the Middle zone (41.2%) followed by the Southern (34.8%) and lowest in the Northern zone (24.0%) and was significantly different ($p<0.001$) among zones.

- Knowledge about the ongoing food fortification programme in Ghana was 348 (23.0%) and this was lower than knowledge about food fortification in general which was found to be 505 (33.4%) out of 1511 respondents interviewed. Out of those who knew about the ongoing food fortification, there was a significant difference ($p<0.0001$) among zones and was highest in the Middle zone (53.4%) followed by the Southern (31.3%) and lowest in the Northern zone (15.2%).

- Respondents who indicated they had heard about food fortification in general were asked about the health benefits of consuming fortified foods. 339 (67.1%) said it promoted good health, 80 (15.8%) said it gives blood, 199 (39.4%) said it gives strength, only 25 (4.9%) said it improves school performance, 58 (11.4%) said it improves child survival and 12 (2.4%) said it improves work output. 132 (26.1%) were of the opinion that it prevented illnesses and 14 (2.8%) said fortified foods improved eye sight.

- Of the 348 respondents who were aware about the on-going food fortification programme in Ghana specifically, 234 (67.2%) said it promotes good health, 192 (55.1%) said it gives strength, 53 (15.2%) said it gives blood, 42 (12.0%) mentioned it improves child survival, 15

(4.3%) said fortified foods improves eye sight, 23 (6.6%) said it improves school performance and 7 (2.0%) indicated improves work output.

- With regards to sources of information, out of the 505 respondents who indicated having heard about food fortification, 234 (46.3%) said they heard about it from the radio, 226 from health workers (44.7%), 87 (17.2%) from TV, 44 (8.7%) from friends, and family and 9 (1.8%) from leaflets.

- Only 182 (12.0%) recalled having seen the food fortification logo and this did not differ significantly between zones. 74 (40.6%) of those who had seen the logo were shown it by health workers, 68 (37.4%) saw it in a poster or a leaflet, 22 (12.0%) saw it on TV.

- Only 22 (12.1%) of those who recalled having seen the food fortification logo thought the logo signified a fortified food item, 19 (10.4%) said it meant nutrients had been added for good health and 14 (7.7%) said this meant that the food was of good quality.

Vegetable Oil

- Household purchasing and utilization patterns of vegetable oil, particularly the common brands of refined oil was investigated and 452 (29.9%) women mentioned they usually used the fortified commercial oil, Frytol was , 87 (5.7%); 33 (2.2%) used Gino, 3 (0.2%) used Obaapa and 13 (0.9%) Nana oil. Other commercial brands mentioned by <1% of respondents were Sunflower, Sankofa and Imperial Chef. Nearly a quarter of women, 370 (24.5%) mentioned using other oils not included in the list and 519 (34.4%) did not use refined oil but only artisanal products.

- 707 (46.8%) women said they prepared meals with, Nana Oil, Imperial Chef and Gino which were the available fortified oils at the time of the survey; 615 (40.7%) mentioned using Frytol, Obaapa, Sunflower oils, Sankofa, Unoli, Kings and other commercially fortified oils.

- Zonal disaggregation of the data showed that the highest reported use of industrially processed oils was in the Middle zone (60.8%), followed by the Southern zone (28.8%) and 10.4% in the Northern zone.

- More than half of respondents 859 (56.8%) used non fortified oils such as palm kernel oil, coconut oils, Shea butter or ground nut oils which are the locally/artisanal processed oil. 1187 (78.6%) respondents used palm oil, zomi or palmin which are also not fortified oils but do contain carotenoids.

- Levels of retinyl palmitate below 10mg/kg were detected in 84% of oil samples, an indication of a low level of fortification

Flour and flour products

- Generally, household use of wheat flour in the preparation of family meals was found to be very low as most respondents indicated they purchased finished flour products for household use. Less than 3% (44) of all the women interviewed reported using flour at least once a week in the preparation of a family dish.

- Even though 44 women indicated they used flour at home, on the day of the interview only 25 out of 1511 women interviewed had flour in the house, representing only 1.7% of all women interviewed.

- A total of 79 flour samples were collected with a mean ferrous fumarate concentration of 39.8 mg/kg. The minimum value was 16 mg/kg and maximum was 99 mg/kg. Over 64% of the small number of flour samples collected had concentrations of ferrous fumarate below 40 mg/kg, less than the 45 mg/kg stipulated in the Ghana Standard

- Flour-based products were available in some households on the day of the interview, e.g. 205 (13.6%) of respondents had bread in the house, 101 (6.7%) had pastries and 18 (1.2%) had doughnuts and bofrot and 324 (21.4%) had at one or more of these products in the household. Across the ecological zones, among those who had flour-based products the highest percentage was found in the Southern zone (41.0%) followed by the Northern (32.7%) and the Middle zones (26.3%) respectively.

- Results from the seven day food frequency questionnaire showed that 48.6% of children 6-24 months consumed bread, 39.3 % consumed pastries on at least 3 or more days a week, compared to 13.9% consuming doughnuts, bofrot and toogbei.

- Among the different types of wheat flour products locally available, consumption of bread on 3 or more days/week by women was found to be highest (43.4%), followed by pastries and biscuits (18.7%) and doughnuts, bofrot, toogbei and similar products (11.2%) and 73.6% had consumed flour at least one or more of these products 3 or more days/week.

Iodine deficiency disorders (IDD)

- Although a total of 762 (50.4%) of those interviewed said they knew the benefits of iodized salt, only 161 (21.1 %) of them were able to list the correct benefits of consuming iodine, which is prevention of IDD.

- Only 596 (39.5%) of those interviewed had ever used iodized salt. The 915 (60.5%) who did not use iodized salt gave various reasons including; 330 (36.1%) who said there are other types of salt more available, 269 (29.4%) said it was too expensive, 206 (22.5%) said they did not know what iodized salt was, 34 (3.7%) said they did not like the taste of iodized salt.

- A total of 1385 salt samples were analyzed by the titration method and 116 (8.4%) were not iodized (0 ppm), 602 (43.4%) showed levels of iodine <15 ppm, and 665 (48%) were $\geq$15ppm. By this method 52% of salt was not adequately iodized (<15ppm).

- Results of salt analyses by the rapid test kit detected that of the 1362 of salt samples tested, 838 (61.5%) were not iodized (0 ppm), 222 (16.3%) had iodine concentrations <15ppm and 302 (22.1%) had iodine concentrations >15ppm. By this method 77.8% of salt was found to be inadequately iodized with levels of iodine < 15ppm. The difference in % between the titration method and the rapid test kit indicates a higher number of false negatives produced by the rapid test kit.

- Overall, 401 (40.5%) of the children studied had iodine deficiency to varying degrees of severity: severe iodine deficiency was found in 70 (7.1%), moderate iodine deficiency in 13.2

% and mild in 20.2%. Optimal and adequate levels of iodine were found in 384 (38.8 %) of children's urine samples. Excess concentrations (>299 μg/L) were found in 20.7% of samples The urinary iodine profile among the three zones showed the prevalence of all levels of deficiency was highest in the northern region, but of particular concern was the greater number of children with severe and moderate iodine deficiency (64 [13%] and 97[20%], respectively) in that region compared to the Southern (0, and 5 [5%]) and Middle zones (6 [1.5%] and 29 [7%]).

- Of the 1369 urine samples analysed from WIFA, 144 (10.5%) had severe deficiency, 15.2% moderate deficiency and 21.4% were mildly deficient, indicating an overall prevalence of deficiency of 47%, similar to the children. The urinary iodine profile among the three zones, showed the prevalence of all levels of deficiency were highest in the northern region, but of particular concern was the greater number of WIFA with severe and moderate iodine deficiency (104, [21.7%] and 125 [26%], respectively) compared to the Southern (26 [6%] and 41[9.5%] and Middle zones (14 [3%] and 42 [9%]).

1 CHAPTER ONE – BACKGROUND AND OBJECTIVES

1.1 Introduction

The implementation of both the Food Fortification Project (FFP) and the Salt Iodization Programme is part of a comprehensive and integrated program to address micronutrient deficiencies in different target groups in Ghana. The micronutrient deficiencies of public health significance in the country are iron deficiency anaemia (DHS 2003; WHO 2001), vitamin A deficiency (Ghana MOH, GAIN unpublished report 2007) and iodine deficiency disorders (IDD) (UNICEF Impact Survey, 2007). In addition to fortification, other interventions to reduce micronutrient malnutrition currently being undertaken by the health sector in collaboration with partners are supplementation, nutrition education and dietary diversification.

1.2 Food Fortification Project (FFP)

The Ghana FFP, a public-private sector partnership with funding from the Global Alliance for Improved Nutrition (GAIN) and the Government of Ghana, was designed to improve the micronutrient status of vulnerable population groups through the increased availability, access, utilization and intake of selected fortified foods.

The goal of the project is to reduce micronutrient deficiencies among children aged two to five years and Women in Fertile Age (15 to 49 years; WIFA) through fortification of wheat flour and vegetable oil. The three-year project aims to fortify 100% of the total annual production of (a) commercially produced wheat flour with iron, vitamin A, vitamin B1, B2, B6, B12, folic acid and zinc and (b) commercially processed, imported bulk and pre-packaged vegetable oil with vitamin A. In addition the project aims to promote the consumption of fortified wheat flour and fortified vegetable oil through a social marketing campaign and an advocacy program.

1.3 Progress of implementation – FFP

Following preparatory activities that included detailed planning, drafting of the Legislative Instrument (LI), development of tools, setting of standards for fortificants and premix, conducting baking trials and training of key stakeholders, fortification commenced in July 2007. A nationwide baseline survey that compiled information on Knowledge, Attitude and Practices (KAP) on

fortification and micronutrient-rich foods, socioeconomic as well as biochemical data, was undertaken before the start of fortification.

Currently all flour processed in the country is fortified with the combination of vitamins and minerals as specified in the Ghana fortification standards by the four wheat flour millers. Vegetable oil fortification with vitamin A is however being undertaken by only three vegetable oil companies that are involved in either processing or packaging in the country.

There is an on-going production level regulatory monitoring system comprising both internal and external monitoring. The system has been in place since the inception of the project with the aim of ensuring good Quality Control (QC) / Quality Assurance (QA) practices according to the set quality and safety standards. The monitoring system entails routine internal monitoring of the fortification process by taking random samples of flour and measuring fortificant in the laboratory by producers. The internal monitoring performed by the industry during production is complemented by external monitoring performed by the Ghana Food and Drugs Board (FDB), the regulatory body with the mandate to ensure food control focuses on testing for compliance and adequacy of fortificant levels. The external monitoring involves monthly visits by government inspectors to flour and oil mills for technical audits which entails checking premix quantity and quality as well as the internal QA systems through review of production records to verify performance of the QC/QA procedures and collection of samples for analysis.

Post market surveillance is also conducted nationwide in selected markets, shops and supermarkets twice a year by the FDB during which flour and oil samples are collected for analysis. The results from the regulatory monitoring have demonstrated that the project is operating quite satisfactorily with regards to flour fortification. Presently all the flour produced in the country is fortified. Scaling up vegetable oil fortification has been difficult and slower due to the involvement of a large number of smaller oil producers and importers. There is now a renewed and on-going effort to bring major processing groups together and provide them with technical support to boost production of fortified oil. Additionally, various groups that are involved in distribution and bulk utilization of vegetable oil are being mobilized in a nationwide sensitization drive.

In addition to accelerating the production and availability of fortified products, awareness and demand for fortified products has been enhanced through social marketing and community mobilization strategies which have been developed and are being implemented nationwide. Communication materials developed are radio messages, print materials such as fliers, posters on both oil and flour, and advertisements on aprons for bakers. Media practitioners and bakers from all the regions have been trained to improve their knowledge of fortification and enable them operate as change agents to sensitize consumers. Intensive mass media campaigns on FFP and its benefits have been launched and rolled out since February 2008 to inform consumers about benefits of consuming fortified foods. Traditional food vendors and other women's groups have been given orientation, in addition to on-going community based education integrated into various programs by health staff. A Ghana fortification logo has been produced and used to brand all print materials.

1.4 IDD Control Program

In response to the findings of the 1992/1994 baseline survey that established IDD as endemic in the country, a follow-up stakeholders' consensus meeting was held which recommended salt iodization as the main control strategy. This led to the initiation of the salt iodization program including the start of the legislative process to support salt iodization in the country. The Food and Drugs (Amendment) Act, 1996, Act 523 was thus passed by Parliament in December 1996 to make provision for mandatory fortification of salt with potassium iodate.

The goal of the national IDD control program is the virtual elimination of IDD and the target is to achieve at least 90% of USI for human and animal consumption.

1.5 Progress of implementation – IDD Control Program

Production of iodized salt for human and animal consumption started in 1995 with support from UNICEF and the Government of Ghana. The UNICEF support has mainly been in the form of capital equipment and recurrent supplies including iodization plants and fortificant (potassium iodate), as well as providing funding for training stakeholders and monitoring of progress of implementation. The Ghana Health Service with support from UNICEF has undertaken a series of educational activities using mass media, health facility based communication, and in school-based communication, to create awareness about the health consequences of IDD and its prevention through consumption of

iodized salt. The National Salt Producers Association of Ghana has been supportive, and collaborated by mobilizing members to participate in the program.

There are systems in place to monitor iodine levels in salt at production sites, assess availability of iodized salt in markets and household coverage of iodized salt. Monitoring is done by the FDB and the Nutrition Department of the Ghana Health Service. The FDB monitors the quality of iodized salt at production sites and factories and in shops while the Nutrition Department undertakes annual household surveys to determine consumption of iodized salt and market surveys to determine access. In addition, assessment of household coverage is incorporated into the 5 yearly Ghana Demographic and Health Survey (DHS) conducted by the Ghana Statistical Service.

Up until 2005, data from surveys have indicated that household coverage of iodized salt had generally shown an increase (Table 1) although not steadily. Coverage of iodized salt increased from a low of 0.3% at the early stages of the program in 1997 and reached 74.4 % in 2005. However, the Multi Indicator Cluster Survey (MICS, UNICEF 2006) showed the coverage of any salt to be only 50.8% (Table 1).

Key reasons for the variable coverage include poor and ineffective enforcement of legislation on salt iodization and an erratic and unreliable supply of potassium iodate. The social marketing component of the program has also been inconsistent and uncoordinated, an indication of the need to review data on trends in awareness about iodized salt and the persistent misconception and poor knowledge about usefulness and benefits of iodization as well issues related to availability. Not only has coverage been low, there have also been major issues related to the quality of the iodized salt and current figures show that only about 32.4% of the iodized salt consumed is adequately iodized, and this is far below the standard 90% of USI target (Table 2).

It is important to note that most of these surveys have used rapid test kits which show qualitative data on presence or absence of iodine above or below 15 ppm making it critical for the current survey to invest in salt titration to conclusively and more accurately assess the proportion of adequately iodized salt.

Table 1: National Trend in Household Consumption of (any type of) Iodized Salt

YEAR	1997	1998λ	2002 λ	2003 λ	2005 λ	2006
% Households Consuming iodized salt*	0.3	22.1	50.0	44.4	74.1	50.8**

* Any type of iodized salt i.e. adequately iodized or inadequately iodized,
** MICS Report (UNICEF 2006),

λ Nutrition Dept-GHS

Table 2: Percent of Households consuming iodized salt containing < or >15ppm potassium iodate, 2005 and 2006

YEAR	2005			2006		
Iodization level	Inadequate Iodine (<15 PPM)	Adequate Iodine (≥15PPM)	Any iodized salt (col 1+2)	Inadequate Iodine (<15 PPM)*	Adequate Iodine (≥15 PPM)*	Any iodized salt* (col 4+5)
National average	24.8	49.3	74.1	18.4	32.4	50.8*

+ Population weighted averages, * MICS 2006 report. + (%)

1.6 Significance of the present survey on fortified foods (including iodized salt)

At the midpoint of the of project implementation of the FFP, it was necessary that a survey was undertaken to track changes in knowledge trends, by collecting information on the penetration and success of communication efforts. Beyond an assessment of communication messages and inputs to increase the awareness among consumers, it is important to measure primary outcomes such as "reach" and "coverage" among the population with adequately fortified foods. Therefore, the survey was designed to generate data on two key indicators of the FFP program:

1. Knowledge, attitudes and practices (KAP) related to food fortification

2. Availability and utilization of adequately fortified foods at household level - used to generate estimates of 'coverage' among target groups and 'reach' among the total population

Taken together, these data will help document areas of success and determine which aspects of the program need strengthening to improve program performance.

Over the last 10 years, the IDD program has made important progress. Available data on the programme however, indicate stagnation and in some areas even decline in household coverage and there is also increasing evidence of reduction in salt quality in terms of levels of iodization. There are on-going efforts to streamline the process and strengthen implementation. There is the need to document the experience and progress made to date, assess demand among different segments of the population and generate more robust figures of household coverage. Information on these programme issues are expected to input into improving program performance and also serve as a basis for future evaluations. The survey will therefore provide data for programme decisions to enhance implementation of both the FFP and the IDD program and ultimately contribute to the information required for the evaluation of the impact of fortification programs in Ghana.

Given that there are data needs for both programmes and that the sample design required for both are similar, it was decided to undertake a single integrated survey.

1.7 Aim and Objectives

The survey's overall aim was to generate the requisite data to assess the project performance in terms of utilization and coverage/reach and frequency of consumption of fortified wheat flour products and vegetable oil in Ghanaian households, as well as household coverage of adequately iodized salt and prevalence of iodine deficiency measured by urinary iodine.

1.8 Objectives – Food Fortification Project (FFP)

- To assess progress of implementation of the FFP to determine coverage and track the outcome of social marketing and communications

1.8.1 Specific Objectives

- To assess the knowledge of consumers regarding the benefits of consuming fortified wheat flour products and vegetable oil.

- To compile information on the purchase and availability of adequately fortified vegetable oil, and flour and availability of flour-based products in households.

- To assess the frequency of consumption of fortified flour products and vegetable oil among children, WIFA, including pregnant and lactating women
- To assess the adequacy of fortification of flour at retail points, and household level
- To assess the adequacy of the fortification of vegetable oil
- To make recommendations for the improvement of the Ghana FFP.

1.9 Objectives – IDD Control Program

To assess the prevalence of iodine deficiency and determine the coverage of adequately iodized salt

1.9.1 Specific Objectives

- To assess the knowledge and awareness regarding the benefits of consuming iodized salt
- To determine the proportion of adequately iodized salt at household level using qualitative and quantitative iodine measurements.
- To provide information on the purchasing patterns of iodized salt
- Investigate the barriers to the consumption/purchase of adequately iodized salt
- To determine the prevalence of low urinary iodine in school children (6 to 12 years) and WIFA
- To make recommendations for the improvement of the salt iodization program

1.10 Design

The survey aimed to obtain data to allow interpretation of the results for each of the three ecological zones (South, Middle, and North) for household based data (e.g. coverage with adequately fortified food). Further, with regard to UI, it aimed at enabling stratification into two target groups, namely children aged 6 to 12 years as well as WIFA (15-49 years).

As part of the survey, samples of refined vegetable oil, wheat flour and salt were taken from households for determination of the respective levels of fortification with vitamin A, iron and iodine.

To assess iodine status, urine was collected from both the WIFA and the schoolchildren for determination of UI excretion.

1.11 Methodology

1.11.1 Sample Size Determination and Study Design

The sample size calculation for this survey was challenging and was based on many assumptions. For instance, the sample size calculation based on expected household coverage was not feasible, as the past data for flour and oil was very old. Equally, the calculation based on coverage with iodized salt was difficult, as the two most recent surveys yielded considerably different results and thus, the choice of either one was expected to give varying sample sizes (MICS Report, 2006; Ghana Health Service, 2005). The more recent results available are those on iodine deficiency in respondents aged 10-19 years (UNICEF, 2007) which reported the prevalence of low UIE in the Jirapa and Bongo districts in the North of Ghana and found a median well below the cut-off of 100µg/L (51.6 and 62.5µg/L for the two zones, respectively).

Therefore, the sample sizes and sampling design were based on the nationally representative sample of the Food Fortification Baseline Survey that used 15 households per cluster and 30 clusters per sampling frame (Ghana Food Fortification Baseline Report, 2007).

With regards to the sampling design, a multi-stage cluster sampling procedure was used in order to select households and individuals following basic principles of population proportionate to size (PPS) sampling methods. Each of the three major ecological zones in the country represented independent sampling frames. Within each of the eco-zones, 30 clusters, or enumeration areas (EA) were selected by PPS through the construction of a listing of all EA's along with their population size. The demarcation of EA by the Ghana Statistical Service (GSS) was applied. A list of current census EAs was obtained from the GSS for the selection of EAs. Each EA selected thus represented one cluster. Once the 30 clusters were identified, a systematic sampling selection was undertaken to select 15 households within each cluster.

The number of households selected was similar to what was used at the baseline survey (Ghana Food Fortification Baseline Report, 2007). As expected in almost every household, there was at least one

WIFA. Where there was more than one woman or child who was eligible in the household one of them was selected randomly. In the event that there was no WIFA or school child, the survey teams skipped that household.

The only eligibility criterion applied for this survey was that there should be at least one subject (WIFA) that was targeted in the selected household and as such, the number of households sampled for the total survey was expected to be 1350 (3 ecological zones x 30 clusters x 15 households). The maximum number of WIFA and schoolchildren was to be the same, but as it was less likely to find a schoolchild in a household than a WIFA, the total number of schoolchildren recruited was expected to be lower. To account for this, the protocol was modified slightly to increase the number of households to 17/cluster making a total 1530 households. It is important to note that this sampling approach was applied to only parts of the survey e.g. household coverage and IDD prevalence.

