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**COST OF DIET STUDY IN THE LAKE TURKANA
FISHERIES AND LODWAR URBAN LIVELIHOOD ZONES
OF TURKANA COUNTY, KENYA**

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Cost of Diet Study in The Lake Turkana Fisheries and Lodwar Urban Livelihood Zones of Turkana County, Kenya

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LIST OF ACRONYMS

BMI	Body Mass Index
COD	Cost of the Diet
COVID-19	Coronavirus 2019
CRS	Catholic Relief Services
CRTA	Crop Resources of Tropical Agriculture
DFSA	Development Food Security Activity
DHS	Demographic and Health Survey
EO	Energy Only
FGD	Focus Group Discussions
FHAB	Food Habits
GAM	Global Acute Malnutrition
HEA	Household Economy Approach
IFA	Iron/Folic Acid
IFPRI	International Food Policy Research Institute
KABP	Knowledge, Attitudes, Beliefs and Practices
KES	Kenya Shillings
KII	Key Informant Interviews
LZ	Livelihood Zone
MAD	Minimum Acceptable Diet
MEL	Monitoring, Evaluation and Learning
MIYCN	Maternal, Infant and Young Child Nutrition
MNCH	Maternal, Newborn and Child Health
MUAC	Mid Upper Arm Circumference
OFDA	Office of Foreign Disaster Assistance
PAM	Persistent Acute Malnutrition
PNC	Post Natal Care
SBC	Social and Behavioral Change
SC	Save the Children
SMART	Standardized Monitoring and Assessment of Relief and Transitions
TOT	Training of Trainers
US	United States
USAID	United States Agency for International Development
USG	United States Government
UHT	Ultra High Temperature
VAD	Vitamin A Deficiency
VAS	Vitamin A Supplementation
WHO	World Health Organization
WRA	Women of Reproductive Age
WASH	Water, Sanitation and Hygiene

EXECUTIVE SUMMARY

USAID Nawiri is a 5-year Development Food Security Activity (DFSA) program funded by USAID and implemented by a consortium¹ of partners led by Mercy Corps. The project involves research for the first two years to establish *What Works* to inform the co-creation of project design and implementation.

Save the Children developed the Cost of the Diet method and software to apply linear computer programming to select a combination of local foods in amounts that would meet the average needs for energy of one or more individuals, as well as their recommended intakes of protein, fat, and micronutrients, all at the lowest possible financial cost. The Food Habits Diet meets the recommended intakes for energy, protein, fat and 13 micronutrients of an average family but is based on typical dietary habits of households in each livelihood zone.

Between February and March 2021, the project completed two Cost of the Diet Studies in Turkana County (followed by two more in Samburu County between April and May) by Save the Children in collaboration with the Ministry of Health. The two studies in Turkana County were conducted in the Fisheries Livelihood Zone (LZ) along the shores of Lake Turkana, and in settlements (groups that were once nomadic pastoralists) in the Urban LZ of Lodwar town. These two studies in Turkana County, along with other research and learning inquiries conducted by USAID Nawiri, will contribute to:

- The design of nutrition-sensitive livelihood strategies and programming that enables poor households to maintain year-round nutrition security for women and children to support the sustainable reduction of Persistent Acute Malnutrition (PAM) in the face of shocks and stresses.
- The exploration of cost-effective options for strengthening local markets to increase local availability of nutritious foods for poor households.

A recent trend analysis of data from SMART Surveys between 2011 and 2018 shows that GAM rates in Turkana County are consistently at or above the WHO-established emergency threshold (15%), with considerable fluctuation around the mean that corresponds to dry periods or drought. The 2019 SMART Survey shows global stunting in Turkana North to be at 20.2% and in Turkana Central 18.2%; this is a six-percentage point increase for Turkana North and a slight reduction for Turkana Central since 2018 SMART Survey. A Maternal, Infant and Young Child Nutrition (MIYCN) Knowledge, Attitudes, Beliefs and Practices (KABP) survey was carried out in Turkana County in 2017 with support from UNICEF. Results found relatively good breastfeeding practices and poor complementary feeding practices, with extremely poor feeding practices during illness. The Kenya DHS 2014 revealed 45.3% of women of reproductive age (WRA, age 15 to 49) in Turkana County to have a Body Mass Index (BMI) lower than 18.5; along with Samburu County (41%), these were the worst values in the country. DHS national-level data showed adolescent WRA age 15 to 19 years to have the highest rates of low BMI among all WRA.

The Cost of the Diet (COD) analysis has shown that families can meet their nutritional needs with foods that are available in the markets. This might not be so for every day of every season and in every market, but throughout the two livelihood zones these studies found the capacity for markets to provide a sufficiently nutritious diet for the average family even though the studies were done at the end of a dry season. The cost of a nutritious Food Habits Diet for an average family of seven in Fisheries LZ is 582.55 KES (US\$5.32) daily and 212,632 KES (US\$1,942) annually. In Lodwar Urban LZ for an average family of nine the cost is 872.37 KES (US\$7.97) daily or 318,416 KES (US\$2,908) annually.