1.11.2 Study implementation

At the start of interviews, there was a brief community sensitization step and consent was sought from respondents at each potentially eligible household which was visited and it was verified that at least one target subject (WIFA or schoolchild) was living in the household. A structured questionnaire was then used to collect information on key variables: selected socio-economic information and related household/individual characteristics as well as on KAP about the benefits of fortified food including iodized salt. Subsequent to the interview, samples of refined oil, salt and wheat flour were obtained from the household in sufficient amounts for later quantitative analysis to determine the concentration of the fortificant in the food/condiment.

Where flour or oil samples were not available at household level, the point of purchase was identified by requesting information from the household interviewee and upon completion of the household interview, a member of the survey team purchased the brand as described by the respondent, and samples for analysis were taken from this product at the time of the interview.

For the assessment of UI, the survey team collected samples from selected WIFA and school children. At the end of the working day, the survey teams decanted two aliquots from each urine sample into 5 mL urine containers for later analysis. The samples were transported on ice to a refrigerator in the area where the field team was working. Later, all samples were transferred to the Kintampo Health

Research Centre where the urine samples were stored frozen (-20°C), the oil samples kept cool and in the dark, and the flour and salt samples stored in dry conditions until they were sent out by courier to Switzerland (oil and flour) and South Africa (urine and salt) for analysis.

Questionnaire modules used:

- Educational status, occupation, household assets to identify the socio-economic status of the household
- Knowledge about fortified foods and benefits.
- Recognition of fortification logo.
- Frequency of purchase of fortified wheat flour or flour products, vegetable oil and salt;
- Availability of vegetable oil and wheat flour or flour products and salt at the household level
- Frequency of consumption of wheat flour products and meals prepared from vegetable oil by target groups and other household members
- Awareness about iodized salt and knowledge about benefits of consumption
- Acceptability/perception of iodized salt among the population and knowledge of benefits and misconceptions regarding its use
- Reasons for not using salt or for purchasing non-iodized salt
- Questions that relate to the purchasing behavior of processed foods containing iodized salt
- Complementary feeding practices
- Percentage of households using iodized salt/number of households in which only iodized salt is available.

1.11.3 Questionnaires/ Instruments Development

Data collection instruments, including household enumeration forms, sample collection forms and consent forms were developed to facilitate interviews, enumeration and management of field work.

Two types of forms were developed for data collection (Appendices)

- A household form with sections for household interviews containing five main sections:
    i. questions regarding demographic and socio-economic information,
    ii. KAP questions regarding fortified foods
    iii. questions covering food purchase practices, availability and intake
    iv. section identifying the food/condiment samples collected at households
    v. section which captured information on oil, salt and flour availability at the household level.
- A laboratory form collected information on urine sample collection from both the WIFA and school child.

Each selected household was given a unique identification number which appeared on the questionnaire. Similarly, each selected woman and child was given a unique identification number, which appeared on questionnaires, forms and urine samples. The containers for the samples of salt, flour and oil had household identifiers. Two salt samples were collected: one for the rapid test kit (UNICEF) and the second sample was shipped out of the country for analysis using the titration method in South Africa (see details later).

All study instruments were piloted and feedback discussion sessions were held to address issues on clarity of questions, concepts and procedures during training.

1.11.4 Survey Plan

Phase 1- Preparatory Activities

- Preparatory activities prior to the field data collection e.g. sampling frame and the selection of survey/target areas.

- Questionnaire Development – all required forms and questionnaires were developed, reviewed and pre-tested in a non-study community and revised.

- Training and recruitment of interviewers – A two-day training was conducted for field interviewers (nutritionists and other qualified field interviewers/enumerators) to understand how to collect the required data. Training covered community entry, laboratory sample collection and handling as well as general interview techniques

- Assessment and procurement of laboratory inputs and other logistic requirements.

- Pilot Survey – this was conducted in a peri-urban area, not included as part of the main survey, to identify from actual field experiences quality control measures as well as operational strategies and schedules to facilitate the movement of survey teams from one survey area to the next. The pilot study also served as further training for the enumerators and pre-testing of questionnaires.

Phase 2- Community Preparation

- Pre-survey Visit – to have discussions and meetings with key health and other local government officials and community leaders in the survey areas to (1) brief on objectives, procedures, survey schedules and necessary logistical arrangement and (2) secure lists of sample households.

Phase 3 – Field Data Collection

- House-to-house data collection methods were employed to gather the data on listed key variables in the cross-sectional survey. Individual household interviews using structured questionnaires were conducted as follows:

Utilization/Consumption

- 7-day Food Frequency Questionnaire on consumption of wheat flour products and vegetable oil targeting children WIFA (including pregnant and lactating women)
- KAP on fortified flour, oil and iodized salt
- Related household/individual characteristics- age, sex etc

1.11.5 Field Work

After completion of a-three day training, the data collection team members were assigned to three teams namely the Northern Team, the Middle Team and the Southern Team with one member assigned the role of Field Coordinator. Each team comprised six members and was expected to cover 30 EA's in each designated zone. The teams were assigned to cover the following regions as described in Table 3:

Table 3: Enumeration areas in each zone

Northern Team	**Middle Team**	**Southern Team**
Upper East Region	Brong-Ahafo Region	Greater Accra Region
Upper West Region	Ashanti Region	Western Region
Northern Region	Eastern Region	Central Region, Volta Region

All the team members reported to their respective zones. Teams held meetings and discussed issues concerning the final corrections that were made to the questionnaire for data collection, this also included drawing up a survey strategy and logistics were received for the survey to begin. Each team was assigned a vehicle and a driver.

A. **Northern Zone (Northern, Upper East and Upper West regions)**

1. A total of 30 EAs were covered and 508 households were visited
2. 1,008 urine samples were collected made up of 501 WIFA and 507 children (6-12 yrs)
3. A total of 502 household salt samples were tested at the household.
4. A total of 55 household oil samples, 2 household flour and 27 community flour samples were collected.

5. A total of 508 questionnaires were completed and 17 households/EA were visited except for an EA called Doli where the community was much smaller and only 15 households could be covered instead of the stipulated 17 because there were insufficient households.

B. **Middle Zone (Brong-Ahafo, Ashanti and Eastern regions)**

1. A total of 30 EAs were covered and 494 households visited
2. Urine samples (n=889) were collected from 476 WIFA and 413 schoolchildren.
3. Total number of salt samples collected was 453
4. Total number of oil samples was 128
5. 11 flour samples were collected from households
6. 494 questionnaires were completed

C. **Southern Zone (Greater Accra, Volta, Central and Western regions)**

1. A total of 30 EAs were covered and 509 households were visited
2. Urine samples (n=562) were collected: 102 from school children and 460 from WIFA
3. 442 salt samples were collected
4. 120 oil samples were collected
5. 30 flour samples were collected from households.
6. A total of 509 questionnaires were completed

A summary of questionnaires completed and samples collected is given in Table 4.

Table 4: Total number of questionnaires and samples collected over the survey period

Zone	Regions	Questionnaires administered	EA	WIFA Urine	Child Urine	Salt	Oil	Flour
Northern	Northern Upper East Upper West	508	30	501	507	502	55	29
Middle	Brong Ahafo Ashanti, Eastern	494	30	476	413	453	128	11

Southern	Greater Accra Volta, Central Western	509	30	460	102	442	120	30
Total		1,511	90	1,437*	1,022*	1,397	303	70

2459 urine samples collected from both women and children.

1.12 Laboratory Procedures

Analytical methods

1.12.1 Vitamin A in oil

Determination of the vitamin A concentration in refined vegetable oil was done by the Swiss Vitamin Institute (SVI), Epalinges, Switzerland using a modified gradient reverse-phase, high-performance liquid chromatography (HPLC) system (Waters HPLC System, Waters, Eschborn Germany). The method is based on that described by Gimeno *et al* (Gimeno *et al,* 2000) with minor modifications. The intra-assay coefficient of variation (CV) obtained by SVI was 3.03% and 2.32% for 10 measurements of two oil samples of known concentration. The SVI is accredited as a laboratory for vitamin analyses in accordance with the Standard International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) 17025.

1.12.2 Iron in flour

Determination of iron concentration in wheat flour was done by inductively coupled plasma optical emission spectrometry (ICP-OES) by the UFAG Laboratorien AG (Postfach, Switzerland). The laboratory is a member of the Food Analysis Performance Assessment Scheme (FAPAS), an external quality assurance scheme run by the United Kingdom (UK) Food and Environment Research Agency and has the UKAS accreditation certificate and complies with ISO 17025. All data was electronically stamped using a Laboratory Information Management System (LIMS) which automatically checks data against QC data.

1.12.3 Iodine in table salt

Iodine determination in table salt was completed using two different methods:

1. The field staff used the rapid test kit at the household to do a qualitative assessment of the iodine content of the salt. The rapid test kit was used by adding a few drops of reagent A onto the surface of the salt sample. The reagent typically consists of an acidic buffer, a reducing agent, which reduces the iodine in the KIO_3 to I_2, and starch, which forms a blue-black complex with the released iodine. If no colour developed solution B was added and a retest done. The iodide concentration of the salt was determined by matching the colour of the solution with the colour charts.
2. The second method was the titration method using a modified version of the method of DeMaeyer et al (1979)(3) conducted in the laboratories of the Nutritional Intervention Research Unit, South African Medical Research Council (SA MRC). The intra-assay CV for low salt pool was 3.75%, for the medium salt pool was 1.80% and for the high salt pool was 3.47%. The inter-assay CV was 4.12% over eight analysis runs.

1.12.4 Urinary iodine

Determination of urinary iodine concentration was completed using a method which includes a digestion step followed by the Sandell-Kolthoff reaction (4) at the Nutritional Intervention Research Unit, SA MRC. The laboratory is a member of the EQUIP (CDC, Atlanta, USA) external quality assurance scheme and has performed well over the last four years of reporting (2007-2010); CV ranged from 2.3–8.8%. The intra–assay CV for the assay of 4 samples 10 times over 2 days, ranged from 1.24% to 15.37% (at low concentrations).

1.13 Quality Control

In addition to training Research Assistants on the questionnaires and survey procedures, all instruments were pre-tested before finalization. Data collection was supervised by team leaders who reviewed completed forms and undertook field editing daily to ensure accuracy and completeness. All data collected were double entered and verified for consistency. Specific quality control checks were carried out during laboratory analysis. There was one field coordinator who served as a liaison between teams and provided backup support.

1.14 Data Processing

At the end of field data collection, each questionnaire was manually checked for completeness and forms were double entered into computers. Data was entered with Microsoft Foxpro then cleaned and range and consistency checks carried out. Analyses of the data and tables were generated using STATA version 8.

2 CHAPTER TWO – RESULTS

2.1 Demographic, Socio-Economic, Marital Status, Household Characteristics

A total of 1511 questionnaires were administered to 508 (33.7%), 494 (32.6%) and 509 (33.6%) women in the Northern, Middle and Southern zones respectively (Table 5). A total of 17 household interviews were carried out in each EA with the exception of six EAs where 15 interviews were carried out. There was however one EA (Omanpe Chief's palace in the Southern zone) where 20 household interviews were conducted.

2.2 Description of Respondents

A total of 1511 respondents were interviewed in the three zones of the country of which 640 (42.4%) lived in urban and 871 (57.6%) lived in rural areas (see Table 5).

Table 5: Urban-rural distribution of respondents in each zone

	Northern	Middle	Southern	Total
Urban	205 (40.3%)	248 (50.2%)	187 (36.7%)	640 (42.4%)
Rural	303 (59.6%)	246 (49.8%)	322 (63.3%)	871 (57.6%)
Total	508 (100%)	494 (100%)	509 (100%)	1511 (100%)

Figure 1: Ghana Map Showing Administrative Regions

Table 6 shows the distribution of sample by administrative region and the map (Figure 1) displays the geographical areas covered by each zone.

Respondents were women in fertile age group (15 to 49 years) of which 145 (9.6%) were 15-19 years old, 919 (60.8%) were in the age group 20-35 years and 447 (29.6%) were aged 36 – 49 years.

Table 6: Number of household interviews conducted by region

Administrative regions	Frequency	Percent
Northern		
Northern	312	20.6
Upper East	93	6.2
Upper West	103	6.8
Middle		
Eastern	207	13.7
Ashanti	186	12.3
Brong Ahafo	101	6.7
Southern		
Greater Accra	152	10.1
Volta	136	9.0
Western	101	6.7
Central	120	8.0
TOTAL	**1511**	**100%**

2.3 Ethnicity

The Akan ethnic group comprised 32.7% of the sample, the Mole Dagbani 17.2% and Ewes 11.6%. The breakdown by ethnicity is shown below in Table 7.

Table 7: Ethnicity of women in fertile age group (15-49 years) interviewed

Ethnicity	Frequency	Percentage of total sample
Akans		
Fante	128	8.5
Asante	160	10.6
Guan	58	3.8
Bono	67	4.4
Akwapim	45	3.0
Akyem	37	2.5
	494	32.7
Others		
Mole-Dangbe	260	17.2
Ewe	175	11.6
Ga / Adangbe	100	6.6
Dagare	102	6.7
Grussi	50	3.3
Kusasi	21	1.4
Frafra / Gruni	7	0.5

Ethnicity	Frequency	Percentage of total sample
Nzema	16	1.1
Gruma / Bimoba	18	1.2
Hausa	15	1.0
Other tribes	252	16.7
Total	**1,511**	**100**

2.4 Religion

The majority (65.3%) of respondents were Christians, 397 (26.3%) were Moslems. Practitioners of Traditional Religion constituted 2.4% of the sample and 52 respondents (3.4%) had no religion.

2.5 Marital Status

Table 8 below shows the marital status of respondents. Most of the respondents (63.1%) indicated they were married at the time of the survey, 11.6% were living together and 9.3% had never married and had no partners.

Table 8: Marital status of the respondents

WIFA Marital Status	Frequency	Percentage of total number of respondents
Married	953	63.1
Live together	175	11.6
Never married but have partner	148	9.8
Never married don't have partner	140	9.3
Divorced	44	2.9
Widowed	34	2.3
Divorced but have partner	9	0.6
Separated	8	0.5
Total	1,511	100

2.6 Women's Educational Level

The data showed that 942 (62.3%) of women interviewed had ever attended school. Of those who had been to school, the greatest proportion was in the Southern zone 42.7%, 39.7% in the middle zone and 17.6% in the Northern zone. The highest percentage of women (78.9%) who had ever attended school was in the Southern zone compared to only 32.7% within the Northern zone (Table 9.)

Table 9: WIFA who have ever attended school within each zone

	Northern	Middle	Southern	Total (Nat)
Ever attended school	166 (32.7%)	374 (75.7%)	402 (78.9%)	942 (62.3%)
Never attended school	342 (67.3%)	120 (24.3%)	107 (21.0%)	569 (37.7%)

Of the 942 (62.3%) respondents who had some formal education: 283 (30.0%) had primary education, 493 (52.3%) had middle/Junior Secondary School JSS, 141 (14.9%) had secondary school education and only 13 (1.4%) had post-secondary and 12 had university education.

Table 10 shows the zonal disaggregation of educational levels attained by respondents. Only 12 respondents (0.8%) attained tertiary level education and eight of these were in the southern zone. The percentages shown are levels of education as a percentage of the total number of women surveyed.

Table 10: Education level of respondent by zone

	Northern	Middle	Southern	Total (National)
Never been to school	342 (60.1%)	120 (21.1%)	107 (18.8%)	**569 (37.7)**
Primary	57 (20.1%)	124 (43.8%)	102 (36.0%)	**283 (18.7)**
Middle/JSS	69 (14.0%)	196 (39.8%)	228 (46.2%)	**493 (32.6)**
Secondary/Senior School/Vocational	37 (26.2%)	45 (31.9%)	59 (41.8%)	**141 (9.3)**
Post-Secondary	3 (23.1%)	5 (38.5%)	5 (38.5%)	**13 (0.9)**
University/Polytechnic	0	4 (33.3%)	8 (66.7%)	**12 (0.8)**
				1511 (100%)

For reading ability, even though 37.7% of respondents had never been to school, a higher proportion (60.8% of those interviewed) reported that they could not read and understand a letter or newsletter. This could be explained in the most part by the fact that 18.7% completed only primary education and hence would be unlikely to be able to read, similar to respondents who had never been to school. 305 (20.2%) women interviewed said they could read with ease and of this number the highest proportion was in the Southern zone followed by the Middle zone and Northern respectively (Table 11). Out the 1511 respondents, about 19% (287) indicated they could only read with difficulty.

Table 11: Ability of respondents to read and understand a letter or newspaper by zone

n=1511	**Northern**	**Middle**	**Southern**	**Total (National)**
Easy	66 (21.6%)	75 (24.6%)	164 (53.8%)	305 (20.2%)
With Difficulty	34 (11.8%)	137 (47.7%)	116 (40.4%)	287 (19.0%)
Not at all	408 (44.4%)	282 (30.7%)	229 (24.9%)	919 (60.8%)
	508	494	509	1511 (100%)

2.7 Occupation

The predominant occupation mentioned by the women interviewed was employment in "sales and services" (31.1%), and a similar proportion (29.6%) worked in farming as indicated in Table 12. Only 27 (1.8%) indicated they were employed in a professional occupation.

Table 12: Occupation of Respondents

Occupation of WIFA	**Frequency**	**Percentage of total respondents**
Farmer	447	29.6
Sales/services	470	31.1
Unemployed	46	3.0
Skilled manual	185	12.2
Student/apprentice	105	7.0
unskilled manual	41	2.7
Professional	27	1.8
Clerical	2	0.1
Other	46	3.0
Total	1,511	100

2.8 Reproduction

A total of 1310 (86.7%) respondents reported that they had ever given birth while 181 said they had not had any children at the time of the survey. Of those who had ever given birth, 54.7% in the urban area had between one and three children. In the rural area, 402 respondents had 1-3 children and 373 had 4–12 children (Table 13). Overall, 726 respondents (48.0%) had children who were 24-59 months and 891 (59.0%) had at least one child aged 6-12 years of age and some had children in both age categories.

Table 13: Distribution of Children born to Respondents by urban/rural location

	Urban (%)	Rural (%)	Total
No children	101 (15.8%)	80 (9.2%)	181
Had children but died	15 (2.3%)	16 (1.8%)	31
1-3 children	**350 (54.7%)**	**402 (46.1%)**	752
4-12 children	174 (27.2%)	**373 (42.8%)**	547
TOTAL	640 (100%)	871 (100%)	1511

2.9 Age characteristics of selected Children

Women were asked if they had a child in the age group 24-59 months and 760 (50.3%) of the mothers did not, but 232 (15.4%) had children aged between 24-35 months and 513 (34.0%) were between 36-59 months old. Six mothers did not know the ages of their children.

2.10 Complementary Feeding

Complementary feeding practices were explored by asking respondents who had a child in the age group 6-24 months about current practices. Of the 461 (30.5%) who had a child aged 6-24 months, 355 (23.5%) had been feeding complementary food. Among those who had started giving their child complementary food, 167 (47%) of introduced food when the child was 6 months old and 106 (29.8%) gave complementary food when the child was less than 6 months of age, whiles 83 (23.4%) did so after 6 months of age but not more than one year of age.

Of the 355 who had fed complementary foods, 221 (62.3%) said they took their own decision to start the complementary feeding and 117 (33.0%) said they were asked to do so by health staff, 11 (3.1%) were told either by their mother or their mother in law and the others said they were advised by their husbands, other family members or based on information from TV/radio or newspapers.

With regards to types of complimentary foods, of the 355 who had introduced complementary feeding at the time of the survey, 282 (79.4%) responded that they had used local homemade foods, 38 (10.7%) said they used local artisanal made foods and 39 (10.9%) used other commercial products and 77 (21.6%) had introduced commercial and local artisanal made complementary foods.

143 out of 355 mothers who had reported having given their children complementary foods specified what they gave to their children. 35 (24.4%) gave Weanimix, 42 (29.3%) gave soy mixes from clinic, and 50 (34.9%) had given Cerelac. 16 (11.1%) reported giving other complementary foods. Of the

total of 143 who specified which complementary foods they had given 17 (11.9%) fed complementary foods to their infants once a day, 44 (30.7%) did so twice a day, 66 (46.1%) three times a day, 6 (4.2%) four times a day and 10 (6.9%) five times or more.

2.11 Age of Cessation of Complementary Feeding

Mothers were asked at what age (in months) they were likely to stop giving complementary porridge to children. Responses from 133 mothers who had a child between the ages of 6-24 months are shown in table 14.

Table 14: Age of Cessation of Complementary Feeding

Age (months)	Frequency	Percentage
<6	2	1.5
≥6-<9	12	9.0
≥9-<12	10	7.5
≥12-<18	24	18.0
≥18-<24	25	18.8
≥24	60	45.1
Total	133	100

3 CHAPTER THREE - KNOWLEDGE AND PRACTICES RELATED TO FOOD FORTIFICATION

3.1 Knowledge of Fortification

General knowledge of the concept of food fortification was low among respondents and there were significant differences between zones. Knowledge of fortification was highest in the Middle zone (41.2%), and lowest in the Northern zone (24.0%) and these differences were significant (p<0.001) (Table 15). Figure2 shows that there has been some level of improvement in knowledge between the baseline situation compared to midterm.