¹ Nawiri partners include Mercy Corps, Save the Children, RTI International, The BOMA project, Centre for Humanitarian Change, CARITAS Lodwar and Maralal, and the African Population and Health Research Center.

In Fisheries LZ, the gap between the cost of a nutritious Food Habits Diet and household income available for food purchase (including the monetary value of the consumption of home production and minus necessary non-food expenditures) is 6,080 KES (US\$56) monthly or 72,958 KES (US\$666) for the Very Poor wealth group and 2,437 KES (US\$22) monthly or 29,238 KES (US\$267) annually for the Poor. The Middle Income group can afford a nutritious diet, along with necessary non-food expenditures. In Lodwar Urban LZ, the gap between the cost of a nutritious Food Habits Diet and household income available for food purchase is 12,800 KES (US\$117) monthly or 153,602 KES (US\$1,403) for the Very Poor wealth group and 2,869 KES (US\$26) monthly or 34,427 KES (US\$314) annually for the Poor. The Middle Income group can afford a nutritious diet.

In Fisheries LZ there was limited availability of some key nutrient-dense foods that would particularly be of concern for achieving a nutritious diet for a small child, pregnant adolescent, pregnant woman, lactating adolescent or a lactating mother. The cost of the lactating mother's portion of a nutritious Food Habits Diet is 31.1 percent of the total cost for an average family of seven in Fisheries LZ and 19.3 percent of the total cost for an average family of nine in Lodwar Urban LZ. Changing the standard COD family composition to include a female adolescent age 15 to 16 (instead of a younger non-female child) increases the cost of the diet by 19 percent, for example, in Fisheries LZ. Analysis shows that a pregnant or lactating adolescent's nutrient needs are even higher and would increase the cost of the diet further.

The relative cost of the youngest child's portion of a nutritious Food Habits Diet is only 3.3 to 4.4 percent of the total cost for the family. Inadequate child feeding practices is most likely the limitation to a nutritious diet for a child age 12 to 23 months.

There are nutrient-dense foods available that households are not consuming very often including goat liver, soybean milk/curd and chicken eggs. Only about half of households are consuming the nutrient-dense dried freshwater fish that is available and that the COD software selects for a nutritious diet.

Modeling of options for the USAID Nawiri Project to support households showed that providing support for goat milk production year-round so that the smallest child and the lactating mother would receive a serving of goat milk daily would reduce the cost of the diet by approximately 1.5 percent in both livelihood zones. Although the cost savings is limited the nutrient contribution for the vulnerable mother and child would be significant. Supporting home garden production of dark leafy greens could reduce the cost of the diet by 23 to 26 percent in both livelihood zones. Gathering a wild food (fruit of the *hyphaene compressa* palm) that provides significant calories, iron and calcium could also reduce the cost of the diet by 13 to 15 percent in both livelihood zones. Providing support for the Ministry of Health's vitamin A supplementation program would minimally reduce the cost of the diet but would provide a valuable contribution to the healthy growth and development of children. Modeling a combination of all of these options could potentially decrease the cost of the diet by 33 percent in Fisheries LZ and 37 percent in Lodwar Urban LZ.

INTRODUCTION

USAID Nawiri² is a 5-year Development Food Security Activity (DFSA) program funded by USAID and implemented by a consortium³ of partners led by Mercy Corps. It is a partnership of Kenyan and international organizations committed to working with the county government to catalyze sustained reduction in persistent acute malnutrition in Samburu and Turkana Counties. The project involves

² Nawiri is a Swahili word meaning "to thrive" and was adopted to replace the original NAWIRI acronym - Nutrition in ASALs Within Integrated Resilient Institutions.

³ Nawiri partners include Mercy Corps, Save the Children, RTI International, The BOMA project, Centre for Humanitarian Change, CARITAS Lodwar and Maralal, and the African Population and Health Research Center

research for the first two years to establish *What Works* which will inform the co-creation of project design and implementation. The USAID Nawiri team is working collaboratively across partners and with county government and other key stakeholders to develop, refine, and ultimately jointly validate a living Learning Agenda that is both realistic and action-oriented.

Between February and March 2021 two Cost of the Diet Studies were completed in Turkana County (followed by two more in Samburu County between April and May) by Save the Children in collaboration with the Ministry of Health. The two studies in Turkana County were conducted in the Fisheries Livelihood Zone (LZ) along the shores of Lake Turkana, and in settlements (groups that were once nomadic pastoralists) in the Urban LZ of Lodwar town. These livelihood zones have been defined by the relevant Kenyan government bodies, including the National Drought Management Authority and the Ministry of Agriculture, Livestock and Fisheries. Due to resource limitations for Cost of the Diet studies for the USAID Nawiri Project, these two livelihood zones were chosen among those in Turkana County as they had not previously been assessed by the Cost of the Diet methodology and because, in general, less is known about these two livelihood zones. Also, Global Acute Malnutrition rates for Turkana North and Turkana Central, which encompass these two livelihood zones, remain above “emergency” designation.

The seasonal calendar for Turkana County includes four seasons (Figure 1); these studies were conducted during the end of a dry season.

FIGURE 2: SEASONAL CALENDAR FOR TURKANA COUNTY

Akamu Dry season			Akiporo Long rains			Aait Dry cool season			Akicheres Short rains		
JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC

Turkana County, located within the Rift Valley of East Africa, is the largest county in Kenya at 77,000 square kilometers and yet the poorest⁴, remote from the capital and with relatively poor access to services. The county is bordered by Uganda to the West, South Sudan and Ethiopia to the north, and Lake Turkana to the east. It adjoins several Kenyan counties to the south. The capital and largest town is Lodwar. The 2019 census⁵ lists a population of 926,976 in Turkana County – roughly 1.95% of the total population of Kenya (a little over 47.5 million).

Turkana County is classified as an arid region with high temperatures and low rainfall of less than 10 inches annually. Nomadic pastoralism had traditionally been the backbone of the economy but with erratic rainfall, frequent drought and outbreaks of livestock disease, traditional pastoralism has been compromised. Camels, goats, sheep and some cattle constitute animal ownership in the zone. Products from the bush are gathered and sold, including charcoal and housing materials (such as poles or thatch), along with local handicrafts. Sorghum, maize and legumes are the main crops grown primarily in the agro-pastoral livelihood zones of Turkana County (see below for livelihood information specific to each livelihood zone in the 2021 Cost of the Diet Studies).

The main paved road from Nairobi passes through Kitale, the Trans-Nzoia county seat and the closest major urban center for Turkana County, and continues through Turkana County to Lodwar, the county seat, before proceeding north to the border of South Sudan. Distances between these urban centers are considerable: Nairobi to Kitale is 237 miles (381 km) and takes about 8 hours; Kitale to Lodwar is 185

⁴ Kenya KIHBS 2018.

⁵ Kenya National Bureau of Statistics, *Kenya Population and Housing Census November 2019*.

miles (298 km); and Lodwar to the border of South Sudan is over 150 miles (242 km). This is the main route for commerce for Turkana, along with transportation by boat of fishing harvests from Lake Turkana to the southern end of the lake and then on to Nairobi.

Report from the SMART Survey in June 2019 provides data on Global Acute Malnutrition rates by sub-county for Turkana County. For the Northern sub-county which contains the Fisheries LZ, the GAM rate reported is 30.2%; for the Central sub-county, which includes the Lodwar Urban LZ, the GAM rate reported is 20.2%. A recent trend analysis of data from SMART Surveys between 2011 and 2018 shows that GAM rates in Turkana County are consistently at or above the WHO-established emergency threshold (15%), with considerable fluctuation that corresponds to dry periods or drought⁶.

The Kenya Demographic and Health Survey (DHS) 2014 found 30.1% of children in Turkana County to be stunted (low height-for-age)⁷. The 2019 SMART Survey shows global stunting in Turkana North to be at 20.2% and in Turkana Central 18.2%; this is a six-percentage point increase for Turkana North and a slight reduction for Turkana Central since 2018 SMART Survey⁸.

The Kenya DHS 2014 revealed 45.3% of women of reproductive age (WRA, age 15 to 49) in Turkana County to have a Body Mass Index (BMI) lower than 18.5; along with Samburu County (41%), these were the worst values in the country. DHS national-level data showed adolescent WRA age 15 to 19 years to have the highest rates of low BMI among all WRA – this would be expected in Turkana County, also. Undernourished WRA, including adolescents, are at higher risk of poor birth outcomes, including low birthweight babies, perpetuating intergenerational cycles of undernutrition and physiological vulnerability⁹. SMART Survey in 2019 in Turkana County found around 10% of woman, either pregnant or lactating or not, to have Mid Upper Arm Circumference (MUAC) below 21.0 cm.

A meta-analysis of adolescent pregnancy in Africa found that approximately one-fifth of adolescent girls/women (age 10 to 19) become pregnant¹⁰. A study done in Maternal Child Health Center services in low-income settlements around Nairobi, Kenya found that “the primary social support for pregnant and parenting adolescent teens comes from the (female) adolescent’s mother. The external family and male partners provide negligible support in the rearing of the child.” The study also found that food insecurity and lack of resources in general constrains mothers’ ability to directly support their adolescent daughters¹¹.

A Maternal, Infant and Young Child Nutrition (MIYCN) Knowledge, Attitudes, Beliefs and Practices (KABP) survey was carried out in Turkana County in 2017 with support from UNICEF. Results found relatively good breastfeeding practices and poor complementary feeding practices, with extremely poor feeding practices during illness (Table 1).

TABLE I. BREASTFEEDING PRACTICES AND COMPLEMENTARY FEEDING PRACTICES

INDICATOR	PREVALENCE (%)
BREASTFEEDING PRACTICES	
Given colostrum	98.4
Initiation of breastfeeding within 1 hour of birth	80.2
Exclusive breastfeeding (0 to 6 months)	76.5

⁶ Analysis for proposal preparation for the present NAWIRI Project; revised submission to USAID, August 30, 2019.

⁷ Kenya Demographic and Health Survey 2014.

⁸ SMART Survey Turkana County 2019.

⁹ Martorell, R. and Zangrone, A. *Intergenerational Influences on Child Growth and Undernutrition*. Paediatric Perinatal Epidemiology; July 2012.