Table 15: Heard about Food Fortification by Zone

	Northern	Middle	Southern	Total
Yes	121 (**24.0%**)	208 (**41.2%**)	176 (34.8%)	505 (33.4%)
No	387 (38.5%)	286 (28.4%)	333 (33.1%)	1006 (66.6%)
Total	508 (33.6%)	494 (32.7%)	509 (33.6%)	1511 (100.0%)

Figure 2: Knowledge of fortification – comparison of Midterm and Baseline survey

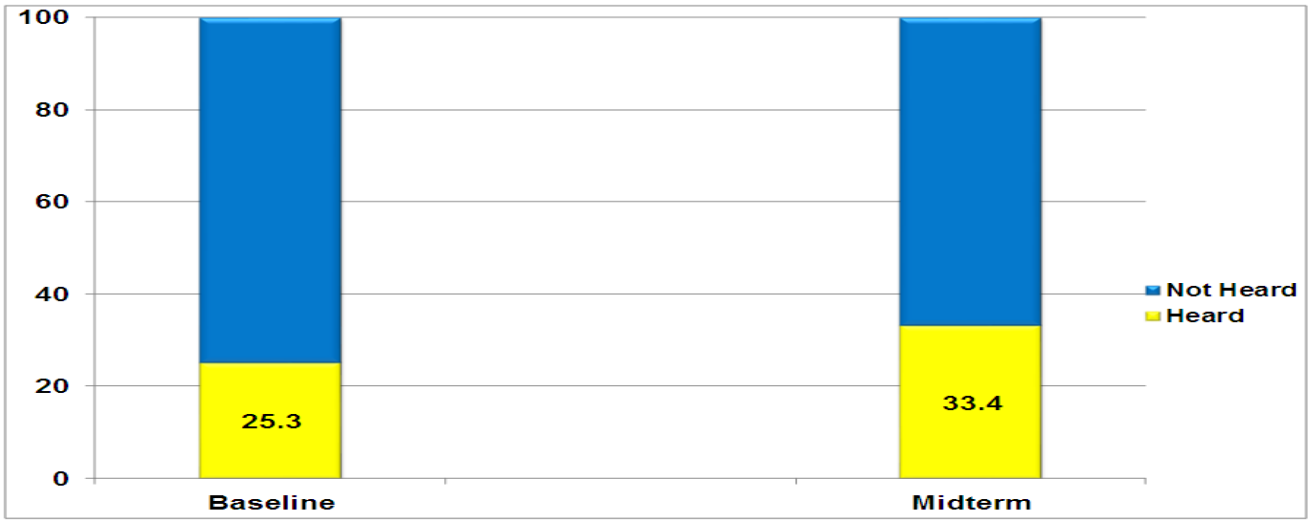


Table 16: Heard about Food Fortification within Zone

	Northern	Middle	Southern	Total
Yes	121 (23.8%)	208 (42.1%)	176 (34.6%)	505 (33.4%)
No	387 (76.2%)	286 (57.9%)	333 (65.4%)	1006 (66.5%)
Total	508 (100%)	494 (100%)	509 (100%)	1511 (100%)

From Table 16, 23.8% of respondents had heard about food fortification in the Northern Zone which was relatively lower than 42.1% out of 494 who had heard in the middle zone. Respondents were

asked about the sources of information on food fortification. Of the 505 respondents who indicated they had heard about food fortification 234 (46.3%) said they heard about it from the radio, 87 (17.2%) from TV, 44 (8.7%) from friends and family and 9 (1.8%) from leaflets. Only one person read about it from the newspapers. Health workers as the main source of information on food fortification were mentioned by 226 (44.7%) of those interviewed and 16 (3.2%) got their information from churches or mosques while 22 (4.3%) got the information from community based volunteers. Although bakers and traditional caterers' associations have been involved in the on-going awareness and demand creation activities, no one reported hearing about food fortification from any of the representatives of these groups. It was interesting to note that 28 (5.5%) of respondents cited getting information from schools.

The 505 respondents who had heard about food fortification were asked what they knew were the health benefits of consuming fortified foods. Of those who had heard about food fortification, 339 (67.1%) said it promoted good health, 80 (15.8%) said it *gives blood*, 199 (39.4%) said it gives strength. Only 25 (4.9%) said it improves school performance, but 58 (11.4%) said it improves child survival and 12 (2.4%) said it improves work output. 132 (26.1%) were of the opinion that it prevented illnesses and 14 (2.8%) said fortified foods improved eye sight.

3.2 Knowledge of the Current Food Fortification Project (FFP) in Ghana, Communications and Identification of Fortification Logo

Knowledge of the specific food fortification programme in Ghana was lower compared to knowledge of food fortification as a general concept. Of the 505 respondents who knew about food fortification, only 348 (23.0%) respondents were aware of the FFP in Ghana and there were significant differences in knowledge between zones ($p<0.0001$). Knowledge about fortification in Ghana was highest in the Middle zone (53.4%) and lowest in the Northern zone (15.2%) as shown in table 17 and figure3 below.

Table 17: Heard about the ongoing Food Fortification in Ghana by Zone

	Northern	Middle	Southern	Total
Yes	53 (15.2%)	186 (53.4%)	109 (31.3%)	348 (100%)
No	455 (39.1%)	308 (26.5%)	400 (34.5%)	1163 (100%)
Total	508 (33.6%)	494 (32.7%)	509 (33.7%)	1511 (100%)

Within the Northern zone where the knowledge was lowest only 10.4% knew about food fortification compared to 37.6% in the Middle zone (Tables 18).

Figure 3: Respondents who had heard about the ongoing Food Fortification in Ghana by Zone

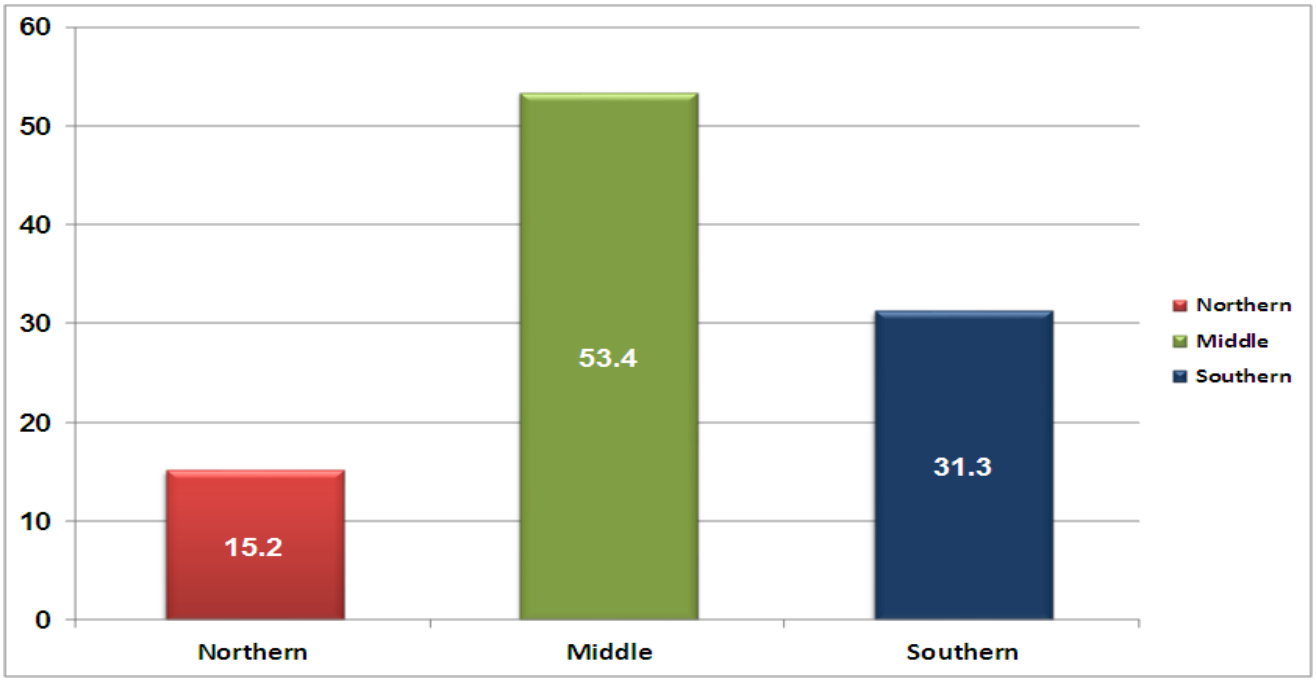


Table 18: Heard about the ongoing Food Fortification in Ghana within Zone

	Northern	Middle	Southern
Yes	**53(10.4%)**	**186 (37.6%)**	**109 (21.4%)**
No	**455 (89.6%)**	**308 (62.3%)**	**400 (78.6%)**
Total	508 (100%)	494 (100%)	509 (100%)

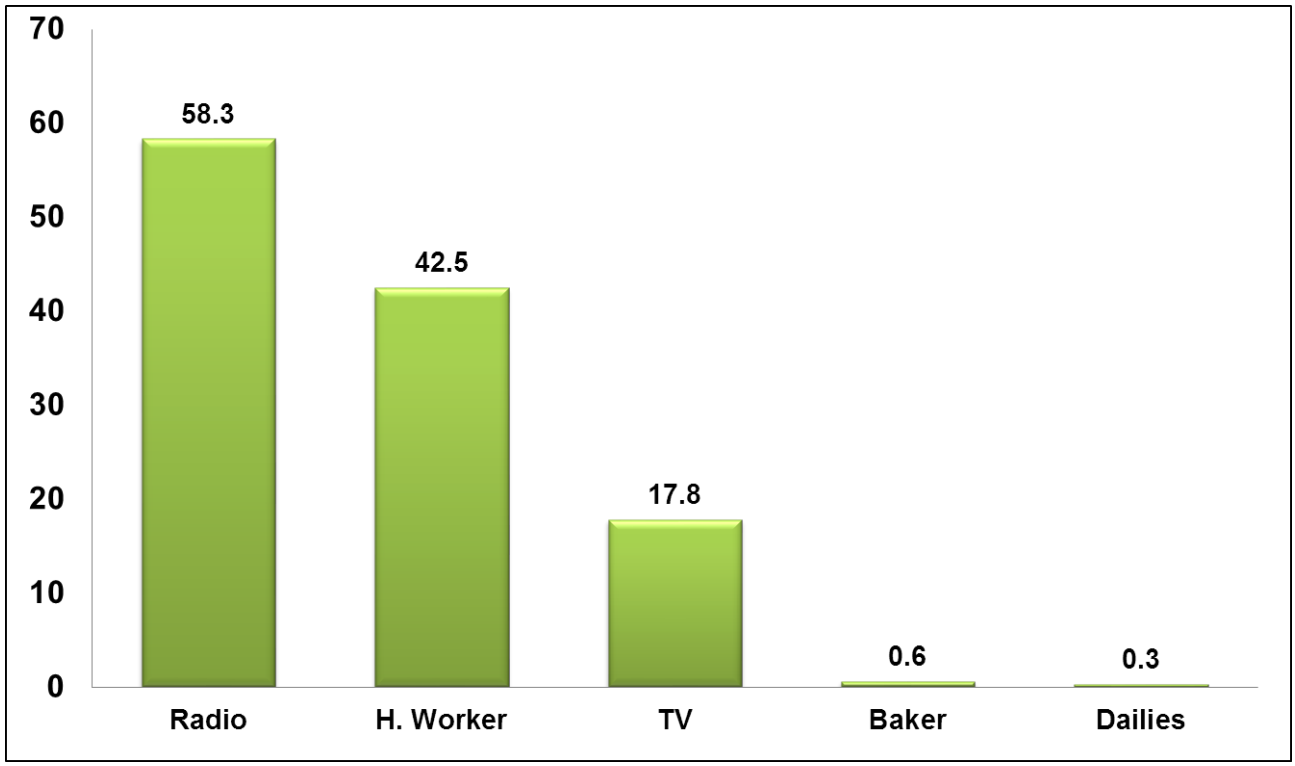
The sources of information regarding the fortification programme in Ghana were explored and 203 (58.3%) of respondents reported they heard about food fortification from the radio and only one person had read about it from the newspapers. Health workers were a major source of information on food fortification for 148 respondents (42.5%). Television accounted for 62 respondents (17.8%) and only two reported hearing about food fortification from bakers or traditional caterers. It was

interesting to note that 6 (1.7%) and 8 (2.3%) respondents heard about this from friends and schools respectively (Table 19 and Figure4).

Table 19: Source of Information about Ghana's Food Fortification by Zone

	Northern	Middle	Southern	Total (National)
Radio	19 (9.4%)	128 (63.0%)	56 (27.6%)	203 (58.3%)
TV	9 (14.5%)	31 (50%	22 (35.5%)	62 (17.8%)
Health workers	22 (14.9%)	93 (62.8%)	33 (22.3%)	148 (42.5%)
Daily Newspapers	0	0	1	1
Baker/caterer	0	1	1	2

Figure 4: Sources of Information on Food Fortification in Ghana

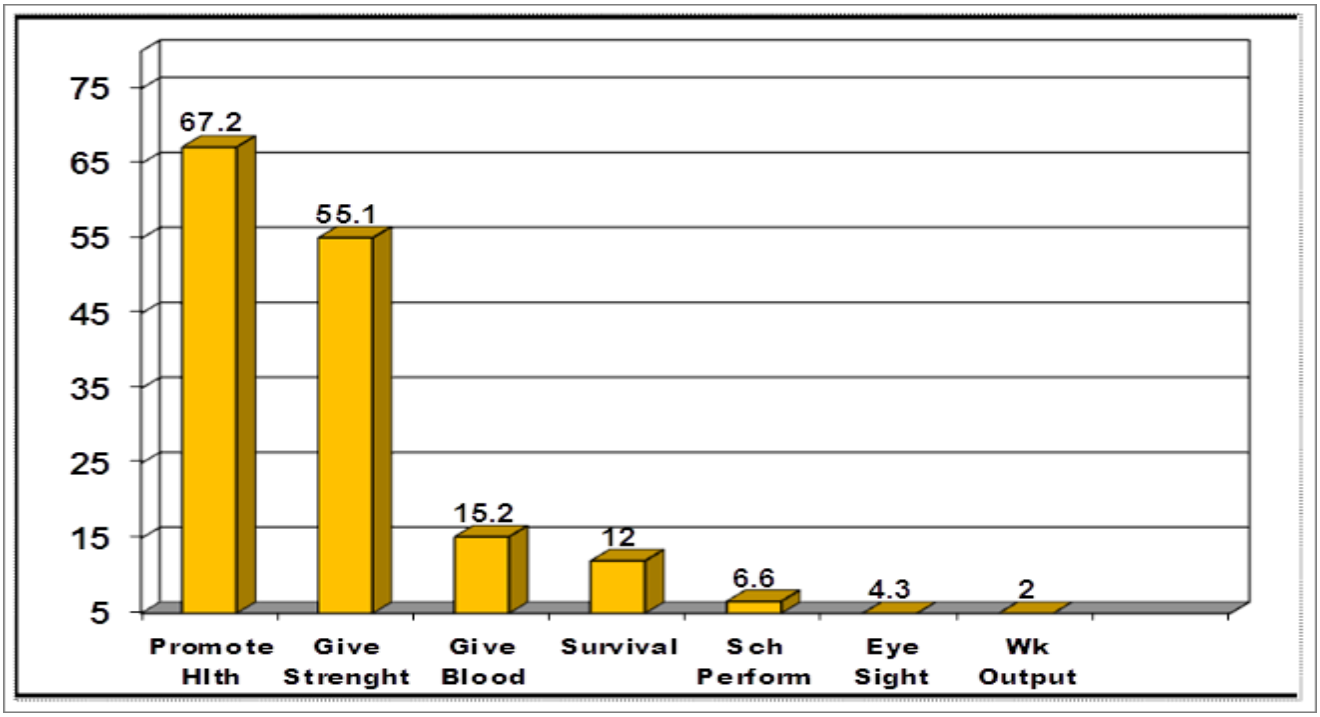


The 348 respondents who had heard about the on-going food fortification programme in Ghana were also specifically asked what they heard about the programme and the responses are summarized in Table 20. Of this group of respondents, Table 20 and Figure 5 show that 234 (67.2%) said it promoted good health, 192 (55.1%) said it gave strength, 53 (15.2%) said it gives blood, 42 (12.0%) mentioned it improves child survival, 15 (4.3%) said fortified foods improved eye sight, 23 (6.6%) said it improved school performance and 7 (2.0%) indicated improved work output.

Table 20: Knowledge of Benefits or Importance of Consuming Fortified Foods by Zone

	Northern	Middle	Southern	Total
Promotes good health	37 (15.8%)	117 (50%)	80 (34.2%)	234 (67.2%)
Gives strength	13 (6.8%)	144 (75%)	35 (18.2%)	192 (55.1%)
Improves school perform.	4 (17.4%)	10 (43.5%)	9 (33.1%)	23 (6.6%)
Gives blood	3 (5.7%)	45 (84.9%)	5 (9.4%)	53 (15.2%)
Improves child survival	4 (9.5%)	26 (61.9%)	12 (28.6%)	42 (12.0%)
Improves eye sight	3 (20%)	7 (46.7%)	5 (33.3%)	15 (4.3%)
Improves work output	0	6 (85.7%)	1 (14.3%)	7(2.0%)

Figure 5: Knowledge of Benefits of Consuming Fortified Foods



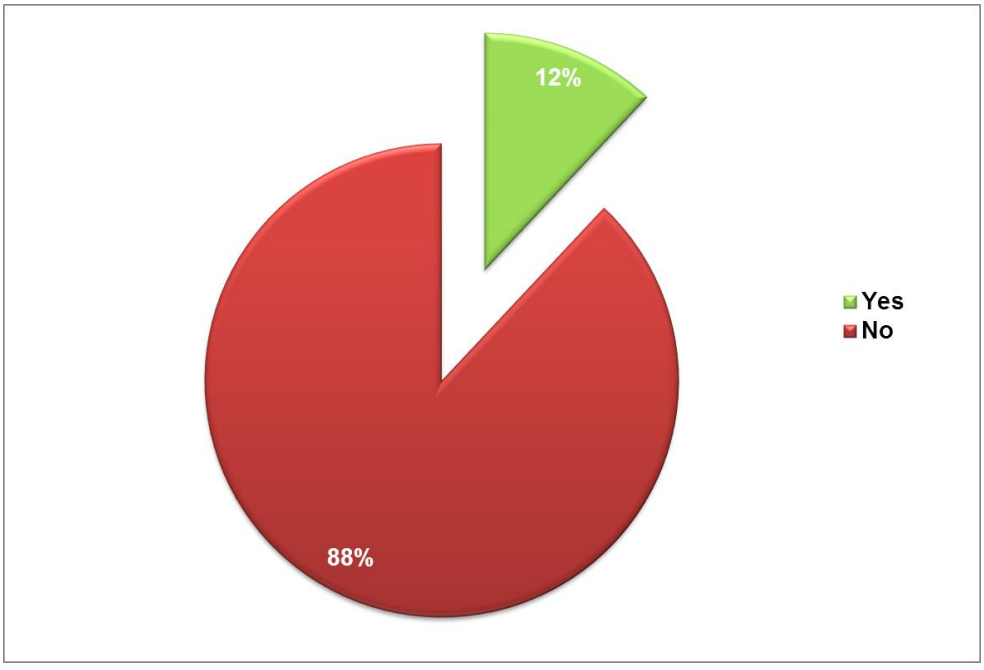
Generally respondents in the middle zone were more knowledgeable about the benefits of fortification. Among respondents who could name some benefits in that zone, as many as 61% cited 'improves child survival' compared to 28.6 percent and 9.5 percent for the Southern and Northern zones respectively. It is important to note that the key message on most of the communication materials was 'promotes good health' and this was predominantly the most cited benefit. A key proxy indicator for assessing the consumer awareness of the fortification programme is the ability to identify the fortification logo. When shown the logo during the survey, only 182 (12.0%) recalled having seen the food fortification logo (Figure 6) but this did not differ significantly between zones as shown in the Table 21.

Table 21: Respondents who had seen the food fortification logo by zone

	Northern	Middle	Southern	Total
Yes	51 (28%)	69 (37.9%)	62 (34.1%)	182 (100%)
No	457 (34.4%)	425 (32.0%)	447 (33.6%)	1329 (100%)
Total	508 (33.6%)	494 (32.7%)	509 (33.7%)	1511 (100%)

Of those who had seen the logo, 74 (40.6%) were shown the logo by health workers, 68 (37.4%) of respondents said they saw the logo in a poster or a leaflet, 22 (12.0%) saw it on TV, and 14 (7.7%) saw the logo at a bakers or traditional caterers shop. No one reported ever seeing the logo in a newspaper.

Figure 6: Respondents who had seen the Fortified Logo at the time of the Survey



Only 22 (12.1%) of respondents said they thought the logo signified a fortified food item, 19 (10.4%) said it meant nutrients had been added for good health and 14 (7.7%) said this meant that the food was of good quality. The views of

respondents were sought on why it was necessary to fortify some food items in Ghana. 503 (33.3%) said fortification helped to promote good health, 331 (21.9%) said it helped to prevent infection and diseases and 291 (19.3%) said it improved health and survival. Only 99 (6.6%) said it would address the problem of vitamin A deficiency, 69 (4.6%) said it improved the nutrient value of food commodities while 76 (5.0%) were of the opinion that it improved child survival.

4 CHAPTER FOUR: OIL- AVAILABILITY AND UTILIZATION

4.1 Household Availability and Consumption of Fortified Oils

To determine the level of consumption of fortified industrially processed vegetable oils, respondents were asked whether they prepared their foods with known fortified vegetable oils and spreads. The data shows some respondents used more than one type of oil and/or spread including industrially processed and locally processed non-fortified varieties. From table 22 707 (46.8%) said they prepared meals with Nana Oil, Imperial Chef or Gino which were the fortified oils available at the time of the survey; 615 (40.7%) mentioned using Obaapa, Sunflower oils, Sankofa, Unoli, kings and other commercially fortified oils not named above. Only 348 (23.0%) of the respondents reported they used fortified spreads such as Blue Band margarine, Remia or Planta. More than half of respondents 859 (56.8%) used non-fortified oils such as palm kernel oil, coconut oils, Shea butter or ground nut oil which are the locally/artisanal processed oil and the majority of respondents (78.6%) used locally processed oil palm varieties such as palm oils, Zomi and Palmin which are naturally rich in pro-vitamin A but not fortified (Table 22).

Table 22: Use of the Listed Vegetable oils/spreads in Food Preparation for WIFA by Zone

	Northern	Middle	Southern	Total	P
Fortified *Oil -Industrial processed*					
Frytol, Obaapa, sunflower oil, Unoli, other soybean oils	41 (6.7%)	296 (48.1%)	278 (45.2%)	615 (40.7%)	<0.001
Nana Oil, Imperial Chef, Gino	130 (47.6%)	319 (21.1%)	258 (31.3%)	707 (46.8%)	<0.001
Fortified spread e.g Blue band margarine, Remia and Planta	53 (15.2%0	138 (39.7%)	157 (45.1%)	348 (23.0%)	<0.001
Non-fortified- *Locally processed –*					
Palm oil, zomi, & palmin*	238 (20%)	486 (40.9%)	463 (39.0%)	1187 (78.6%)	<0.001
Palm kernel oil, coconut oil, shea butter, groundnut oil, cashew oil	438 (51.0%)	201 (23.4%)	220 (25.6%)	859 (56.8%)	< 0.001

*Palm oil, Zomi and Palmin are different varieties of red oil from processed palm fruits

The use of common vegetable oils and spreads in the preparation of family meals were assessed using a 7-day food frequency questionnaire. About 14.4% of respondents indicated they consumed meals prepared with fortified industrially processed oils (Obaapa, Sunflower, Unoli and Kings) 3 or more days a week. Frytol, Nana oil, Imperial chef, and Gino were used by 13.9% of respondents and

4% of women had consumed meals containing a fortified spread 3 or more days in the week preceding the survey (Table 23).

Table 23: No. of Days in the Past Week HH Food was Prepared Using Fortified Vegetable Oils and Spread

	3 or more	1-2 days	None	Not known
Obaapa, Sunflower oil, Unoli, Kings and other commercial oils	218 (14.4%)	161 (10.7%)	1096 (72.5%)	36 (2.4%)
Frytol, Nana oil, Imperial chef. Gino	210 (13.9%)	200 (13.2%)	1061 (70.2%)	40 (2.6%)
Fortified spread, Blue band margarine, Remia, Planta	60 (4.0%)	103 (6.8%)	1307 (86.5%)	41 (2.7%)

4.2 Household Purchase of Vegetable Oil

Table 24 below shows the frequency that WIFA purchased all types of vegetable oil for the family. The highest proportion of respondents (16.9%) reported purchasing oil daily for household use whiles 13.4% said they bought weekly.

Table 24: Frequency of purchase of vegetable oil for household use

	Purchased oil	% purchasing oil
Daily	255	16.9
>3 times/week	53	3.5
1-2 times/week	124	8.2
once/week	203	13.4
twice/month	104	6.9
once/month	205	13.6
Irregularly	85	5.6
Never	482	31.9

The issue of the average quantity of oil purchased at a time for household use was explored among the 1002 respondents who indicated they purchased oil for household use. The data shows that generally it appeared those who purchased oil infrequently bought larger quantities. Of this 1002 respondents, 371 (37.0%) purchased a small poly bag (<0.5 litres), 206 (20.5%) bought 0.5 litres, and 274 (27.3%) bought one litre. A total of 45(4.5%) reported buying between two and three litres while 106 (10.5%) bought a gallon or more for household use.

4.3 Utilization of Fortified Vegetable Oil for Household Use by Zone

The use of commercially processed and locally produced oil in food preparation by zone is summarized in Table 25, which shows that a large number of women (36.6%) used locally processed oils such as Palm oil Zomi and Palmin and 31.4% used Palm kernel oils, coconut and Shea butter. All of these oils are not fortified but those containing palm oil are naturally rich in carotenoids. The use of fortified spreads such as Blue-Band margarine, Remia and Planta was mentioned by only 9.7% of respondents. With regards to the use of industrially processed oils the highest reported use was in the Middle zone (60.8%), followed by 28.8% in the Southern zone and 10.4% in the Northern zone. Usage was observed to be significantly different among zones. A similar picture (51.7%) was obtained for other brands of industrially processed oils apart from those listed above where the percentages were similar (24.1%) in the Southern and the Northern zone but significantly different from the Middle zone.

Table 25: Use of Listed Oils in Food Preparation for household by Zone

	Northern	Middle	Southern	Total	P
Fortified Oil (Industrially Processed)					
Obaapa, Sunflower, Sankofa oil, Unoli, Kings and other commercial oils	20 (10.4%)	169 (60.8%)	80 (28.8%)	278 (100%)	0.0001
Frytol, Nana oil, imperial chef and Gino	85 (24.1%)	182 (51.7%)	85 (24.1%)	352 (100%)	0.0001
Fortified spread, Blue band margarine, Remia, Planta	34 (23.1%)	60 (40.8%)	53 (36.0%)	147 (100%)	0.0001
Non-fortified					
Palm Kernel oil, Coconut oil, Shea butter, groundnut oil, cashew oil	269 (56.6%)	109 (22.9%)	97 (20.4%)	475 (100%)	0.0001
Palm oil, Zomi and Palm	137 (24.7%)	278 (50.3%)	138 (24.9%)	553 (100%)	0.0001

4.4 Household Availability of Variety of Fortified Oil and Types Packaging

Household availability of vegetable oil particularly the available brand of refined oil at the time of the survey was investigated by zone (Table 26). Frytol was used by 87 (5.7%) Gino was used by 33 (2.2%), Obaapa by 3 (0.2%) and Nana oil by 13 (0.9.%). Other brands mentioned were Sunflower, Sankofa

and Imperial Chef but these were used by less than 1% of WIFA. Nearly a quarter of women 370 (24.5%) mentioned using other oils and 519 (34.3%) only did not use refined oil but only artisanal. Of those who use refined oil 43.9% bought it in the original packaging, 38.4% in small refilled poly bags and 17.6% used other means of packaging. 21% of those interviewed had refined oil available at home on the day of the interview.

Table 26: Household availability of oil at the time of the survey by zones

Brand	Northern	Middle	Southern	Total having oil
Frytol	30 (34.5%)	31 (35.6%)	26 (29.9%)	87 (5.7%)
Gino	4 (12.1%)	10 (30.3%)	19 (57.6%)	33 (2.2%)
Nana	0	10 (76.9%)	3(23.1%)	13 (0.9%)
Unoli	0	1 (14.3%)	6 (85.7%)	7 (0.5%)
Obaapa	0	1 (33.3%)	2 (66.7%)	3 (0.2%)
Kings	1 (33.3%)	1 (33.3%)	1 (33.3%)	3 (0.2%)
Imperial Chef	0	1 (33.3%)	2 (66.7%)	3 (0.2%)
Sunflower	0	0	1 (100%)	1 (0.1%)
Sub-total of households with branded fortified oils.				*150 (9.9%)*
Did not find refined oil at home	*82 (12.4%)*	*271 (40.9%)*	*309 (46.7%)*	*662 (43.8%)*
Does not use refined oil	355 (68.4%)	92 (17.7%)	72 (13.8%)	519 (34.4%)

4.5 Storage and Packaging of Oil

15.2% of refined oil was in the original packaging, 3.1% in small plastic bottles, 2.6% in small poly bags and 1.3% used other means of packaging. The oil found in 77.8% (1181) of houses visited was not packaged. 151 (9.9 %) of the oil was stored in the dark, 131 (8.7%) in the light and the storage conditions was not observed in 45 (3.0%) of households. There was no oil found in 78.4% (1184) of the households visited.

4.6 Frequency of Consumption of Processed Vegetable oil and Spreads by 24-59 months old Children

Frequency of consumption of processed vegetable oil and spreads by children 24-59 months was determined using a 7-day food frequency method and adequacy was based on consumption of each

listed food vehicle at least three days or more. Results show that 16.7% of children consumed Obaapa, Sunflower and Unoli oils and 15.4% consumed Frytol, Nana oil, Imperial Chef and Gino at least 3 or more days in a week, compared to 3.3% consuming fortified spread. Seventy percent of children had not consumed any fortified spreads such as BlueBand margarine, Remia, Planta in the seven days preceding the survey (Table 27).

Table 27: No. of Days in the Past Week Child (6-24 months) Consumed Food Prepared with Branded Vegetable Oils and Spreads

	3 or more days	1-2 days	None	Not known
Obaapa, Sunflower, Sankofa, Unoli, Kings other commercially fortified oils	136 (16.7%)	87 (10.7%)	549 (67.7%)	38 (4.7%)
Frytol, Nana oil, Imperial chef and Gino fortified oils	125 (15.4%)	117 (14.4%)	529 (65.3%)	39 (4.8%)
Fortified spreads, e.g. Blue band margarine, Remia, Planta	27 (3.3%)	58 (7.2%)	702 (86.6%)	23 (2.8%)

4.7 Oil Analysis Results

305 oil samples were collected from the households visited, two of which had insufficient sample volume for analysis. Table 28 show the number of oil samples collected by zone, and Table 29 the number of oil samples with adequate (10mg/kg oil), low or higher concentrations of retinyl palmitate.

Table 28: Percentage of Oil Samples Collected from the Three Ecological Zones

Zone	Number	%
Northern	62	20.4
Middle	122	40.3
Southern	119	39.3
Total*	303	100%

*Insufficient sample (2) not included in the analyses

Table 29: Levels of Retinyl Palmitate Detected in Analyses of oil Samples

Oil Category (Retinol palmitate mg/kg oil)	**Number of samples**	**%**
<1	172	56.7
>1< 10	78	25.7
≥ 10* <20	**36**	**11.9**
≥20	15	5.0
Insufficient sample*	2**	0.7
Total	303	100

*10mg retinyl palmitate/kg oil standard

**Insufficient sample not included in the analyses

4.8 Mean oil sample analyses by zone

Table 30: Mean Oil Retinol Palmitate Concentrations across the Three Zones

Category (Retinol palmitate mg)	**Northern (62)**	**Middle (122)**	**Southern (119)**	**Total**
Mean	4.1	5.1	3.5	4.3
Range*	0-24.7	0-29.9	0-45.9	0-45.9

* For purposes of analyses an arbitrary value of 0.9 was given for all values less than 1

5 CHAPTER FIVE: FLOUR

5.1 Household Flour Purchasing Patterns, Utilization and Consumption

Generally household use of wheat flour in the preparation of family meals was found to be very low as most respondents indicated they purchased finished flour products for household consumption. Less than 3 percent of all the women interviewed (44) reported using flour at least once a week to prepare e the family meals. Of this number, 5 (11.4%) used Irani brothers flour, one used Ghana China, 5 (11.4%) GAFCO, Sankofa; 4 (9.1%) Takoradi Flour Mills and 7 (15.9%) used other brands of flour. Half of respondents, who used flour at home at least once a week, did not know which brand of flour they use.

Of respondents that use flour for household use, 14 (31.8%) used flour in its original packaging, 27 (61.4%) used flour from small plastic bags and the rest used flour in other packaging. Even though 44 women indicated they use flour at home, on the day of the interview only 25 (65.8%) had flour in the house and this constituted only 1.7% of all women interviewed. Of the 25 who had flour at home, 4 (16%) had the Irani Brothers brand, 1 had GAFCO, 3 (12%) Takoradi flour and 7(28%) used other brands. It was not possible to identify which brand of flour was used by 11 (44%) of the women. The observed flour was in the original packaging in 11 of them (44%) and in small plastic bags in 10 (40%).

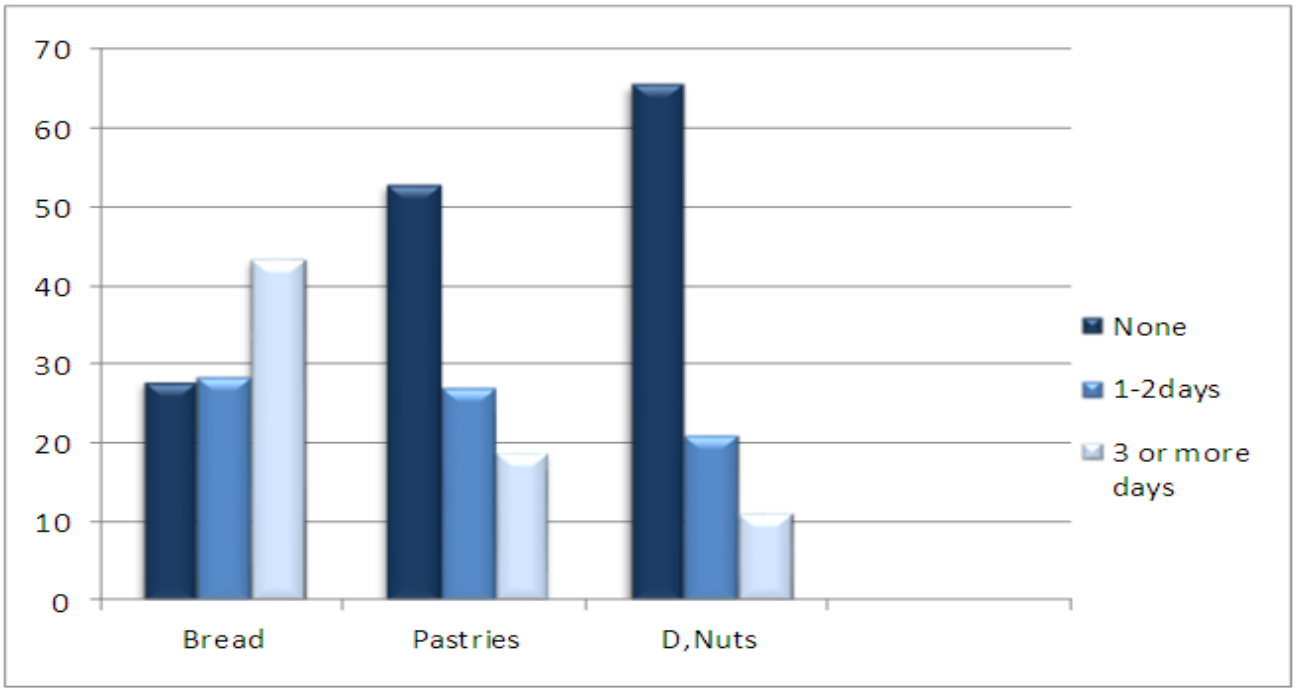
5.2 Consumption of Flour Products by WIFA and Children

Among the different types of wheat flour products locally available, consumption of bread was highest followed by pastries and biscuits, doughnuts, bofrot, and similar products and the results show a general increase in consumption patterns (Table 31 and Figure 7)

Table 31: Number of Days in the past week Women Consumed Wheat Flour Products

	3 or more	**1-2 days**	**None**	**Not known**
Bread (all types)	656 (43.4%)	429 (28.4%)	421 (27.9%)	5 (0.33%)
Pastries, biscuits, cakes, rock buns, pies	283 (18.7%)	407 (26.9%)	800 (52.9%)	21 (1.4%)
Doughnuts, bofrot, toogbei, poolo, atsomoo, spring rolls	169 (11.2%)	317 (21.0%)	991 (65.6%)	34 (2.2%)
Other flour products	5 (0.3%)	15 (1.0%)	1,426 (94.4%)	65 (4.3%)

Figure 7: Frequency of Consumption of Flour Products by WIFA

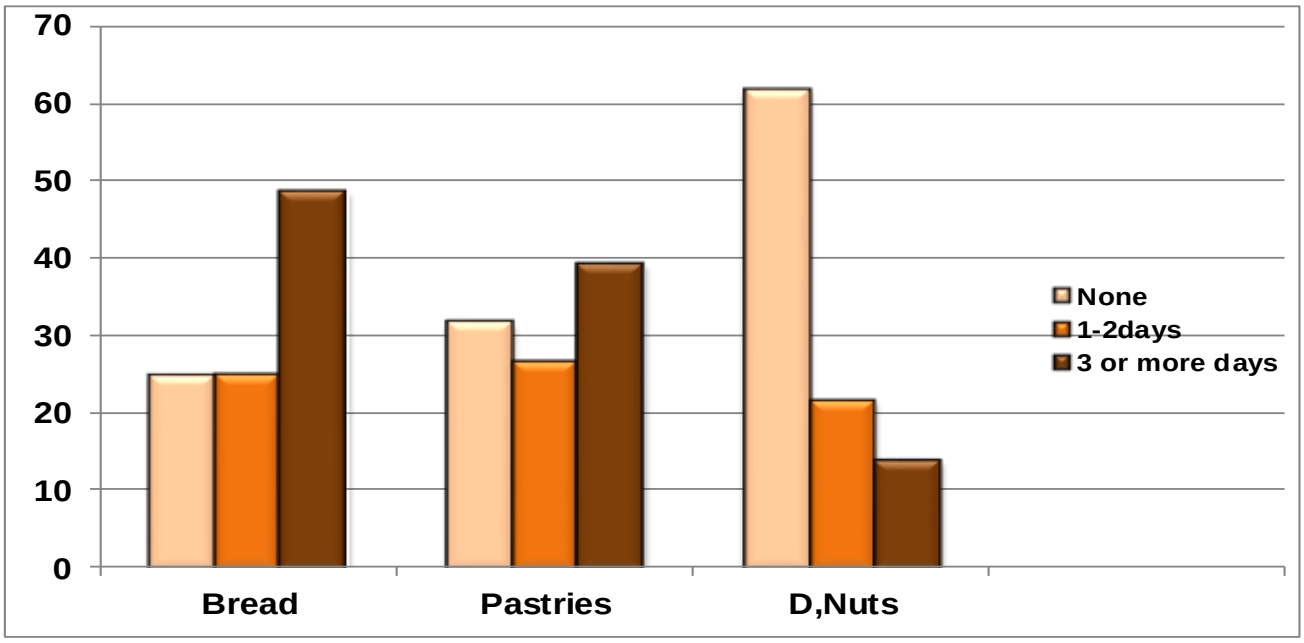


Similarly, consumption of food items prepared from wheat flour by children 24-59 months was determined, as described earlier, using the seven day food frequency method and adequacy based on consumption of each listed food vehicle at least three days or more. Results from the seven day food frequency displayed in Table 32 and Figure 8 show that 48.6% of children consumed bread, 39.3 % consumed pastries at least 3 or more days in a week, compared to 13.9% consuming doughnuts, bofrot and toogbei in the seven days preceding the survey.

Table 32: No. of Days in the Past Week Child Consumed Wheat Flour Products

	3 or more	1-2 days	None	Not known
Bread	394 (48.6%)	202 (24.9%)	202 (24.9%)	12 (1.5%)
Pastries, biscuits, cake	319 (39.3%)	216 (26.6%)	257 (31.7%)	18 (2.2%)
Doughnuts, bofrot, toogbei, pancake, polo atsomo	113 (13.9%)	175 (21.6%)	501 (61.8%)	21 (2.6%)

Figure 8: Frequency of Consumption of Flour Products by Child



5.3 Availability of Flour Products in the House on the Day of Interview

Interviewers inquired about flour products to assess household availability on the day of the survey. In all, 205 (13.6%) of respondents had bread in the house on the day of the interview, 101 (6.7%) had pastries and 18 (1.2%) had doughnuts and bofrot in the house. Across the ecological zones, among women who had flour products at home the highest percentage was found in the Southern zone (41.0%) followed by the Northern (32.7%) and the Middle zones (26.3%) respectively (Table 33). The distribution of pastries, biscuits, cakes, rock buns and pies was highest in the Southern (52.5%). However, the availability of doughnuts etc was greatest in the Northern zone (36.4%) followed by the Southern (34.3%) and least in the Middle zone (29.3%). Significant differences in consumption among the zones were found for each category of flour product.

Table 33: Availability of Flour Products in the House on the Day of Interview by Zone

	Northern	Middle	Southern	Total HH with Flour Products	P=
Bread (1511)	67 (32.7%)	54 (26.3%)	84 (41.0%)	205 (100%)	0.0001
Pastries, Biscuits and cakes	21 (20.8%)	27 (26.7%)	53 (52.5%)	101 (100%)	0.0001
Doughnuts and bofrot	5 (27.8%)	3 (16.7%)	10 (55.6%)	18 (100%)	0.0001

5.4 Results of Flour Analysis

Generally there is very little household level purchase and utilization of wheat flour for family consumption and for this reason, only a few flour samples were available to be collected at the household. In total only 79 flour samples were collected (Table 34). The mean ferrous fumarate concentration was 39.8 mg/kg. The minimum value was 16 mg/kg and maximum was 99 mg/kg. About 64% of the flour samples had levels of ferrous fumarate <45mg/kg which is below the Ghana Standard.

Table 34: Levels of Ferrous Fumarate Detected in Analyses of flour samples

Category	**Number**	**%**
< 45mg/kg	51	64.5
≥ 45<50 mg/kg	**2**	**2.5**
>50mg/kg	**26**	**32.9**
Total	79	100

6 CHAPTER SIX: IODINE DEFICIENCY AND SALT IODIZATION

6.1 Household Salt Purchasing Practices and Utilization

Women were asked to show the interviewer the type of salt they use for household cooking. Of the 1511 women interviewed 856 (56.7%) had coarse salt, 146 (9.7%) granular salt, 439 (29.1%) had smooth fine salt and 70 (4.6%) did not have any salt at home. With regards to where salt is normally purchased, 709 (46.9%) reported buying salt from a market or shop in the community, 462 (30.6%) from a market in a nearby town, 273 (18.1%) buy salt from local shops or kiosks, and 10 (0.7%) from markets across the borders. The type of packaging of salt at the point of sale was also assessed to determine how much re-bagging is done by retailers as this has implications for quality (Table 35). Re-bagged salt was purchased by 749 respondents (49.6%), 464 (30.7%) buy salt from a heaped bowl, 269 (17.8%) in sachets out of 1511 women interviewed.