¹⁰ Mullu Kassa, G., et al. *Prevalence and determinants of adolescent pregnancy in Africa: A systemic review and meta- analysis*, Reproductive health 2018.

¹¹ Kumar, M., et al. *Adolescent Pregnancy and Challenges in Kenyan Context: Perspectives from Multiple Community Stakeholders*, Global Social Welfare 2018.

Continued breastfeeding at 12 months of age	89.4
Bottle feeding	12.9
COMPLEMENTARY FEEDING PRACTICES	
Minimum Dietary Diversity: % age 6-23 months (breastfed and non-breastfed) who received foods from ≥ 4 food groups	46.6
Minimum Meal Frequency: % age 6-23 months (breastfed and non-breastfed) who receive food the minimum recommended number of times (by age) or more	33.0
Consumption of iron-rich foods (6-23 months)	47.6
FEEDING DURING ILLNESS	
Offered less breastmilk than usual	85.8
Offered less food than usual	73.3
WOMEN'S NUTRITION	
Minimum diet diversity (foods from ≥ 5 food groups)	33.2

The MIYCN/KABP 2017 study also found that only about one-quarter of women took iron, folic acid or combined iron/folic acid tablets (IFA) for the recommended 90 days or more during pregnancy, although about half did take IFAs for ≤ 30 days. One of the reasons given by mothers for not completing IFA supplementation was “forgetfulness”.

Kenya has been active in the area of food fortification, with mandatory fortification of salt with iodine established in 1978 and voluntary fortification of wheat/maize flours and cooking oil initiated in 2000 and mandated by 2012¹². However, samples tested have shown poor compliance with fortification standards. Results regarding mothers’ knowledge about fortification are mixed. The MIYCN study in 2017 found 79% of mothers in all of Turkana County to report consuming fortified maize flour and 78% fortified wheat flour. Recent SMART Survey 2019 found around 90% of mothers in Turkana North and Turkana Central to state either the maize flour they consume is not fortified or that they do not know if it is; 50% did not know the fortification logo.

Kenya has had a successful vitamin A supplement distribution program. The Kenya National Micronutrient Survey 2011 showed at least 84.3% of children under age five had ever received vitamin A supplementation (VAS). The survey found vitamin A deficiency (VAD) to be fairly low in preschool children age 6 to 59 months (8.1% in rural areas). However, the report did caution that half of preschool age children had marginal levels of VAD¹³. SMART Survey 2019 in Turkana County, however, found only 21% to 24% of children age 12 to 59 months to have received VAS twice or more in their lives.

The MIYCN/KABP 2017 showed overall knowledge of recommended MIYCN messages to be high and attitudes and perceptions to be positive, yet there are clearly barriers to translating this into appropriate feeding practices on a daily basis. Household food insecurity and women’s workload were two key barriers noted; however, several behavioral constraints were noted, including a lack of responsive complementary feeding of young children, and a lack of knowledge of how to prepare nutritious foods for infants and young children.

OBJECTIVES

These two studies in Turkana County, along with other research and learning inquiries conducted by USAID Nawiri, will contribute to:

- The design of nutrition-sensitive livelihood strategies and programming that enables poor

¹² Nutrition International, *Food Fortification in Kenya Policy Brief*, 2020.

¹³ Kenya Ministry of Health, *Kenya National Micronutrient Survey 2011*.

- households to maintain year-round nutrition security for women and children to support the sustainable reduction of Persistent Acute Malnutrition (PAM) in the face of shocks and stresses.
- The exploration of cost-effective options for strengthening local markets to increase local availability of nutritious foods for poor households.

The aim of these Cost of the Diet studies is to identify local foods that meet household needs for a healthy diet, estimate the minimum cost of a nutritious diet, and assess the degree to which constraints on availability and affordability prevent households in two different livelihoods zones in Turkana County from attaining a nutritious diet. The key objectives of these studies include:

- Identify the common locally consumed foods in each distinct livelihood zone.
- Identify the least expensive sources of locally available nutrient-rich foods.
- Assess the availability and affordability of preferred foods and/or nutrient-rich foods.
- Estimate the minimum cost of a healthy diet for different household compositions (for example, with a pregnant or lactating woman, with an adolescent mother, with a female adolescent, in a polygamous household, and other household compositions).
- Estimate the affordability of the diet according to wealth ranking.
- Use the Cost of the Diet software to analyze the cost and the nutrient content of nutritious foods appropriate for complementary feeding of infants and small children and improvements in maternal nutrition, both among female adolescents, other women of childbearing age, and pregnant adolescents or women.
- Develop models of the impact of potential interventions that might enable households to meet their nutrient requirements.
- Contribute input to the USAID Nawiri longitudinal study and to the strengthening of nutrition information systems at the county level.

This study will complement USAID Nawiri's other learning and research inquiries during phase I and contribute input to the design of interventions/strategies that are appropriate to the local context.