Table 35: Packaging of salt purchased by respondents by Zone

	Northern	**Middle**	**Southern**	**Total**
Re-bagged	203 (27.1%)	258 (34.4%)	288 (38.4%)	749 (49.6%)
Salt heaped in bowl and packaged	246 (53%)	140 (30.2%)	78 (16.8%)	464 (30.7%)
Sachet	59 (21.9%)	87 (32.3%)	123 (45.7%)	269 (17.8%)
Other	0	9 (31.0%)	20 (69.0%)	29 (1.9%)
	508	494	509	1511

An assessment was also made of quantities of salt women buy at a time. A large number of the women (43.4%) buy salt in quantities equivalent to a small milk tin (about 150g) at a time. This is followed by those who buy an Olonka or American tin (15.5%) equivalent to 2kg at a time and 13.8% who buy in a tomato tin, 11.7% and 6.3% in a 250 g sachet and 500g sachet respectively. Only 0.5% (8) buy a one kilogram sachet at a time (Table 36).

Table 36: Quantity of salt purchased by zone

	Northern	Middle	Southern	Total salt bought
Milk tin	304 (46.3%)	232 (35.4%)	120 (18.3%)	656 (43.4%)
Olonka/American Tin	74 (31.6%)	97 (41.4%)	63 (26.9%)	234(15.5%)
Tomato tin	61 (29.0%)	24 (11.4%)	125 (59.5%)	210 (13.9%)
250 g sachet	38 (21.5%)	60 (33.9%)	79 (44.6%)	177 (11.7%)
500 g sachet	22 (23.2%)	29 (30.5%)	44 (46.3%)	95 (6.3%)
I kg sachet	2 (25%)	3 (37.5%)	3 (37.5%)	8 (0.53%)
Other	7 (5.9%)	49 (41.5%)	62 (52.5%)	118 (7.8%)
Does not buy salt	0	0	13 (100%)	13 (0.86%)
	508	494	509	1511

Frequency of purchase of salt by respondents was assessed. The majority of the women (47.6%) said they bought salt weekly (Table 37), 21.1% said they bought it once a month, 11.6% 1-2 times in a week and 7.8% bought salt once in 6 months. Only very few bought salt daily (0.8%) or 3-5 times per week (1.8%).

Table 37: Frequency of salt purchased by Zone

	Northern	Middle	Southern	Total
Daily	7 (58.3%)	1 (8.3%)	4 (33.3%)	12 (0.8%)
1-2 times in a week	54 (30.9%)	69 (39.4%)	52 (29.7%)	175 (11.6%)
3-5 times in a week	16 (57.1%)	3 (10.7%)	9 (32.1%)	28 (1.8%)
Weekly	**319 (44.3%)**	**203 (28.2%)**	**198 (27.5%)**	**720 (47.6%)**
Once a month	58 (18.2%)	121 (37.9%)	140 (43.9%)	319 (21.1%)
Once in 2-3 months	39 (30.0%)	35 (26.9%)	56 (43.1%)	130 (8.6%)
Once in 4-5 months	5 (55.6%)	1 (11.1%)	3 (33.3%)	9 (0.6%)
Once in 6 months	10 (8.5%)	61 (51.7%)	47 (39.8%)	118 (7.8%)
	508	494	509	1511

6.2 Storage of Salt

At the time of the interview 950 (62.3%) respondents said they kept salt in the kitchen, 221 (14.6%) kept it in a store room and the remaining 340 (22.5%) respondents said they kept it away from the kitchen or the store room. A total of 984 (62.7%) respondents stored their salt in a container with lid, 117 (7.7%) in a container without a lid, 425 (28.1%) in bag or sachet and the rest 21 (1.4%) stored it elsewhere.

Table 38 summarizes the brands of salt purchased by the respondents and it was revealed that 1135 (75%) purchased salt with no brand name.

Table 38: Brand of salt purchased by Zone

Salt Brand	Northern	Middle	Southern	Total salt bought
No brand name	362 (31.9%)	407 (35.9%)	366 (32.2%)	**1,135 (75.1%)**
Anapurna	47(30.1%)	36 (23.1%)	73 (46.8%)	156 (10.3%)
Shiffu salt	1 (4.5%)	**14 (63.6%)**	7 (31.8%)	22 (1.5%)
Other	3 (3.7%)	35 (42.7%)	**44 (53.7%)**	82 (5.4%)
Did not know brand	**95 (81.9%)**	2 (1.7%)	19 (16.4%)	116 (7.7%)
	508	494	509	1511 (100%)

6.3 Awareness and Knowledge of Importance of Iodized Salt

The majority (79.9%) of those interviewed indicated they had heard of iodized salt (Table 39) and of those 341 (28.2%) heard it from a trader or shopkeeper, 331 (27.4%) from a health worker, 320 (26.5%) from the radio, 84 (6.9%) from the TV, 75 (6.2%) from a family member, 43 (3.6%) from school or school teacher and 1.1% from other sources (Figure 9).

Figure 9: Sources of Information on Iodized Salt

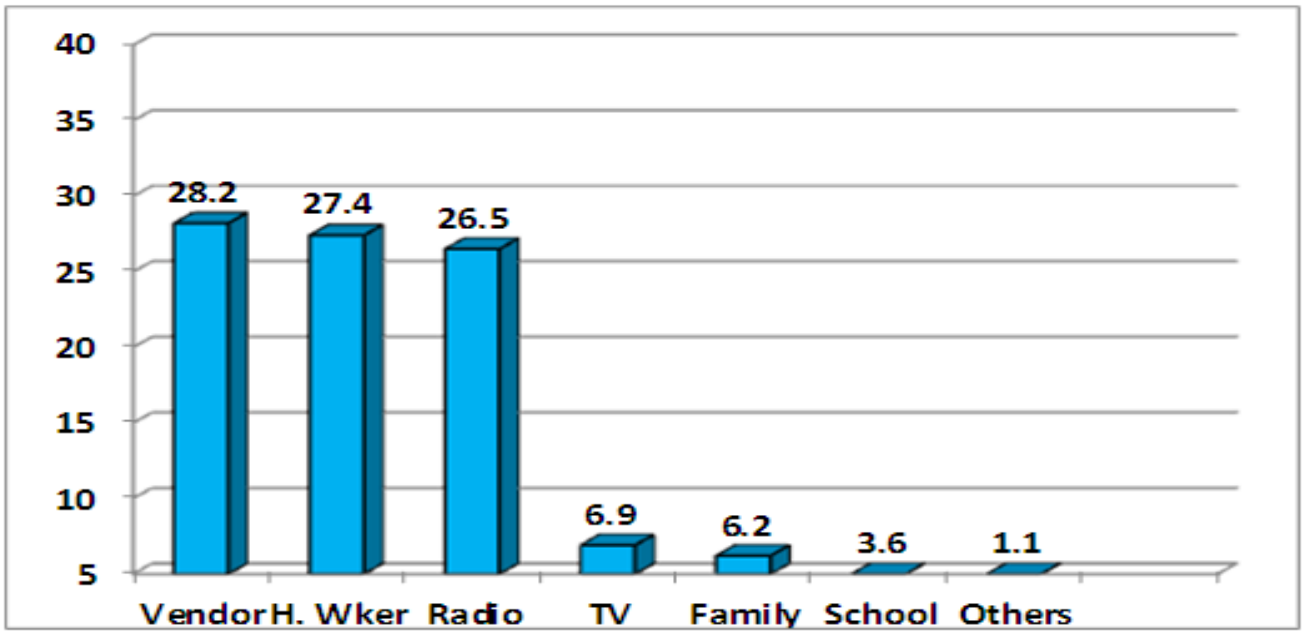
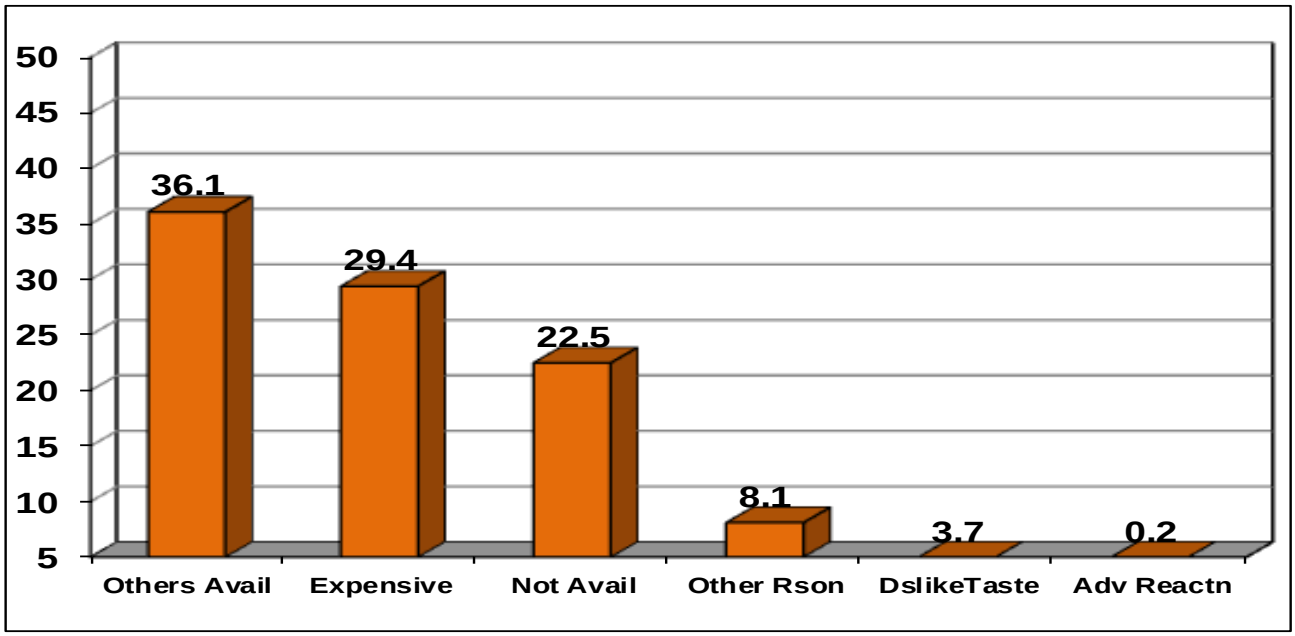


Table 39: Respondents who had heard about iodized salt by zone

	Northern	Middle	Southern	Total salt bought
Heard about iodized salt	414 (34.3%)	395 (32.7%)	398 (32.9%)	1207 (79.9%)
Not heard about it	94 (30.9%)	99 (32.6%)	111 (36.5%)	304 (20.1%)
	508	494	509	1511 (100%)

Of those interviewed, 596 (39.5%) said they have ever used iodized salt. The 915 (60.5%) who did not use iodized salt gave various reasons why, including: 330 (36.1%) said they did not use iodized salt because other types of salt were more readily available, 269 (29.4%) said it was too expensive, 206 (22.5%) said they did not know what iodized salt was, 34 (3.7%) said they did not like the taste of iodized salt and only 2 (0.2%) said they reacted to iodized salt. 74 (8.1%) assigned other reasons for not using iodized salt (Figure 10). Women were asked whether their households had separate salt for use at the table. The results show that this is currently not a common practice as only 36 (2.4%) of those interviewed had separate salt for use at the table.

Figure 10: Reasons for not using iodized salt



6.4 Knowledge of Benefits of Using Iodized Salt

Table 40: Knowledge of Women of Fertile Age about benefits of Using Iodized salt

Benefits of using iodized salt	Number of respondents (%)
treat goiter	238 (31.2%)
makes one healthy	152 (19.9%)
prevents IDD	72 (9.4%)
prevents a range of diseases	68 (8.9%)
makes children intelligent	59 (7.7%)
gives energy and strength	40 (5.2%)
treat illness	39 (5.1%)
promoted proper brain function	29 (3.8%)
builds strong teeth	14 (1.9%)
prevents miscarriage and abortion	1
other benefits	32 (4.2%)

A total of 762 (50.4%) of those interviewed said they know the benefits of iodized salt. Of those who knew, 238 (31.2%) said iodized salt is used to treat goiter, 152 (19.9%) said it makes one healthy and 72 (9.4%) said iodine prevents IDD, 68 (8.9%) said it helps to prevent a range of diseases, 59 (7.7%) said it makes children intelligent, 40 (5.2%) said it gives energy and strength, 39 (5.1%) said it was used to treat illnesses, 29 (3.8%) said it promoted proper brain function, 14 (1.9%) mentioned benefits like it builds strong teeth, good for pregnant women and children ,one person said it helped to prevent miscarriage or spontaneous abortion, and 32 (4.2%) mentioned other benefits. Thus only 161 (21.1 %) of women were able to tell the correct benefits of consumption of iodine which is prevention of IDD.

The knowledge of the women about the existence of a regulation on mandatory fortification of salt for human and animal consumption was assessed. Only 114 (7.5%) were aware there were regulations and a law supporting the production and sale of salt in Ghana and of these 85 (74.5%) stated that the law required that salt must be iodized and the rest did not know what the law required.

6.5 Salt Testing

A total of 1385 salts samples were collected during the survey and this comprised 493 (35.6%), from the Northern Zone, 447 (32.3%) from the Middle Zone and 445 (32.1%), Southern Zone respectively.

Of the 1511 women who were interviewed 1362 (90.1%) provided salt to be tested, 90 (6.0%) had no salt in the house while 59 (3.9%) had salt in the house but this could not be tested due to the unavailability of enough test kits on the day of the survey. Analyses of salt samples was completed during field data collection by rapid test kit and it was found that 838 (61.5%) were not iodized (0ppm), 222 (16.3%) had iodine <15ppm and 302 (22.1%) had iodine greater than 15ppm. Therefore, 77.8% of the salt samples were inadequately iodized with levels of iodine less than 15ppm as assessed by the rapid test.

Table 41: Levels of Iodine Detected in Analyses of Salt Samples by rapid test kit and titration

	Rapid test kit		Titration method	
Category	**Number**	**%**	**Number**	**%**
Not iodized (0 ppm)	838	61.5*	118	8.4
PPM<15	222	16.3*	602	43.4
PPM≥15	302	22.1	665	48.0
Total	1362	100	1385	100

*77.8% therefore had levels of iodine <15ppm from the field test results

In addition to analysing salt samples using field test kits all the samples were reanalysed by the a more robust technique the trimetric method. Table 41 reveals that the levels of iodine detected using the titration method did not agree with the field test kit results. Only 118 samples by titration compared to 838 samples by field kit had no iodine, while 604 samples by titration compared to 222 by field kit had <15ppm. More than twice as many were classified as being adequately iodized by the titration method compared to the field method.

Table 42: Levels of Iodine Detected in Salt Samples by titration method

Category	Number	%
PPM<15	720	51.9
PPM≥15<40	440	31.8
PPM≥40<60	100	7.2
PPM≥60	125	9.0
Total	1385	100

Table 42 and Figure 11 show the results from titration method which indicate majority of the salt samples that is 51.9% had iodine content less than 15ppm.

Figure 11: Level of Iodine in Salt by Titration Method

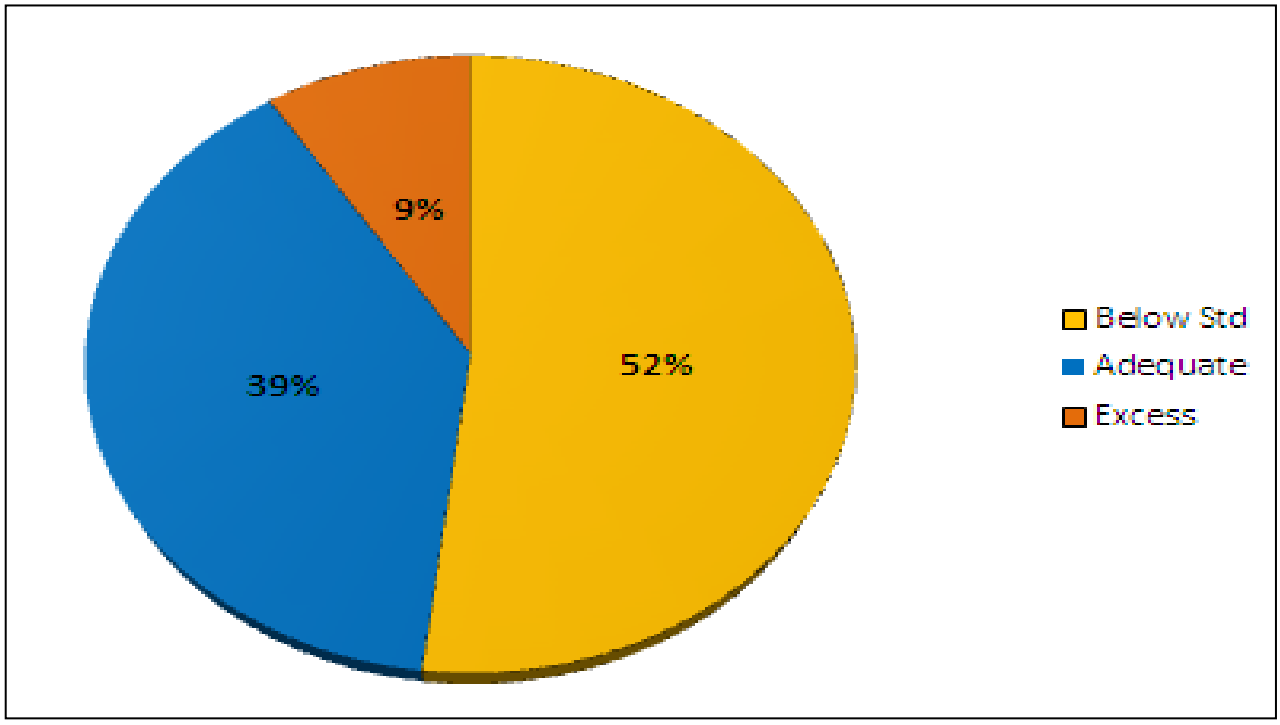


Figure 12: Level of Iodine in HH Salt by Titration by Zones

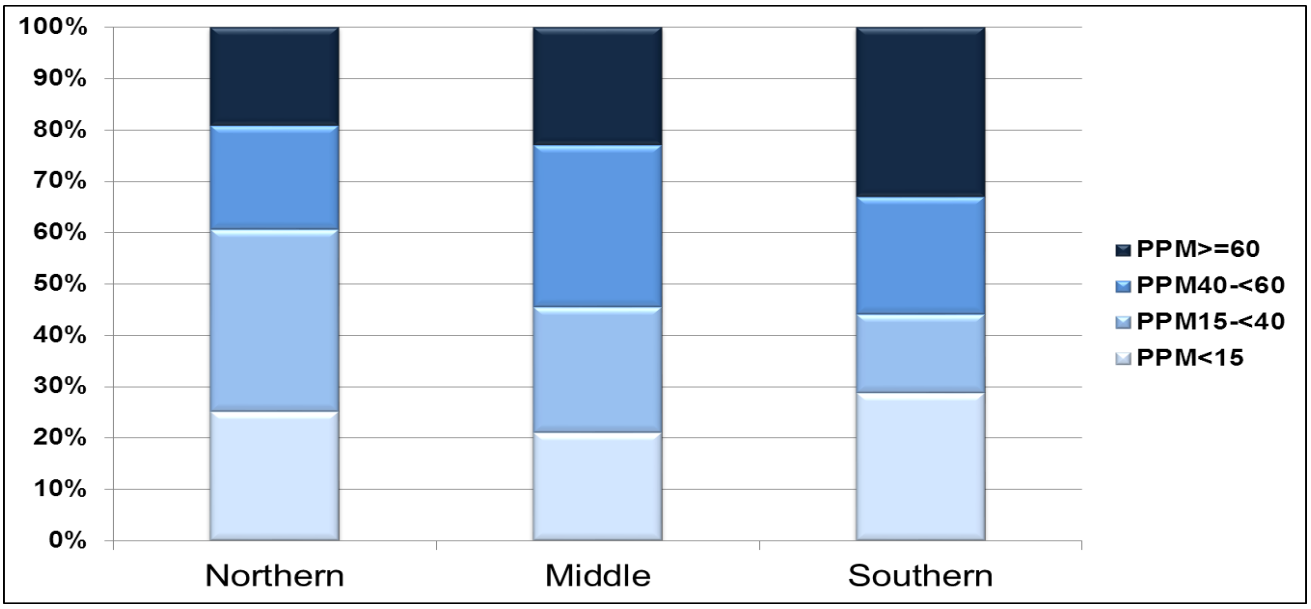


Table 43: Levels of Iodine Detected in HH Salt by Titration by Zone

Category	Northern	Middle	Southern	Total
PPM<15	235 (32.6%)	213 (29.6%)	272 (37.8%)	720 (51.9%)
PPM≥15<40	201 (45.7%)	150 (34.1%)	89 (20.2%)	440 (31.8%)
PPM≥40<60	26 (26.0%)	44 (44.0%)	30 (30.0%	100 (7.2%)
PPM≥60	31 (24.8%)	40 (32.0%)	54 (43.2%)	125 (9.0%)
Total	493 (35.6%)	447 32.3%)	445 (32.1%)	1385 (100)

Table 43 describes the level of Iodine detected in household salt samples grouped by iodine level categories in the three zones. The southern zone had the highest number of household salt samples (37.8%) with iodine levels below 15ppm and the highest number of households with excess iodine content that is above 60ppm (43.2%). A graphically display is shown in Figure 12.

6.5.1 Mean Salt Concentration by Zone

The Mean salt iodine concentration detected in the three zones is described in Table 44. The results indicate the mean iodine concentrations in salt samples are comparable among the three zones.

Table 44: Mean salt concentration by zone

	Northern (493)	Middle (447)	Southern (445)
Mean	22.4	23.7	23.4
Range	0-238.0	0-134.6	0-265.5

6.6 Results of Urine Analysis

6.6.1 Description of samples collected

Urine samples were collected from 991 children (6-12 years of age) and 1372 WIFA, but four (one child and three WIFA urine samples) could not be analysed because the volume was insufficient. Results are therefore available from 990 child and 1369 WIFA urine samples.

6.6.2 Child Urine Analysis Results

990 urine samples were collected from children; 491 (49.6%) from the Northern zone, 404 (40.8%) from the Middle zone and 95 (9.6%) from the Southern zone.

Table 45: Levels of Iodine Deficiency Detected from Analyses of Child Urine Samples

Category	Urine µg/L	Number	%
Severe iodine deficiency	<20	70	7.1
Moderate iodine deficiency	20-49	131	13.2
Mild iodine deficiency	50-99	200	20.2
OPTIMAL	**100-199**	**258**	**26.1**
ADEQUATE	**200-299**	**126**	**12.7**
EXCESS	>299	205	20.7
Total		990	100.0

Figure 13: Child Urinary Iodine Profile

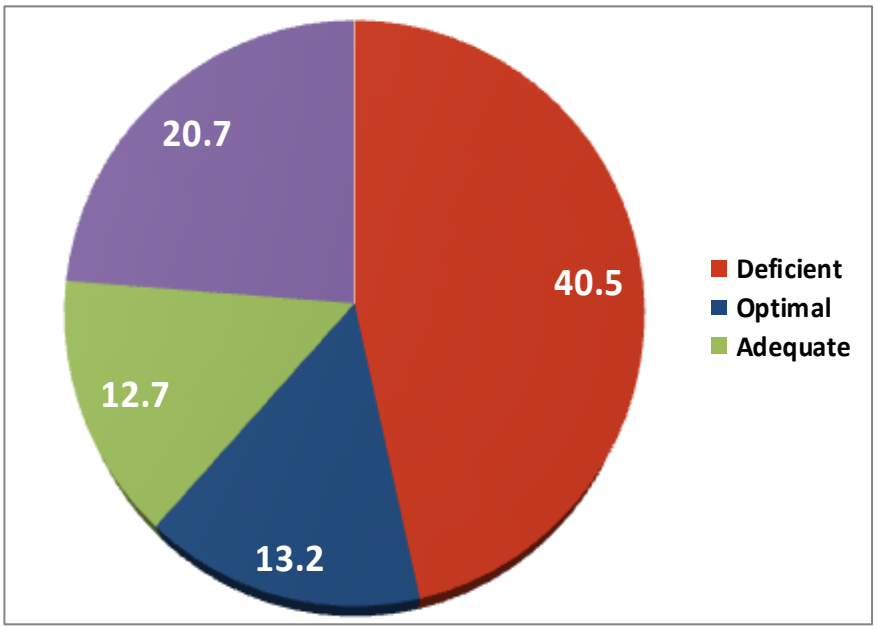


Figure 13 describes the child urinary profile which shows that 40.5% of the children studied had iodine deficiency to varying degrees of severity: Severe iodine deficiency was found in 7.1%, moderately iodine deficiency in 13.2 % and mild in 20.2%. 384 (38.8 %) of children's urine samples contained optimal to adequate iodine and about a fifth (20.7%) of the children had excess urinary iodine (>299 µg/L). The detailed information of the different levels of child urinary profile is described in Table 43.

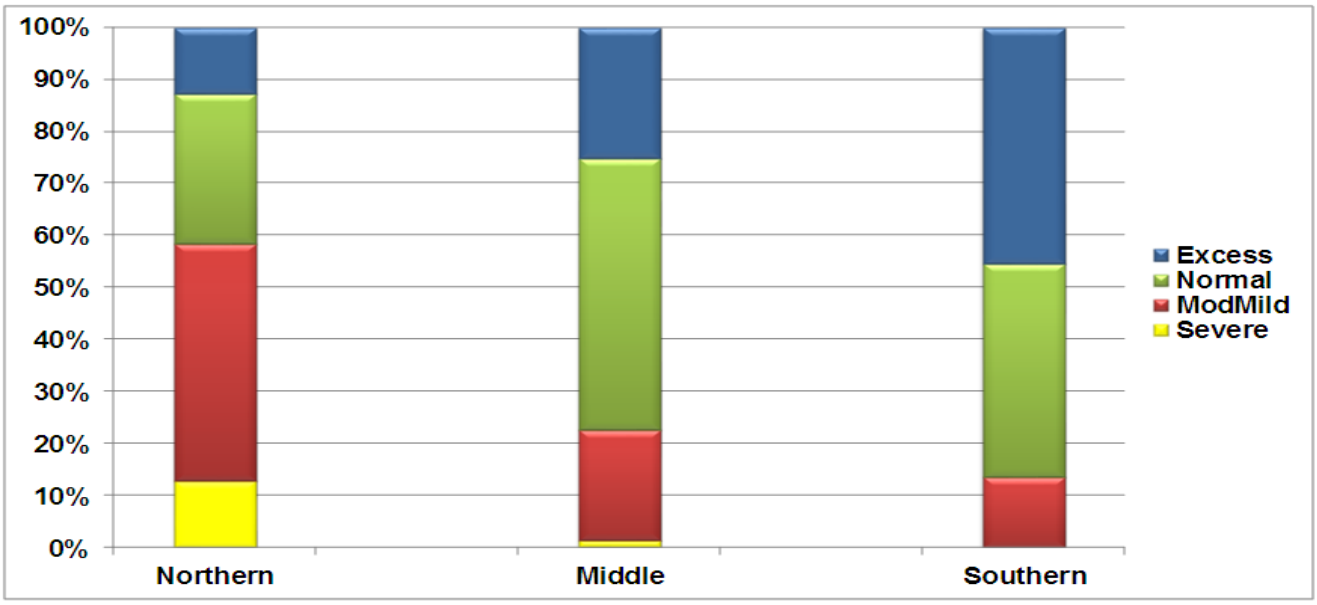
6.6.3 Child Urine Analyses by Zone

The majority of children with iodine deficiency were in the Northern zone (Table 42). Of the 491 children whose urine samples were analysed, 58.5% had severe, moderate or mild iodine deficiency in the Northern zone, and 22.1% and 13.7% in the Middle and Southern zones respectively. About half of the children in the Middle zone (50.5%) had optimal to adequate urinary iodine levels, 41.1% had this status in the Southern zone but only 28.7% in the Northern zone. Children with excess urinary iodine were highest in the Southern zone (45.3%), followed by the Middle zone at 24.5% and 12.8% in the Northern zone. Comparing the Northern and Southern zones it is clear that children in the latter had relatively better iodine status (Figure 14).

Table 46: Levels of Iodine Deficiency Detected in Analyses of Child Urine Samples.

Category (Urine µg/L)	Northern	Middle	Southern	Total
Severe iodine deficiency (<20)	64 (13.0%)	6 (1.5%)	0	70 (7.1%)
Moderate iodine deficiency (20-49)	97 (19.8%)	29 (7.2%)	5 (5.3%)	131 (13.2%)
Mild iodine deficiency (50-99)	126 (25.7%)	66 (13.4%)	8 (8.4%)	200 (20.2%)
OPTIMAL (100-199)	**99 (20.2%)**	**135 (33.4%)**	**24 (25.3%)**	**258 (26.1%)**
ADEQUATE (200-299)	**42 (8.5%)**	**69 (17.1%)**	**15 (15.8%)**	**126 (12.7%)**
EXCESS (>299)	63 (12.8%)	99 (24.5%)	43 (45.3%)	205 (20.7%)
Total	491 (100%)	404 (100%)	95 (100%)	990 (100%)

Figure 14: Level of iodine deficiency in Children by Zone



6.6.4 Mean Child Urine Sample Analyses by Zone

Results from analysis of the study children revealed the mean to be 192.3µg/L. Disaggregation of the result by zone showed the lowest mean concentration of urinary iodine was in the Northern zone (143.6 µg/L) and highest mean concentration was in the Southern zone (306.2 µg/L) and none were in the deficient iodine status categories. It is worth noting that the data from the Southern zone indicated the mean value was in the excess iodine status category (>299µg/L), nonetheless the analysis was based on relatively lower urine sample numbers and should be interpreted with caution (Table 47).

Table 47: Mean Child Urine Iodine (µg/L) by Zones

Category (Urine µg/L)	Northern (491)	Middle (404)	Southern (95)
Mean	143.6	224.7	306.2
Range	0-1470.4	4.7-1426.3	20.8-1010.1

6.7 WIFA Urine Analysis

The breakdown of the number of urine samples collected from WIFA in the three ecological zones of the country are as shown below and are approximately similar in all three zones (Table 48).

Table 48: Percentage WIFA Urine Samples Collected from the Three Ecological Zones

Zone	Number	Percentage
Northern	480	35.1%
Middle	458	33.5%
Southern	431	31.5%
Total	1,369	100

Table 49: Levels of Iodine Deficiency Detected in WIFA Urine Samples.

Category	Urine µg/L	Number	%
Severe iodine deficiency	<20	144	**10.5**
Moderate iodine deficiency	20-49	208	**15.2**
Mild iodine deficiency	50-99	294	**21.4**
Optimal	100-199	315	23.0
Adequate	200-299	175	12.8
Excess	>299	233	17.2
Total		1,369	

Of the 1369 urine samples collected from women (Table 49), 47.1 % showed some degree of iodine deficiency. 10.5% were categorised as having severe deficiency, 15.2% moderate deficiency and 21.4% were mildly deficient and 17.2% showed excess urinary iodine levels.

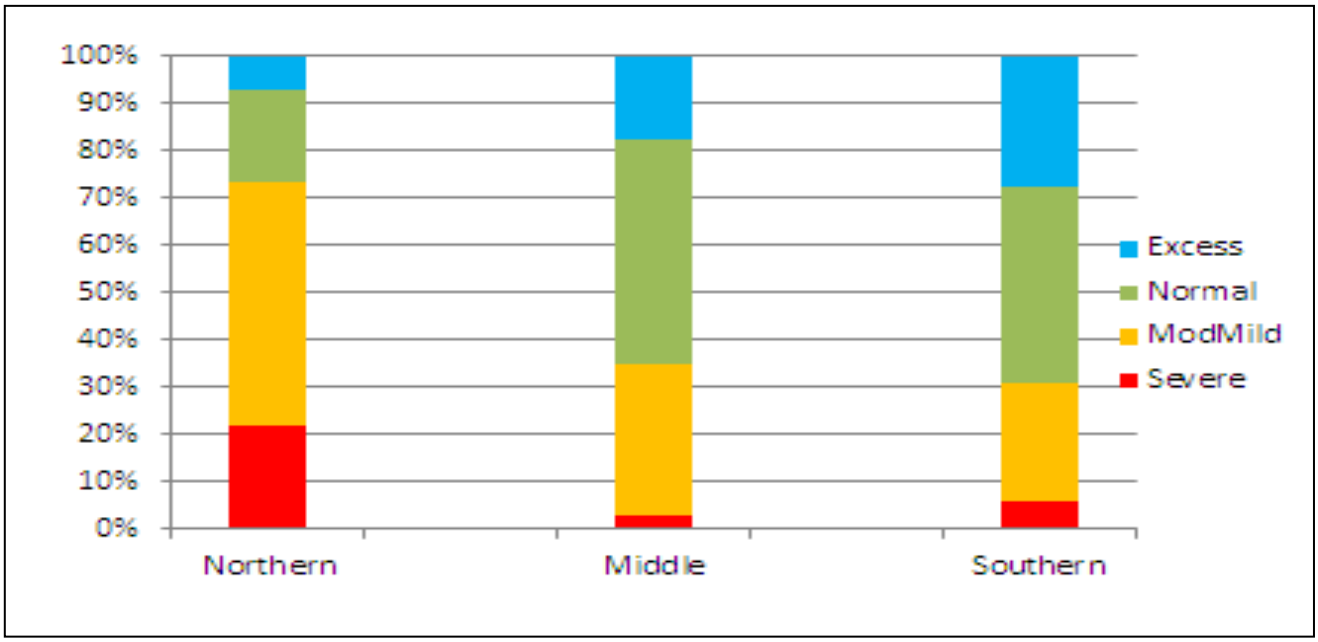
6.7.1 WIFA Urine Sample Analyses by Zone

The urinary iodine profile among the three zones (Table 50) shows that the prevalence of all levels of deficiency were highest in the Northern region, i.e. 21.7% had severe deficiency compared to 6% in the Southern and 3.1% in the Middle zone.

Table 50: Levels of Iodine Deficiency Detected in WIFA Urine Samples by Zone

Category (Urine µg/L)	Northern	Middle	Southern	Total
Severe iodine deficiency (<20)	104 (21.7%)	14 (3.1%)	**26 (6.0%)**	144 (10.5%)
Moderate iodine deficiency (20-49)	125 (26.0%)	42 (9.2%)	**41 (9.5%)**	208 (15.2%)
Mild iodine deficiency (50-99)	123 (25.6%)	104 (22.7%)	67 (15.5%)	294 (21.5)
OPTIMAL (100-199)	69 (14.3%)	150 (32.7%)	96 (22.3%)	315 (23.0%)
ADEQUATE (200-299)	25 (5.2%)	67 (14.6%)	83 (19.3%)	175 (12.8%)
EXCESS (>299)	34 (7.1%)	81 (17.7%)	118 (27.4%)	233 (17.0%)
Total	480 (100%)	458 (100%)	431 (100%)	1369 (199%)

Figure 15: Level of Iodine Deficiency in Women by Zone



A graphical presentation of urinary iodine of studied WIFA is shown in figure 15.

6.7.2 Mean Mother (WIFA) Urine Sample Analyses by Zone

The mean urinary iodine concentration for the women studied was determined to be 174.8 µg/L). Table 51 reports the mean urine iodine concentrations for women in fertile age across the three zones and shows that the lowest mean value (103.7 µg/L) was in the Northern zone and was just above the cut off for optimal iodine concentration (100µg/L).

Table 51: Mean WIFA Urine Iodine Concentrations across the Three Zones

Category (Urine µg/L)	Northern (480)	Middle (458)	Southern (431)
Mean	103.7	188.9	239.0
Range	0-1566.6	0-1221.8	0-2551.5

6.7.3 Correlation between Salt and Urinary Iodine Concentration

6.7.3.1 Child Urinary Iodine Concentration Compared to Observed Level of Iodine in Household Salt

Table 52: Child urinary iodine concentration by Observed level of iodine in salt

Category (Urine µg/L)	<15ppm	≥15<40ppm	≥40<60ppm	≥60	Total
Severe Iodine Deficiency (<20)	28 (58.3%)*	19 (39.6%)*	1 (2.1%)	0	48 (100%)
Moderate Iodine Def. (20-49)	53 (55.2%)	36 (37.5%)	2 (2.1%)	5 (5.2%)	96 (100%)
Mild Iodine Deficiency (50-99)	71 (50.7%)	60 (42.9%0	6 (4.3%)	3 (2.1%)	140 (100%)
Optimal (100-199)	94 (48.2%)	**76 (38.9%)**	9 (4.6%)	16 (8.2%)	195 (100%)
Adequate (200-299)	50 (55.6%)	**29 (32.2%)**	7 (7.8%)	4 (4.4%)	90 (100%)
Excess (>299)	55 (40.1%)	48 (35.0%)	20 (14.6%)*	14 (10.2%)*	137 (100%)
Total	351 (49.7%)	268 (37.9%)	45 (6.4%)	42 (5.9%)	706 (100%)

Table 52 compares adequacy of iodine in household salt using the titration method and concentrations of iodine in child urine categorised by deficiency criteria. The data indicates that urinary iodine concentration appears to correlate with level of adequacy of salt iodine content. If salt iodine concentrations of >15ppm and <40ppm are considered adequately iodized, and the categories optimal and adequate status are considered to be good status, 32.2% of children are consuming adequately iodized salt and have good iodine status as measured by urinary iodine. Conversely, 58.3% of those classified as having severe urine iodine deficiency levels lived in households consuming salt containing <15 ppm of iodine at the time of the survey. Only one household salt

sample with an iodine concentration between 40 and 60ppm and none with an iodine concentration >60ppm were associated with a child with severe urinary iodine deficiency. In households who had a salt iodine content <15ppm, the percent in each urinary iodine category did not vary. However, in the two categories indicating excess salt iodine, that is (≥40 ≤60ppm) and (≥60ppm), 13.8% of the children had excess urinary iodine concentrations (>299µg/L).

6.7.4 WIFA Urinary Iodine concentration Compared to Observed Level of Iodine in Household Salt by Titration Method

Tables 53 and 54 compare the adequacy of household salt determined by the titration method with the reported level of iodine deficiency based on the WIFA urinary iodine concentrations. The data appears to show some level of positive correlation with level of adequacy of salt iodine content. If salt iodine concentrations of >15ppm and <40ppm are considered adequately iodized, and the categories for optimal and adequate status are considered to be good status, 9.8% of women are consuming adequately iodized salt and have good iodine status as measured by urinary iodine. Conversely, 54% of those with severe urinary iodine deficiency levels lived in households consuming salt with an iodine level < 15 ppm. Only 5 women (0.4 %) who had household salt with iodine concentrations between 40 and 60ppm and 6 (0.44%) who had levels > 60ppm were found to have severe urinary iodine deficiency. Eighty–two women (6%) had urinary iodine concentrations classified as excess (>299µg/L) and had household salt containing < 15ppm of iodine.

Table 53: WIFA Urinary iodine status compared to level of adequacy of salt at the household level

Category (Urine µg/L)	**<15ppm**	**≥15<40ppm**	**≥40<60ppm**	**≥60**	**Total**
Severe iodine deficiency <20)	67 (54.0%)	46 (37.1%)	5 (4.0%)	6 (4.8%)	124 (100%)
Moderate iodine deficiency (20-49)y	113 (59.2%)	63 (33.0%)	5 (2.6%)	10 (5.2%)	191 (100%)
Mild iodine deficiency(50-99)	159 (59.3%)	82 (30.6%)	11 (4.1%)	16 (5.9%)	268 (100%)
Optimal (100-199)	151 (54.7%)	**92 (33.3%)**	18 (6.5%)	15 (5.4%)	276 (100%)
Adequate (200-299)	70 (46.7%)	**42 (28.0%)**	17 (11.3%)	21 (14%)	150 (100%)
Excess (>299)	82 (41.2%)	54 (27.1%)	23 (11.6%)	40 (20.1%)	199 (100%)
Total	642 (53.1%)	379 (31.4%)	79 (6.5%)	108 (8.9%)	1208 (100%)

Table 54: WIFA Urinary iodine status compared to level of adequacy of salt at the household level

Category (Urine µg/L)	**<15ppm**	**≥15<40ppm**	**≥40<60ppm**	**≥60**	**Total**
Severe iodine deficiency(<20)	67 (10.4%)	46 (12.1%)	5 (6.3%)	6 (5.6%)	124 (10.3%)
Moderate iodine deficiency (20-49)y	113 (17.6%)	63 (16.6%)	5 (6.3%)	10 (9.3%)	191 (15.8%)
Mild iodine deficiency (50-99)	159 (24.8%)	82 (21.6%)	11 (13.9%)	16 (14.8%)	168 (22.2%)
Optimal (100-199)	151 (23.5%)	**92 (24.3%)**	18 (22.8%)	15 (13.9%)	276 (22.8%)
Adequate (200-299)	70 (10.9%)	**42 (11.1%)**	17 (21.5%)	21 (19.4%)	150 (12.4%)
Excess (>299)	82 (12.7%)	54 (14.2%)	23 (29.1%)	40 (37.0%)	199 (16.5%)
Total	642 (100%)	379 (100%)	79 (100%)	108(100%)	1208 (100%)

For instance 54.0 % of those showing severe iodine deficiency based on urinary iodine concentration had household salt with less than 15ppm.

7 CHAPTER SEVEN - DISCUSSION

7.1 Introduction

This report describes the results of the combined survey undertaken to provide information needed for policy makers and program implementers to make informed decisions about the progress of implementation of the Ghana food fortification project and the salt iodization programme. It covers the results of analyses of data generated from household interviews of women (15-49 years) and laboratory analyses of urine from both women and school aged children (6-12 years) and where available salt, flour and oil collected from the selected households. This study follows up on the baseline survey, which was conducted in 2008, in response to the need to generate the necessary data to provide the basis to help evaluate the National Food Fortification Project in the country.

7.2 Knowledge on Food Fortification Project

The knowledge of fortification was found to be very low as only 33.4% of the respondents knew about fortification in general and only 23% were aware specifically of the on-going food fortification in Ghana despite the fact that the programme has been in operation for close to 5 years. Nevertheless it is important to note that this is an improvement on the baseline situation where only 25.3% said they had heard about fortification.

A look at the trend in the three zones with regard to respondents who knew about fortification at the time of the survey showed a rather wide zonal variation. More than half (53.4%) of those who know about fortification were in the Middle zone whiles only 15.2% were from the Northern zone. Although the northern zone is more rural and has fewer radio stations and health workers, these factors alone do not completely explain the observed differences in zones since the south which is the most urban did not show the highest proportion. This is more so as current awareness creation both at national and the community levels have been spread across the country and used more or less consistently. It is important that an in-depth assessment of the possible explanation for this picture is done including access to and coverage of the fortified foods to form the basis for the development of more focused and targeted strategies.

Knowledge about the benefits of fortification was also found to be low, although community-based activities and radio slots have been used over the last two years to increase knowledge and perceptions related to fortification. Perhaps at this stage, it would be helpful to carry out a review of message content, mode of dissemination, type of media, as well as coverage of the target groups. An encouraging point is the fact that there are positive perceptions about fortification, and among the respondents who had heard of it, most of them were able to mention benefits like “good health”, “gives blood”, and “gives strength”. Themes for the proposed new social marketing and communication efforts should be formulated around these positive attributes. With regards to the sources of information about food fortification, radio and health workers were mentioned the most.