Specifically, the study will:

- Contribute to the line of learning inquiry (No.2) on Strengthening MIYCN Behaviors to Ensure Optimal and Resilient Maternal and Child Nutrition by providing information on the types of locally available nutritious foods and accessibility and economic constraints to the consumption of a healthy diet. The Cost of the Diet studies will obtain information specific to the needs of adolescent mothers and other vulnerable women and children. Along with a more in-depth look at gender equality issues through the MIYCN statement of work, the Cost of the Diet studies will inform SBC strategies to address the gap between MIYCN knowledge and practices for consumption of a mix of affordable and nutritious foods to improve the quality of the diet of children 6 to 23 months of age and women of reproductive age. Therefore, the study will identify feasible ways in which to modify some of the direct and underlying factors leading to PAM.
- Complement the line of learning inquiry (No.4) about Livelihoods, Poverty Graduation and Social protection because it will provide useful input to the design of programmatic strategies for market improvements and different on-farm and off-farm livelihood approaches. The Cost of the Diet analysis provides the affordability gap for a nutritious diet, which can contribute information towards cash transfer and other social protection approaches.
- Provide baseline information on affordability and cost for nutritious foods for learning inquiry No.1, the longitudinal study of seasonality, shocks and factors influencing PAM, to track changes in affordability gap due to shocks and seasons, and adapt interventions to mitigate impacts.
- Provide information on food availability, preferred foods, desirable foods, and gaps in food availability for the Market Survey and learning inquiry 6: Strengthening local markets and regional supply chains to increase local access and availability of nutritious foods.

The Cost of the Diet focuses on good nutrition for an average family, based on household size in the target area. As the overarching goal of the USAID Nawiri Project is “persistent acute malnutrition is sustainably reduced in Kenya’s arid and semi-arid lands”, the Cost of the Diet studies included additional focus on women of reproductive age – and in particular, adolescents – and young children under age three.

RESEARCH METHODOLOGY

Save the Children developed the Cost of the Diet method and software to apply linear computer programming to select a combination of local foods in amounts that would meet the average needs for energy of one or more individuals, as well as their recommended intakes of protein, fat, and micronutrients, all at the lowest possible financial cost. The method enables public health nutritionists and food security specialists to estimate the cost and affordability of meeting energy and nutrient specifications using local foods, as the software selects the most nutritious and least expensive diet. Users can then create models of the effect of different interventions, such as agricultural production or market support, or of introducing novel or bio-fortified foods. As a practical tool, it highlights nutritious available local foods for promotion through SBC strategies, identifies nutrient-rich local foods as input to strategies to improve production availability and market access, displays information on the ratio between cost of foods and their contribution to the diet, and provides detail on the gap between households’ purchasing power and the minimum cost of a nutritious diet as an input to the development of cash transfer programs.

DESCRIPTION OF FIELDWORK

For the Cost of the Diet research the following were conducted in each of the two livelihood zones – Fisheries LZ and Lodwar Urban LZ:

1. Market Surveys in a sample of six markets in each livelihood zone that included the largest market (usually in the town where the sub-county seat of government is based), several comparatively mid-size markets, and small shops within villages.
2. Key Informant Interviews with 1 or 2 of the established Traders in the larger markets.
3. In villages, Focus Group Discussions with two different sets of mothers with children under age three (mothers age 21 to 49 and adolescent mothers age 15 to 20) and from a variety of wealth groups (see 4. Below).
4. In other villages with different women¹⁴, Dietary Habits Interviews were conducted with 8 individual mothers from the two age groups noted above (15 to 20 and 21 to 49) and that represented the three wealth groups that were the focus of this study: the Very Poor, the Poor, and Middle wealth groups.

Half of the field team enumerators were male and half female; only women interviewed adolescent mothers for Focus Group Discussions and Dietary Habits Interviews. Informed consent, approved by Save the Children’s internal Ethics Review Committee, was obtained from all women of all ages. Local government officials, predominantly from the Ministry of Health, participated in the selection of markets and villages, led several sessions during Training of the Enumerators, and participated as supervisors during fieldwork. A list of the fieldwork team members and their position/affiliation can be found in

¹⁴ This was slightly different from standard Cost of the Diet methodology in which the same women that participate in the focus groups are then asked to participate individually in the Dietary Habits Interview. National protocols to reduce the transmission of COVID-19 prohibited extended contact between the survey team and local women so different women participated in the focus groups and the Dietary Habits Interviews. As all of the information gathered is representative of the broader population in the livelihood zone, this modification is not considered to have affected the results.

Annex A.

For all Cost of the Diet training and fieldwork activities the national protocols for minimizing the spread of COVID-19 were followed. Gloves and/or sanitizer were used for touching any food items; social distancing was practiced during training workshops, in the markets and during focus groups or household interviews with women; individual interview periods were limited; and masks were worn by the survey team and provided to those mothers surveyed.

FIGURE 3. FOCUS GROUP DISCUSSION WITH ADOLESCENT MOTHERS AT LOWARENGAK, TURKANA COUNTY



Perhaps the greatest adjustment to protocols was that the Cost of the Diet lead expert had to work remotely with the field team as travel to Kenya from the USA was restricted due to COVID-19 (see Quality Control below). The guides used for the Cost of the Diet studies were developed in advance through consultation between the remote Cost of the Diet lead expert and the Cost of the Diet team leaders in Kenya. They included:

1. A Food List of food items commonly consumed and purchased by families from the three wealth groups that were the focus of these studies. This Food List was then used as the basis for both the Market Survey and for the Dietary Habits Interviews. Several food items were not available in the Food Composition Databases used by the COD software and were added by the COD lead expert, per the COD Guidelines. These included the fruit of the *Hyphaene compressa* palm tree (local name *doum* or *eng'ol*), *Crotalaria* leaves (local name *mito*), and *Solanum* leaves (local name *sujaa* or *managu*). Their nutrient composition was identified through internet search of research documents. Through similar research documentation, the food composition of meat from donkeys was identified as similar to that of horse meat and entered as such into the database. Photographs of the ingredients and nutrient content of a locally prepared porridge mix known as *Ujimix* were taken by the COD team; this food item was found to be similar to a food item in the database (“porridge, store bought”) and identified as such.
2. A guide for conducting focus groups and recording responses among mothers of children age 6 months to three years. There were two guides with the guide for the adolescent mothers

including a few questions in addition to those in the guide for mothers age 21 to 49.

For the Market Survey, a total of 2 Traders (or more if needed to complete a survey of available food items from all or most of the food groups) in 6 markets in each of the two livelihood zones were conducted. Market Surveys were usually done in the morning when the greatest number of food items were still available for sale. In one instance in Lodwar town the enumerators returned early morning a second day when they found that a limited supply of vegetables and fruits had sold out by mid-morning the first day of the survey.

For the Market Survey, price was recorded and three samples offered at that price were weighed using a Nutricook NC-KSE5-EKO scale. In addition, for potentially large or cumbersome volumes the typical Salter 50 kg hanging scale (used to weigh small children) was available but was rarely utilized. For pre-packaged foods, such as spaghetti, the price and weight was recorded from the label. For foods sold by weight, such as meat, only one sample and price were taken. In general, no food items were paid for; however, supervisors of the survey teams carried a small amount of money and occasionally purchased items such as meat that needed to be carved off the bone to be weighed, or milk that was poured into the survey team's measuring containers.

FIGURE 4. MARKET SURVEY WITH A TRADER AT NARIOKOTOME, TURKANA COUNTY



In the same geographic area as each market, focus group discussions were held with adolescent mothers age 15 to 20 with children under age 3 and, separately, mothers age 21 to 49 with children under age 3 for a total of 8 FGD in each livelihood zone. On the last day in each livelihood zone, an individual Dietary Habits Interview was conducted with 8 adolescent mothers age 15 to 20 with children under age 3 and with 8 mothers age 21 to 49 with children under age 3 in four different villages for a total of 32 Dietary Habits Interviews. These were divided among women from very poor, poor, and middle wealth status.

A list of the market survey sites and villages included for focus groups and Dietary Habits Interviews for

the Fisheries LZ and the Lodwar Urban LZ can be found in Annex B, along with a map showing the sites' location in Annex C.

These two Cost of the Diet studies were done with a focus on the present season only, the end of a dry season. Limited “light touch” Market Surveys are planned to be carried out during the other three seasons to estimate seasonal variance to the cost of the diet. Additionally, these two COD studies included Key Informant Interviews with a few established Traders in the larger markets to ask about their marketing challenges and opportunities and obtain retrospective price data of key food items (in accord with the food items listed in the World Food Programme Minimum Expenditure Basket Kenya)¹⁵.

QUALITY CONTROL

Training of the field team was conducted in two stages: a three-day Training of Trainers (TOT) was conducted for the COD team leaders, assistants and field supervisors to familiarize them with the methodology and to enable them to conduct the next week’s four-day Training of Enumerators. A detailed syllabus for the training workshop was provided by the remote COD lead expert. Daily discussion and review between the COD lead expert and the COD team leaders during both the TOT and the Training of Enumerators was held via a commonly used cloud platform for conferencing.

Concurrently with the three-day TOT, two half-days of training for data entry and use of the software was conducted by a Save the Children Management Information Systems specialist with support from the COD team lead. In similar fashion, the COD lead expert provided a detailed training syllabus and sample data entry forms and each training session ended with discussion and review via cloud platform conferencing.

Both the TOT training and the Training of Enumerators included experiential practice in becoming comfortable with weighing foods accurately both in the classroom and through visits to local markets. Focus group role-plays were conducted using the focus group discussion guides, which were slightly modified through feedback from training workshop participants.

Daily debrief and discussion was held between the remote COD lead expert and the COD team leaders throughout the fieldwork period. The fieldwork supervisors reviewed all Market Survey forms daily before handing over for data entry. The Health Information Systems specialist reviewed the quality of data entry daily. The software was then uploaded to a cloud platform site where the remote COD lead expert could download and review the data. At the end of the fieldwork, the Market Surveys were scanned and sent by email to the remote COD lead expert who conducted a 10% sample of data entry accuracy. There were virtually no errors found. This same procedure was followed for quality control of the Dietary Habits Interviews.