This is also a very important finding that should be considered as the project explores ways to improve consumer knowledge and increase demand for and utilization of fortified flour products and vegetable oil particularly regarding the choice of appropriate strategy and communication channels.

7.3 Oil Purchase and Utilization

The report indicates that over 46% of respondents said they prepared meals with Nana Oil, Imperial Chef or Gino, which were some of the fortified oils available at the time of the survey. Again the need to heighten the intensity of on-going communication to generate demand cannot be overemphasized. This should however be done bearing in mind the zonal disaggregation of the data which shows that the highest reported use of industrially processed oils was in the middle zone and the fact that usage was significantly different among zones. The fact that the pattern of the use of the different types of oils varied a little among zones is of interest. For example Obaapa, sunflower, Unoli King and others were consumed mostly in the middle zone (60.8%), followed by the Southern zone (29%) and the Northern zone (10%). On the other hand the use of other fortified oils e.g. Frytol, Nana, Imperial Chef and Gino, was again highest in the middle zone but the distribution was it was equal (24%) in the southern and northern zones. The reasons for the observed difference among zones need to be explored in more detail and addressed in targeted communication.

The data also demonstrates that although about half of respondents indicated their preference for industrial processed oil produced by large factories, many also used non-fortified oil from small producers. Certain segments of the population consume the non-fortified oil in considerable

quantities, with more than half of respondents (57%) reporting the use of palm kernel oil, coconut oil, Shea butter or ground nut oil, which are the locally (artisanal) processed oil. In addition, 78% purchased palm oil, zomi or palmin all of which contain natural carotenoids. The national program will need to compile reliable data on the extent of the non-fortified oils and consider how to address fortification at the small scale level in order to reach all vulnerable groups. Alongside this it is critical to strengthen the communication aimed at increasing the consumption of vitamin A reach foods to include information on the benefits of consuming red palm oil that is rich in pro-vitamin A. This is critical as the drive for increasing the use of fortified vegetable oil could contribute to a shift from the use of palm oil a naturally rich source to a fortified source. One area of concern is the quality of complimentary foods which have far reaching consequences on the wellbeing and survival of children under-five years and therefore on-going efforts should address the micronutrients intake of children among others.

The data on complimentary feeding from this survey indicates shows suboptimal practices persists such as late introduction and use of homemade food items that are generally not enriched and may have low energy density. For instance, close to a third (29.8%) of those who had started giving complementary food introduced food when the child was less than 6 months of age whiles 83 (23.4%) did so after 6 months of age but not more than one year of age.

With regards to types of complimentary foods, of the 355 who had introduced complementary feeding at the time of the survey, 282 (79.4%) responded that they had used local homemade foods. More detailed information needs to be compiled on the quality of these foods to provide the basis for caregiver education.

The data from the analysis of oil samples showed that the level of retinyl palmitate detected in 84% of samples was below 10mg/kg, an indication of a low level of fortification. Only 12% of the oil samples had adequate concentrations of retinyl palmitate ($\geq$ 10mg retinyl palmitate/kg oil) and 5% had concentrations above 20mg/kg oil. This may be an indication of either loss of retinyl palmitate during transport and storage or very low levels of compliance to the fortification standards and calls for further investigation. If the problem is low compliance to the fortification standards, then a review of the existing food control systems, both internal and external monitoring, as well post

market surveillance is required. The project aims to reach at least 80% of consumers with adequately fortified oil and this dramatically falls short of the target. The end line target is to improve vitamin A status and this can be achieved only if target groups are reached with adequately fortified oil on a sustainable basis. Data from routine monitoring and post market surveillance show increasing availability of fortified oil which will have to be supported by heightened demand creation. This is crucial because of the availability of locally processed and possibly cheaper choices from a large number of unfortified oils on the market which is not going to be fortified under the current project.

7.4 Flour Fortification

Because householders buy flour-based products and not flour *per se*, only a few flour samples were collected (N=79). The laboratory analysis showed that over 64% of the flour samples had levels of ferrous fumarate below 45 mg/kg, lower than the minimum value (45 mg/kg) stipulated in the Ghana Standard. The mean ferrous fumarate concentration in the wheat flour was found to be 39.8 mg/kg, below the standard. However the data should be interpreted with caution as the sample size was very small because generally household processing and use of wheat flour in the preparation of family meals were found to be very low as most respondents indicated they purchased finished flour products for household use. Indeed less that 3% of all the women interviewed reported using flour at least once a week in the preparation of the family dish.

It should also be noted that flour produced by the Irani Bothers' is currently being fortified at a lower concentration due to reports that some fortificants contained in the Ghana Premix have undesirable effect on the flour quality during the production stage and therefore Irani flour samples collected will contain less than expected fortificants. The effect of low level of ferrous fumerate in particular and possible other micronutrients in line with the standards for the Ghana prefix is a major concern. This has implication for the achievement of the project goal of contributing to reducing unacceptably high anaemia prevalence of 78% in children and 59% in WIFA respectively, (GDHS, 2008).

The results of the 7-day food frequency survey showed that among the different types of wheat flour products locally available, 43% and 48% of women and children respectively consumed bread at least

three times a week . While this is relatively high, the figure is actually a reduction from the baseline situation where over 60% of women reported consuming bread at least three times a week.

7.5 Iodine Deficiency/ Salt Iodization

The information gathered showed that iodine status is still low as 40% of school-aged children and 47% of WIFA were found to have mild to severe iodine deficiency. For both population groups, zonal disaggregation showed the northern zone to be the most worst affected area. Since urinary iodine excretion reflects iodine intake this could possibly be attributed to relatively poor access to adequately iodized salt in this part of the country and indicates a serious public health problem.

Conversely, further analyses of WIFA and child urinary iodine status showed that about a fifth of the children and WIFA had excess iodine in their urine attributable to the consumption of excess iodine. It has been suggested that the practice of some salt producers of sprinkling iodine on the surface of a salt load might lead to localised excess iodisation if the salt is not mixed properly. It is also believed that other production errors such as using too much fortificant might contribute to this situation. The southern zone had the highest percentage of salt samples with both low and excess levels of iodine due to the easy availability of non-iodized salt in the coastal areas, where there are a lot of small scale artisanal producers, and the practice of surface sprinkling of iodine respectively. It should be noted that generally most of the production sites are situated in the southern zone and the bulk of salt for distribution nationwide is from that area therefore the issue of poor production techniques may be more focused in the south. The factors will ultimately affect the adequacy or otherwise of intake across the country.

When salt samples were tested with the rapid field test kit, 78% were classified as inadequately iodized, compared to 52% by the titration method. Although some level of disparity between the two tests was expected, a rather high number of false negatives was detected by the rapid test kit in this survey. This is of concern because it means that producers of iodized salt using rapid test kits for quality control are more likely to overdose their salt with potassium iodate giving rise to excess levels of >60ppm. The fact that almost 52% of salt samples analyzed by titration method showed levels of iodine <15 ppm raises the question of the quality of iodized salt on the market.

An attempt was made to assess the correlation between the adequacy of iodine in household salt using the titration method and concentrations of iodine in child urine categorised by deficiency criteria. There was some level of correlation. For instance if salt iodine concentrations of >15ppm and <40ppm are considered adequately iodized, and the categories optimal and adequate status are considered to be good status, 32.2% of children are consuming adequately iodized salt and have good iodine status as measured by urinary iodine. Conversely, 58.3% of those classified as having severe urine iodine deficiency levels lived in households consuming salt containing <15 ppm of iodine at the time of the survey. On the other hand some level of discordance was observed. In the two categories indicating excess salt iodine, that is (≥40 ≤60ppm) and (≥60ppm), 13.8% of the children had excess urinary iodine concentrations (>299µg/L). This calls to question where this group is getting their iodine from. Further studies will throw more light and will be of interest.

It should be noted that non-iodized and inadequately-iodized salt reach households in Ghana largely because available on the market is salt that has low or no iodine content and this could be largely attributed to the aforementioned factors related to suboptimal production practices. All this should be discussed against the background of the set goal of the IDD programme being universal iodization which means to ensure that at least 90% of households use iodized salt. The implication for augmenting efforts to control for iodine content during production and marketing cannot be overemphasized.

The other unanswered questions are how much of the current control systems are in fact, more qualitative and not quantitative and how does this affect adequacy of iodization? Furthermore, to what extent have producers failing to meet the norms been penalized with sanctions? Is enforcement of regulations lax and contributing to this? Has adequate capacity been developed to support production and monitoring? These issues have huge implication for monitoring and enforcement and ultimately achieving the gaols for universal salt iodization.

To investigate consumer understanding and attitudes related to the on-going mandatory salt iodization women's knowledge of the health impact of iodine deficiency was assessed and the results showed that overall knowledge of the benefits of salt iodization was generally low with most women interviewed giving incorrect responses. Indeed only about 21% of a total of 762 of respondents who

said they know the benefits of iodized salt actually did. As has been stated as important for the sustainable control of other micronutrients deficiencies, consumer education is one again crucial to provide information on benefits of choosing iodised salt.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

The findings from the survey have given indications of the performance of both the FFP and Salt Iodization program in terms of knowledge, utilization, and household coverage. The results have also given information on consumer knowledge levels and the prevalence of iodine deficiency using urinary iodine concentrations. The potential policy and program design implications have been summarized and discussed and may provide the basis to guide discussions in reviews, re-strategizing and improvements of both the FFP and IDD programmes. It is the expectation that the NFFA, the Executing Agency and other regulatory agencies will oversee and coordinate the use of the results of this study to review the current implementation and incorporate aspects of the findings into the programmes. The National Salt Iodization Committee, Regional Coordinating councils in the respective regions need to collaborate with key partners including GAIN and UNICEF need to part of this process of strengthen the IDD program.

8.2 Flour Fortification

Of the few fortified wheat flour samples collected during the survey, 64% had levels of ferrous fumerate concentrations below 45 mg/kg, and did not contain adequate iron levels according to specification. However this information should be interpreted with caution as the number of households that had flour on the day of the survey was very low. It is recommended that the inspection of the fortified flour at the factory level and post-market surveillance should continue to ensure that all brands are meeting the set criteria.

8.3 Oil Fortification

The inspectors at ports of entry need to monitor closely the importation of cooking oil in particular as increasingly a lot of the industrially process and fortified oil are brought in from elsewhere. . Factory inspection, testing at ports of entry and post market surveillance should be strengthened to quality. Future studies should compile data to allow brand specific information for both oil and flour.

The social marketing strategies need to take cognisance of the fact that there is still a lot of local non-fortified oil available on the market. It should also recognise that some of these in particular palm oil is naturally rich pro-vitamin A and guard against a shift from the use of this type of oil.

8.4 Iodine Deficiency Disorders

The result of the assessment indicates that the quality of salt in Ghana is not good in terms of iodine content relative to the set standard. The fact that over half of the salt samples tested by titration method were not adequately iodized has implications for quality control and the current monitoring system and ultimately how much iodine reaches the consumer. An essential component which is of interest the need to institute an effective system for use of the data generated from the monitoring systems to ensure sustainable solutions are found to address the problem of poor quality.

The control of iodine content during production and marketing is important to achieving the aim of the national program.

The issue of false negatives in the use of field test kits and the potential for this contributing to excess intake of iodine is of concern and needs to be discussed and resolved as a matter of urgency. It is expected that the renewed being pursued jointly by GAIN, UNICEF and Government will incorporate these findings to improve implementation and increase access to adequately iodised salt.

8.5 Issues on Knowledge Attitude Practices

The result of the analysis of the questionnaire on KAP relating to food fortification, IDD and salt iodization revealed a rather low knowledge level which was not impressive. This finding suggests that there is a need for intensive, effective, coordinated and sustainable social marketing and communication to improve knowledge, create awareness and generate the requisite demand for fortified foods.

This might entail reviewing and redesigning the current communication strategy as well as the types of communication channels. In particular, a sustained increase in the intake of fortified bread and oil is necessary for the achievement of the project objectives and this will depend largely on an effective and well-targeted communication strategy. Consumer knowledge of benefits of consuming iodized salt is important to guide making the choice between iodized or non-iodized salt.

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GHANA HEALTH SERVICE

GHS LOGO

COMBINED SURVEY ON COVERAGE OF FOOD FORTIFICATION AND ASSESSMENT OF IODINE DEFICIENCY DISORDERS IN GHANA
26/11/09

HOUSEHOLD INTERVIEW QUESTIONNAIRE

FORM NUMBER		FORMNO
REGION		REGION
DISTRICT		DISTRICT
ENUMERATION AREA NAME		EANAME
ENUMERATION AREA NUMBER		EANUM
URBAN.RURAL	1. URBAN 2. RURAL	URBRUR
HOUSEHOLD NUMBER		HHNO
NAME OF HOUSEHOLD HEAD		HHNAME

HOUSEHOLD QUESTIONNAIRE

1. HOUSEHOLD VISIT SCHEDULE

1.0. Name of eligible woman		
1.1. Date of interviewer visit (*ddmmyy)*……		DVIS
1.2 Result of visit		
1. Interview Completed / 2. Interview not complete / 3. Other (specify)		RVIS
1.3 Time interview Started (hh:mm) (24 hours format) ……		TSTART
1.4 Time interview ended (hh:mm) (24 hours format)……		TEND
1.5. Fieldworker code.....		HFW
1.6. Forms checked by (Supervisor)……		HFS

CONSENT

The Ghana Health Service has been implementing programmes to address the micronutrients deficiency such as vitamin A, iron and iodine deficiency disorders in different target groups in the country. These programmes include supplementation, nutrition education and food fortification. The food fortification is being carried out under the Ghana Fortification Project with funding from Global Alliance for Improved Nutrition (GAIN) and the Government of Ghana. The goal of this project is to improve the micronutrient status of children two–five years of age and women in the reproductive age group especially pregnant and lactating women through increased availability and intake of fortified foods.

At the start of the project we spoke to some of you in a baseline survey to determine the availability, access and intake of fortified foods by children two–five years of age and women in the reproductive age. The Ghana Health Service has also been undertaking Salt Iodization program in collaboration with health partners such as UNICEF. These programs have been in operation for some time and there is the need to review progress made. Therefore we wish to collect information on knowledge about food fortification, availability and consumption of flour products and food made from commercially processed vegetable oils among children and women and use of iodised salt by households.

The data will be utilized for the evaluation of both the National Food Fortification Project and the Salt Iodization program, and for follow-up and review of programmes and to compile data which will enable us to describe the extent of reduction of these deficiencies in children and women.

Study procedures and participation.

This survey will be carried out in households throughout the country by personnel of the Kintampo Health Research Centre, Ghana Health Service and the Ghana Statistical Service by visiting selected households. If you agree to take part in this survey, you will be asked a series of questions on your food intake and that of your children. You will be asked about the availability and consumption of flour products and food made from vegetable oils and small amounts of salt and vegetable oil usually used in meals preparation for your household will be collected. You will be asked to give permission for a sample of your urine and that of your child to be taken to determine the iodine status presence. You will be visited only once and any information I give will be treated as confidential. Participation is voluntary and you are free to decline to participate and will not suffer any consequences. The sample of urine you give will only be used to carry out the tests which I have just mentioned and no other test.

I understand that I may not have any direct benefit from my participation but my community as a whole would benefit.

I have been informed that I or my partner/husband/child's father are free to ask any questions and we might have about this project and for any further questions Dr Seth Owusu-Agyei (Tel 061-24145), Dr Sam Newton (061-27304 ext 108) or Dr Kwaku Poku Asante (Tel 061-28869 ext 107) who are at the Kintampo Health Research Centre and Mr. Jacob Armah (Tel 021 665001) of Ghana Health Service, Accra may be contacted.

I understand that my participation and that of my child is voluntary and that the information which I give will remain confidential and will be available only to the investigating team and may be reviewed by the institutional ethics committee.

Do you have any questions?

Name of Respondent:---------- Date…….

Signature or Thumb print.

Name of witness : ---------- Date……

Signature of witness.

Name of interviewer…….. Signature...……...……

Date

1.10. Consent given ……..	1. Yes	2. No	WCONSET

WOMEN'S FORM

Collect any relevant documents that may have information about the respondent's age and her children's age and immunization

2.0 DEMOGRAPHIC CHARACTERITISCS OF WOMAN (15-49 years)

First I would like to ask some questions about you and your household.

2.1. In what year were you born? ***(,8888 = NK, verify from any available document e.g. Voters ID)*** | | | | | YEARBORN

2.2. How old are you? ***(in completed years, 88 = NK, verify from any available document e.g. Voters ID)*** | | | WAGE

2.3. How long have you been living **continuously** in your **current** residence? | | | DLIVE
(in years, 00= less than 1 yr, 99 = since birth, 88 = not known)

2.4. Have you ever attended school?.....…… | 1. Yes | 2. No | WEDUC

2.5. If Yes what is the highest level of education you attained?

1. Primary	2. Middle/JSS	3. Secondary/ SSS Vocational/ Technical	4. Post Sec training: Nursing, Training college etc	5. Univ. / Poly.	9. NA	WLSCHOL

2.6. What is the highest (grade/form/year) you completed at that level? | | | GRADCOMP
(99 = Not applicable)

2.7. Can you read and understand a letter or newspaper easily, with difficulty, or not at all?	1. Easy	2. With difficulty	3. Not at all	WREAD

2.8. What is your religious affiliation?

11. Catholic	12. Anglican	13. Methodist	14. Presbyterian	15. Pentecostal /Charismatic	WRELIG
16. Other Christian	17. Moslem	18. Traditional	19. No religion	20. Other(specify)	

2.9. What is your ethnicity?

11. Bono	12. Asante	13. Fante	14. Akwapim	15. Akyem	WETHNIC
16. Ga/Adangbe	17. Ewe	18. Guan	19. Mole-Dagbani	20. Grussi	
21. Gruma/Bimoba	22. Hausa	23. Nzema	24. Dagarti	25. Gruni	
26. Kusasi	27. 28. Other(specify)……				

2.10. What is your occupation, that is, what kind of work do you **mainly** do?

10. Professional/ technical/ Managerial	11. Clerical	12. Sales/ services	13. Skilled manual (seamstress, hairdresser, carpenter, fitter, etc)	WOCCUP
14. Farmer (crop/animal,fishing)	15. unskilled manual (laborer etc)	16. Unemployed	17. Student/Apprentice	
18. Other:				

2.11 What is your current marital status?

1. Married	2. Living together	3. Widowed	4. Divorced	5. Separated	WMARRY
6. Never Married, but **have** a partner		7. Never Married, **don't have** a partner		8. Divorced**, but have** a partner	

3.0 REPRODUCTION

3.1. Have you ever given birth? | 1. Yes | 2. No | EVERBORN
If yes ask the next question or write 99 for the number of births in 3.2

3.2. How many children do you have? …….. | | | CHILDREN
99=No Child; 00=had child but died

3.3. Do you have a child who is in the age group 2- 5 years ? | 1. Yes | 2. No | UNDER5

3.4. Do you have a child who is in the age group 6- 12 years?	1. Yes	2. No	BET612

1. Section A –Food Fortification Project

4. KAP/ About Fortification

4.1 Have you heard of food fortification?	1. Yes	2. No	FOODFORT

4.2. If yes where did you hear about food fortification? **(DON'T PROMPT)**

4.2.1. Radio	1. Yes	2. No	9. NA	RADFORT
4.2.2 Leaflets/posters	1. Yes	2. No	9. NA	LEAFFORT
4.2.3 TV	1. Yes	2. No	9. NA	TVFORT
4.2.4 Newspaper	1. Yes	2. No	9. NA	DAILFORT
4.2.5. Friends family and relatives	1. Yes	2. No	9. NA	FRIEFORT
4.2.6 Health workers	1. Yes	2. No	9. NA	HEALFORT
4.2.7 Church/mosque	1. Yes	2. No	9. NA	CHURFORT
4.2.8 Community based agents/volunteers	1. Yes	2. No	9. NA	COMFORT
4.2.9 Bakers/Traditional Caterers	1. Yes	2. No	9. NA	BAKERFORT
4.2.10 Other (specify)……..	1. Yes	2. No	9. NA	OTHFOR

4.3. If yes what are the health benefits/importance of consuming fortified foods?
(DON'T PROMPT)

4.3.1. Promotes good health	1. Yes	2. No	9. NA	PROFORT
4.3.2. Gives blood	1. Yes	2. No	9. NA	BLODFORT
4.3.3 Gives strength	1. Yes	2. No	9. NA	STREFORT
4.3.4. Improves school performance	1. Yes	2. No	9. NA	SCOOLFORT
4.3.5 Improves child survival	1. Yes	2. No	9. NA	CHILDFORT
4.3.6 Improves work output	1. Yes	2. No	9. NA	WORKFORT
4.3.7 Prevents illness	1. Yes	2. No	9. NA	ILLNFORT
4.3.8 Improves eyesight	1. Yes	2. No	9. NA	EYFEFORT

KNOWLEDGE ABOUT ON-GOING COMMUNICATION CAMPAIGN AND IDENTIFICATION OF LOGO

4. 4.Have you heard about the on-going food fortification in Ghana?	1. Yes	2. No	HEADFORT

4.5 If yes, where did you hear about this? **(DON'T PROMPT)**

4.5.1. Radio	1. Yes	2. No	9. NA	RADHEAR
4.5.2 Television	1. Yes	2. No	9. NA	LEAFHEAR
4.5.3 Health worker	1. Yes	2. No	9. NA	TVHEAR
4.5.4 Newspaper	1. Yes	2. No	9. NA	DAILHEAR
4.5.5. Baker/caterer	1. Yes	2. No	9. NA	FRIEHEAR
4.5.6 Other (specify)……..	1. Yes	2. No	9. NA	OTHHEAR