To ensure the quality of information relayed from focus groups, the focus groups were recorded and several team members took notes at each focus group. These recordings and notes were reviewed with a fieldwork supervisor who then summarized the responses in a single guide for each focus group and these were sent by email to the remote COD lead expert. After review of all focus group guides, a conference call was organized so that the remote COD lead expert could ask further probing questions of the fieldwork team. The fieldwork supervisors conducted the Key Informant Interviews with Traders; these forms were scanned and sent to the remote COD lead expert who then sent any questions by email to the supervisors.

¹⁵ Kenya Cash Working Group, *Minimum Expenditure Basket Interim Guidance Document-Kenya*, July 2019.

SECONDARY DATA

Secondary data reviewed prior to the fieldwork included the following documents:

1. Kenya Demographic and Health Survey 2014.
2. Kenya National Bureau of Statistics, Population and Housing Census November 2019.
3. Kenya National Bureau of Statistics, Basic Report on Well-being, 2018.
4. IFPRI/SNV, Kenya Policy Atlas on Food and Nutrition Security and Resilience, June 2020
5. A Maternal, Infant and Young Child Nutrition (MIYCN) Knowledge, Attitudes, Beliefs and Practices (KABP) survey carried out in Turkana County in 2017 with support from UNICEF.
6. Turkana SMART Survey June 2018 and June 2019.
7. Reproductive Health, Kassa et al. *Prevalence and determinants of adolescent pregnancy in Africa: A systematic review and meta-analysis*, 2018.
8. Global Social Welfare, Kumar et al. *Adolescent pregnancy and challenges in Kenyan context: Perspective from multiple community stakeholders*, 2018.
9. Kenya Ministry of Health National Micronutrient Survey 2011.
10. Nutrition International, Policy brief on food fortification in Kenya, 2020.
11. Cost of the Diet Analysis, Central Pastoral Livelihood Zone, Turkana County, Kenya 2017.
12. Cost of the Diet Analysis, Kerio Central Agropastoral Livelihood Zone, Turkana County, Kenya 2012.
13. London School of Tropical Medicine & Hygiene, *The availability and minimum cost of a nutritionally adequate diet for rural households in Turkana (specifically in Turkana North and West sub- counties) County, Kenya* 2010.
14. Kenya Cash Working Group (July 2019). *Minimum Expenditure Basket: Interim Guidance Document, Kenya*.
15. McCarthy, Derrick B., editor (2017). *Chapter 6: Quality and Nutritional Characteristics of Donkey Meat* in Meat and Meat Processing, Nova Science Publishers.
16. Aboshora, W. et al. (2014). *Physicochemical, Nutritional and Functional Properties of the Epicarp, Flesh and Pitted Sample of Doum Fruit*. Journal of Food and Nutrition Research, Vol.2, No.4, pages 180-186.

17. Save the Children/Food Economy Group, *Arid Support Programme Resilience Measurement Report* 2016.

18. Save the Children/Food Economy Group, *Livelihood Profiles Baseline Update using the Household Economy Approach in Turkana County, Kenya 2016; updated in 2019-2020.*

RESULTS

BRIEF DESCRIPTION OF LIVELIHOOD ZONES STUDIED IN TURKANA COUNTY¹⁶

Turkana County is located in the north of Kenya. There are six sub-counties in Turkana County: Turkana Central, North, South, East, West and Loima. The map in Figure 4 shows both the sub-county demarcations and the extent of the six livelihood zones defined for the county.

The landscape is arid and vegetation is limited and the zone's topography is mostly plains lands.

The livelihood zones include (in the same order as the color-coded map key): Kerio Agropastoral LZ, Lake Turkana Fisheries LZ, Turkana Border Pastoral LZ, Turkana Central Pastoral LZ, Turkana Agropastoral LZ, and Lodwar Urban LZ.

Due to budget constraints for the Cost of the Diet studies, it was determined that only two could be completed. The livelihood zones of Fisheries and Lodwar Urban LZ were chosen for study with a focus on the “very poor”, “poor” and “middle” wealth groups. Those in the “better off” wealth group were not included as it was (correctly) anticipated that they can afford a nutritious diet. Cost of the Diet studies had been previously done in the Central Pastoral LZ in 2017 and Kerio Agropastoral LZ in 2012. Although the price or “cost” data from these studies are out-of-date, information on the general trends and dietary habits are still useful.

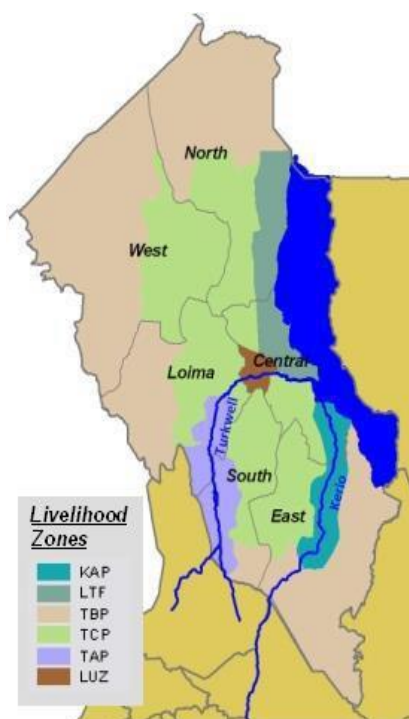


FIGURE 5. MAP OF SUB-COUNTY DEMARCATIONS

TURKANA FISHERIES LIVELIHOOD ZONE

As seen in Figure 4 above, Turkana Fisheries LZ encompasses a narrow strip of land that lies along the western shores of Lake Turkana and is encompassed within North and Central sub-counties. To the north, and particularly along the lake, it touches the southwest corner of Ethiopia. To the east is Lake Turkana. Infrastructure – particularly roads – is poor in this area.