4.6. What did you hear?**(DON'T PROMPT)**

4.6.1. Promotes good health	1. Yes	2. No	9. NA	RADWHAT
4.6.2 Gives strength	1. Yes	2. No	9. NA	LEAFWHAT
4.6.3 Improves school performance	1. Yes	2. No	9. NA	TVWHAT
4.6.4 Gives blood	1. Yes	2. No	9. NA	DAILWHAT
4.6.5. Improves child survival	1. Yes	2. No	9. NA	FRIEWHAT
4.6.6 Improves eyesight	1. Yes	2. No	9. NA	HEALWHAT
4.6.7 Improves work output	1. Yes	2. No	9. NA	CHURWHAT
4.6.8 Other (specify)……..	1. Yes	2. No	9. NA	OTHWHAT

4.7a. Have you seen this logo before? **(SHOW LOGO)**	1. Yes	2. No	SEENLOGO
4.7b If yes, where did you see the logo? (**DO NOT PROMPT**)			

4.8 If yes where did you hear about food fortification? **(DON'T PROMPT)**

4.8.1. Posters /leaflet	1. Yes	2. No	9. NA	POSHEAR
4.8.2 Television	1. Yes	2. No	9. NA	TVHEAR
4.8.3 Health worker/ health facility	1. Yes	2. No	9. NA	HEAHEAR
4.8.4 Newspaper	1. Yes	2. No	9. NA	NEWHEAR
4.8.5 Bakers/Traditional Caterers	1. Yes	2. No	9. NA	BAKTRAHE
4.8.6 Other (specify)……..	1. Yes	2. No	9. NA	OTHHEAR

4.9 What does the LOGO signify or show or mean **(DON'T PROMPT)**

4.9.1. Food item fortified	1. Yes	2. No	8.NK	9. NA	FOODLOGO
4.9.2 Nutrients added for good health	1. Yes	2. No	8.NK	9. NA	NUTLOGO
4.9.3 Food has good quality	1. Yes	2. No	8.NK	9. NA	FOQUALOGO
4.9.4 Other (specify)……..	1. Yes	2. No	8.NK	9. NA	LOGOOTH

4.10. Why is it necessary to fortify some food items in Ghana?

4.10.1. Address vitamin deficiency	1. Yes	8. NK	DEFVIT
4.10.2. Improve health/survival	1. Yes	8. NK	SURVLVIT
4.10.3. Improve nutrient value of food commodities	1. Yes	8. NK	GROWTVIT
4.10.4 Prevention of infection & diseases	1. Yes	8. NK	DISVIT
4.10.5. Promotes good health	1. Yes	8. NK	DEATHVIT
4.10.6. To improve child survival	1. Yes	8. NK	CHILVIT

HH AVAILABILITY AND CONSUMPTION OF FORTIFIED OILS, FLOUR &FLOUR PPRODUCTS

4.11. Do you prepare your food with some of these vegetable oils/spreads? **(PROMPT)**

4.11.1. Obaapa, Sunflower oil, Sankofa, Unoli, Kings and other commercial oils?	1. Yes	2. No	8. NK	OBAOTHVIT
4.11.2. Nana Oil, Frytol,, Imperial Chef, Gino	1. Yes	2. No	8. NK	FORTIFOILVIT
4.11.3 Fortified spread, e.g. Blue Band margarine, Remia and Planta	1. Yes	2. No	8. NK	SPREADVIT
4.11.4. Palm kernel oil, coconut oil, Shea butter, Groundnut oil?	1. Yes	2. No	8. NK	KERVIT
4.11.5. Palm oil, Zomi and Palmin	1. Yes	2. No	8. NK	POILVIT
4.11.6 Other specify……	1. Yes	2. No	8. NK	OTHPREP

4.12. How many days in the past week (7 DAYS) did you eat foods prepared with the following vegetable oil & spread? **(PROMPT & PROBE)**	None	1-2 days	3 or more days	Not Known

4.12.1. Obaapa, Sunflower oil, Sankofa, Unoli, Kings and other commercial oil	1.	2.	3.	8.	COMMOIL
4.12.2. Nana Oil, Frytol,, Imperial Chef, Gino	1.	2.	3.	8.	NAFRYOIL
4.12.3. Fortified spread, e.g. margarine, Remia and Planta	1.	2	3.	8.	FORTOIL

4. 13a How often do you purchase oil for household use?	1. Daily	2. More than 3 times a week	3. 1-2 times a week	4. Once a week	OILLAST
	5. 2 times a month	6. Once a month	Other, Specify: ……	9. NA	

4.13 b. What is the average quantity of vegetable oil you purchase at a time for household use (in liters?)	1. Small poly bag (< 0.5 litre)	2. 0.5 litre	3. One litre	4.. Two litres	AVEOIL
	5. Three litres	6. One gallon	7. More than one gallon	9. NA	

4.13c On average how many people in your HH eat meals prepared using this quantity of vegetable oil in the house?			9. NA	HOWMANY

4.13d. On average how long does this quantity of oil last before it gets finished?	1. one day	2. less than a week	3. 1 week	4. 2 week	OILLAST
	5. 3 weeks	6. Monthly	7. More than a month	9. NA	

CONSUMPTION OF FLOUR PRODUCTS (BY WIFA)

4.14. How many days in the past week (7 DAYS) did you eat the following food Items from wheat flour? **(PROMPT)**	None	1-2 days	3 or more days	Not Known	
4.14.1. Bread (all types)	1.	2.	3.	8.	BREADOIL
4.14.2. Pastries, biscuits ,cakes, rock buns, pies	1.	2.	3.	8.	PASTOIL
4.14.3 Doughnuts, bofrot, toogbei Pancake, polo, atsomo, springrolls etc	1.	2.	3.	8	NUTOIL
4.14.4 Other flour products.....	1.	2.	3.	8	OTHFLWK

4.15. Do you have any flour products in your house today?
(OBSERVE)

4.15.1. Bread	1. Yes	2. No	9. NA	BREAD
4.15.2. Pastries Biscuits and cakes	1. Yes	2. No	9. NA	PASTRY
4.15.3. Doughnuts and bofrot	1. Yes	2. No	9. NA	BOFROT

CHILD FORM

Using a plan sheet of paper, List ages of children between the ages of 24-59 months (include only those directly cared for by selected caregiver) and randomly select one …….

5.0 DEMOGRAPHIC CHARACTERITISCS OF SELECTED CHILD

I would like to ask some questions about this child in your household.

5.1. Name of selected child (24-59 months) | |

5.2. When was (NAME) born? ***(8888 = NK, verify from any available document e.g birth certificate, Health Record Cards, Family records.)*** [VERIFY] | | | | | | | CHILDBORN

5.3. How old is (name) child? ***(completed months, 88 = NK, verify from any available document)*** | | | CHILDAGE

REFER TO WEIGHING CARD, BIRTH CERTIFICATE BAPTISMAL CERTIFICATE, FAMILY RECORDS ETC.

5.4. Sex	1. Male	2. Female	CSEX

6. CHILD FEEDING PRACTICES

6.1. Do you prepare food for your child with some of these food items? **(PROMPT)**

6.1.1 Obaapa, Sunflower, Sankofa, Unoli, Kings other commercial oil	1. Yes	2. No	8. NK	CFRYVIT
6.1.2 Frytol, Nana oil, imperial chef and Gino	1. Yes	2. No	8. NK	CBLUEVIT
6.1.3. Fortified spread, e.g. Blue Band margarine, Remia, Planta	1. Yes	2. No	8. NK	CFORTVIT
6.1.4. Palm kernel, coconut, Shea butter, cashew oil, Groundnut	1. Yes	2. No	8. NK	CKERVIT
6.1.5. Palm oil, Zomi, Palmin	1. Yes	2. No	8. NK	COILVIT
6.1.6 Other specify……				COTHERF

6.2. How many days in the past week did you feed this child with foods prepared with vegetable oil and spread? **(PROMPT)**

	None	1-2 days	3 or more days	Not Known	
6.2.1. Obaapa, Sunflower, Sankofa, Unoli, Kings other commercial oil	1.	2.	3.	8.	CFRYOIL
6.2.2. Frytol, Nana oil, imperial chef and Gino	1.	2.	3.	8.	CBLUEOIL
6.2.3 Fortified spread, e.g. Blue Band margarine	1.	2.	3.	8.	CFORTSPR

6.3. How many days in the past week did you feed your child with the following foods items from wheat flour?

	None	1-2 days	3 or more days	Not Known	
6.3.1. Bread (all types)	1.	2.	3.	8.	CBREADOIL
6.3.2. Pastries, biscuits, cakes	1.	2.	3.	8.	CPASTOIL
6.3.3 Doughnuts, bofrot, toogbei pancake, polo, atsomo, etc	1.	2.	3.	8	CNUTOIL

6.3.4 Other flour product? .....

1.	2.	3.	8	COTHFLWK

COLLECTION OF OIL & FLOUR SAMPLES FOR ANALYSIS

6.4. Which brand of refined oil do you usually use to prepare the family dish? (DO NOT PROMPT)

11. Frytol	12.Obaapa	13. Sunflower	14. Unoli	WCHBRAND
15. Nana oil	16. Kings	17. Sankofa	18. Imperial Chef	
19. Gino	20. Other SPECIFY)……	99.NA Does not use refined oil only artisanal oil		

6.5 In which packaging do you usually buy your oil?

1. Original packaging	2. In small refilled poly bags	3. Other (SPECIFY): …….	PACKOIL

6. 6 .Do you currently have refined oil in the household? (OBSERVE & RECORD)

1. Yes	2. No	OILPRSENT

6..7 .If yes can we sample some of your oil for analyses in the laboratory?

1. Yes	2. No	9.NA	SAMPLAB

6.8. OBSERVE WHICH BRAND OF OIL IS IN USE & RECORD

11. Frytol	12.Obaapa	13. Sunflower	14. Unoli	15. Nana oil	OBSBRAND
16. Kings	17. Sankofa	18. Imperial Chef	19. Gino oil		
20. Does not have refined oil at home	21. Refused	99. NA Does not use refined oil only artisanal oil	10. Other (SPECIFY)……...		

6.9 IN WHICH PACKAGING WAS OIL OBSERVED?

1. Original packaging	2. Small plastic bottles	3. Small poly bag	4. Other (SPECIFY) ……	9.NA	OILPACK

6. 10 OBSERVE BATCH NUMBER OF BRAND OF OIL IN USE IN THE HOUSEHOLD AND RECORD

1. Batch Number:	BATCHOIL
2. No batch number available	

6.11. IN WHICH PACKAGING WAS THE OIL YOU OBSERVED?

1. Original Packaging (labeled bottle or printed bag	2. Brought container, small plastic bag that are filled	3. Other (SPECIFY) ……..	9.NA	OBSPACK

6.12. OBSERVE THE STORAGE CONDITION?

1. In the dark	2. In the light	3. Non observable……..	9.NA	OBSTORE

6. 13 Do you use flour at least once a week to prepare a family dish? (IF YES GO TO QUES 6.14, IF NO CIRCLE NA FOR 6.14-6.20)

1. Yes	2. No	USEFLOUR

6. 14 Which brand of wheat flour do you usually purchase?

1. Irani Brothers (Cross)	2.GHANA China	3. GAFCO (Sankofa)	FLOPURCH

4. Takoradi Flour Mills	5. Other	8. DK	9.NA

6.15 In what packaging do you usually buy the flour?

1. Original packaging	2. Small plastic bags	3. Other (SPECIFY) ……	9.NA

PACKFLOUR

6. 16. .Do you have any wheat flour in the house today?

1. Yes	2. No

FLOPRSENT

6.17 .If yes can we sample some of your flour for analyses in the laboratory?

1. Yes	2. No	9.NA

SAMPFLO

COLLECT SAMPLE AND LABEL WITH HH ID

6. 18 OBSERVE BRAND OF FLOUR IN USE & RECORD

1. Irani Brothers	2.GH China	3. GAFCO	
4. Takoradi	5. Other	8. DK	9.NA

OBSFLO

6. 19 OBSERVE BATCH NUMBER OF BRAND OF FLOUR IN USE IN THE HOUSEHOLD AND RECORD

1. Batch Number:
2. No batch number available

BATCHFLO

6.20 IN WHICH PACKAGING WAS THE FLOUR OBSERVED?

1. Original packaging	2. Small plastic bags	3. Other (SPECIFY) ……	9.NA

FLOURPACK

Section B -IDD

IDD HOUSEHOLD SURVEY QUESTIONNAIRE-GHANA USI /GAIN
PART I: SALT USE

7.1. Can you show me the salt you use for household cooking?

1. Coarse	2.Granular	3. Smooth/fine	4. No salt
5. Other (SPECIFY)…….			

SHOWSALT

7. 2 Where do you buy salt for household use ?

1. Local shop/kiosk	2..Market/shop in community	3. Shop/kiosk in nearby town
4. Market in nearby town/village	5. Market/shop across the border	6. Other……

OBSFLO

7.3 In what form do you buy salt for household use?

1. Served from salt heaped in a bowl and packaged	2. Already re-bagged	3. Sachet	4. Other

FORMSALT

7.4. How much salt do you mostly buy at a time?

1. 1 tomato tin (s/s)	2. 1 milk tin	3. 250 gm sachet	4. 500gm sachet
5. I kg sachet	6. Olonka /American tin		9.NA Does not buy salt.
7. Other (SPECIFY)……			

SALTQUAN

7.5. How often do you buy salt for household use?

1.) Daily	2. 1-2 times a week	3. 3-5 times a week	4. Weekly	SALTREC
5. Once a month	6. Once in 2-3 months	7. Once in 4-5 months	8.Once in 6 months	
8. Other (SPECIFY)…….				

STORAGE OF HOUSEHOLD SALT

7.6 Where do you keep salt? **(ASK TO SEE PLACE OF STORAGE)**

1. In the kitchen	2 In the store room	3. Other (SPECIFY) …….	KEEPSALT

7.7 How do you store your salt? **(ASK TO SEE / OBSERVE MEANS OF STORAGE)**

1. Container with lid	2. Container without lid	3. Same bag/sachet	4. Other	STORESALT

7.8. What is the brand name of household salt being used **OBSERVE LABEL ON PACKAGING MATERIAL & RECORD)**

11. Panbros salt	12. Anapurna	13. Diamond salt	14. Shiffu salt	SALTBRND
15. Hebroni	16. Unique	17. NITTS salt	18. Abagna	
19. Tradevco	20.No brand name	88. don't know		
21. other, SPECIFY…….				

PART II: AWARENESS & KNOWLEDGE OF IMPORTANCE OF IODATED SALT

7. 9 Have you ever heard of iodated salt?

1. Yes	2. No	HEARHSALT

7. 10 If Yes, where did you hear about it?

11 Health worker		12. School child/Sch. teacher		13. trader/ shopkeeper	14. Family member
15. Radio	16. TV	17. Newspaper	18. Other specify	9. NA	WHERDSALT

7. 11 Do you use iodated salt?

1. Yes	2. No	USESALT

7. 12 If No, please give me the **MOST IMPORTANT** reason (s) why you don't use iodated salt?

1. It is too expensive	2. I don't know what it is	3. The other kind of salt is more available	REASSALT
4. I react to it	5. I don't like the taste	6. Other specify…….	9. NA Use iodated salt

7. 13 Do you know about any benefits of iodated salt?

1. Yes	2. No	KNOWBEN

7.14 If Yes, can you please state/mention **MOST IMPORTANT** benefit?

(DON'T PROMPT)

1 Provides iodine to prevent / Prevents IDD	2. promote proper brain function	3. makes child intelligent	4. Prevents miscarriage/ spontaneous abortion	BENFITSALT
5. Treat goiter	6 Treat illnesses.	7. Prevent range of diseases	8. Makes one healthy	
9. Give energy/strength	10. Build strong bones, teeth	11.Good for pregnant women	12. Good for children	

13. Other (SPECIFY)		99. NA	

7. 15 Are you aware of any regulations/law supporting the production and sale of salt in Ghana? | 1. Yes | 2. No | AWARESALT

7.16 If yes, state the regulation regarding the sale of salt for human consumption? **(DON'T PROMPT)**

1. Salt must be iodized	2. Don't Know	3. Other (specify)	9. Not applicable	FORMSALT

PART III: SALT TEST

7.17a Could you please provide a pinch of salt usually used by this household in cooking for testing? DETERMINE IODINE CONTENT ….ppm. . COLLECT SAMPLE, DIVIDE INTO TWO &CONDUCT SPOT TEST USING ONE PORTION & LABLE THE SECOND PORTION WITH HH ID

1. 0 ppm (Nil)	2 <15ppm	3. >15 ppm	PROVSALT
4. No salt in the household	5. Salt not tested		

7.17b. Does the household have separate salt for use at table? | 1. Yes | 2. No | SEPSALT

7.17c If yes, could you please provide a pinch of this other salt used by this household at table for testing? Iodine content is ….ppm COLLECT SAMPLE AND CONDUCT ON THE SPOT TEST ONLY

1. 0 ppm (Nil)	2 <15ppm	3. >15 ppm	DIFFSALT
4. Salt not tested	9.NA No other salt in the household		

Section C –COMPLEMENTARY FEEDING

7.18. Is there a child aged between 6-24 months in this household? | 1. Yes | 2. No | EBORN

7.19. If Yes, state the age of the child **(IN MONTHS)** | | | 9.NA | AGEMO

7.20. Do you feed (NAME CHILD) complementary food? | 1. Yes | 2. No | 9.NA | COMPFO

7.21. If Yes, at what age did you start giving complementary food? **(IN MONTHS)** | | | 9.NA | AGECOMP

7.22 Who told you to introduce complementary food at that age? DO NOT PROMPT

1. Own decision	2. Mother/ mother-in-law	3. Husband	4. Other family member		TOLDCOMP
5. Health staff	6. TV/Radio/ Newspaper	7. Package information	8. Other, specify	9. NA	

7.23 If yes, what type of complementary food do you give to NAME CHILD? **PROBE**

1. Home-made	2. local/artisanal made	3. Commercial	9.NA	TYPCOMP1

IF THE ANSWER INCLUDES 2 OR 3, CONTINUE WITH QUESTIONS 7.24 -7.26

IF THE ANSWER IS 1, END INTERVIEW

7.24 Which brand of complementary flour do you buy for (NAME CHILD)?	1. Weanimix	2. Soymixes from clinic	3. Cerelac	4. Other (SPECIFY)	9. NA	TYPCOMP2

7.25 How many times in a day do you feed (NAME CHILD) this complementary flour?	1. once a day	2. 2 times	3. 3 times	4. 4 times	5 or more times	9. NA	TYPCOMP3

7.26. At what age will you stop giving complementary porridge to (NAME CHILD) INDICATE AGE IN MONTHS			9.NA	AGESTOP

7.27 RECORD OF HOUSEHOLD SAMPLE COLLECTION

7.27a. Mother ID	G	M						MOTHID

IF MOTHER HAS NO CHILD BETWEEN AGE 6-12 FILL IN 999999 FOR SCHILDID

7.27b. Child ID	G	C						SCHILDID
7.27c. Household salt ID	G	S						SALTID
7.27d. Household oil ID	G	O						OILID
7.27e. Household flour ID	G	F						FLOURID

WHERE ANY OF THE ABOVE HOUSEHOLD SAMPLES IS NOT COLLECTED FILL IN 99999 FOR SAMPLE ID

LABEL THE SAMPLE BOTTLE WITH THE LABEL CORRESPONDING TO THE SAMPLE

END OF QUESTIONNAIRE, PLEASE THANK THE MOTHER FOR HER TIME

Appendix 2: Laboratory Forms

1. KINTAMPO HEALTH RESEARCH CENTRE COMBINED FOOD FORTIFICATION AND IODINE SURVEY LABORATORY FORM (18/03/13)	LABORATORY Form No.	FORMNO

1. BACKGROUND and ID:

1.1 Household No. _____ HHNO

1.2 Mother's ID: G M _____ MOTHID

1.3 Mother's name _____ MOTHNAME

1.4 School age child's ID G C _____ SCHILDID

1.5 School age child's name _____ SCHLDNAM

1.6 Date of collection: ……. _____ DVIS1

1.7 Staff code: …… _____ HFW

1.8 Which sample is being collected…… 1. Mother | 2. Child | 3. Both SAMPLE

2.0 **CHILD**

2.1 Child urine sample taken? 1.Yes | 2.No | 9. NA URINCHILD

IF 2.1 IS 1=YES GO TO 2.3 IF THE ANSWER IS 2. No (THAT IS URINE SAMPLE NOT TAKEN) RECORD THE REASON IN 2.2 AND ENTER 999999 FOR 2.3

2.2 Reason urine sample was not collected:

1. Child refused to give urine	2. Unable to get urine	CNOURINE
3. Other (specify)	9.Not applicable, specimen taken	

2.3 WRITE THE URINEID NUMBER HERE
IF NO URINE GIVEN WRITE 999999 G C U _____ URINEID1

3.0 **MOTHER**

3.1 Mother urine sample taken? 1.Yes | 2. No | 9.NA URINMOTH

IF 3.1 IS 1=YES GO TO 3.3 IF THE ANSWER IS 2. No (THAT IS URINE SAMPLE NOT TAKEN) RECORD THE REASON IN 3.2 AND ENTER 99999s FOR 3.3

3.2 Reason urine sample was not collected:

1. Mother refused to give urine	2. Unable to get urine	MNOURINE
3. Other (specify)	9.Not applicable, specimen taken	

3.3 WRITE THE URINEID NUMBER HERE
IF NO URINE TAKEN WRITE 999999

G	**M**	**U**						URINEID2

END OF LABORATORY FORM.CHECK YOUR FORM AND THANK THE MOTHER.

Form checked by……

Appendix 3: The Ghana Food Fortification Logo