All foods (other than fish) in the zone are transported via Lodwar Town located in Turkana Central Sub-county and are heavily dependent on the costs of fuel and transport.

Although the population were pastoralists several decades ago, they now rely almost entirely upon fishing for their livelihood. Women are less engaged in fishing activities while men are often paid in kind for fisheries labor. Households also obtain income from small amounts of livestock, sale of bush

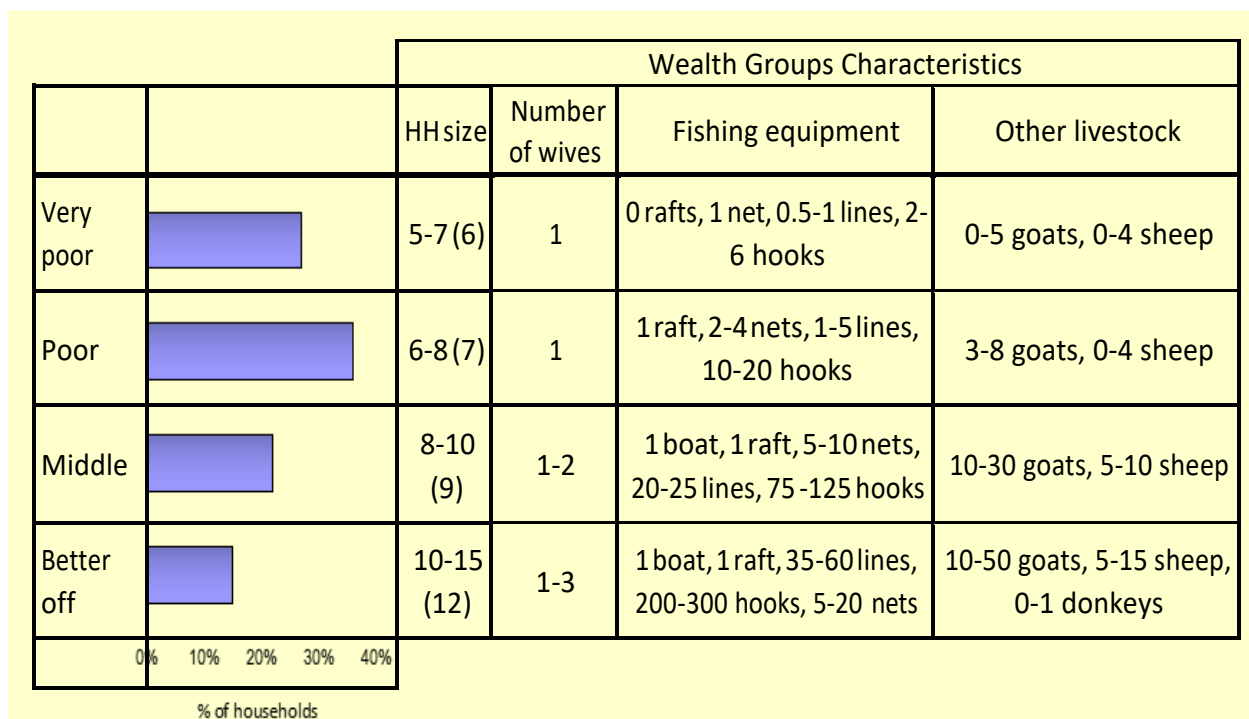
¹⁶ The information in this section, including the figures on wealth group characteristics, comes from Save the Children/Food Economy Group Household Economic Approach studies done in Turkana County as a baseline in 2017 and updated in 2021.

products and petty trade.

Fish is sold fresh and in combinations of being dried, salted and smoked. Larger amounts of fish may be transported to Nairobi while smaller amounts will be sold in Kalokol where the road then continues to Lodwar Town, then to Kitale and onward. There is concern that work on a dam in Ethiopia on the Turkana River which feeds into Lake Turkana may negatively affect the fisheries livelihood.

Wealth groups in the Turkana Fisheries LZ are primarily characterized by the fishing equipment they own, along with other assets, such as animals and transport (see Figure 5)¹⁷.

FIGURE 6. TURKANA FISHERIES LZ



The average household size ranges from five to nine; an average household size of seven was used in the COD Analyses. Polygamy is typically practiced only by those among the “better off” wealth group who can afford the expense of a much bigger family.

LODWAR URBAN LIVELIHOOD ZONE

Lodwar Town is the largest town, with a population of over 82,000, and the seat of government for Turkana County. The Lodwar Urban LZ consists of 11 sub-location villages located in two wards (Kanamkemer and Lodwar) in Turkana Central sub-county. It is situated along the main road which runs from southern Kenya to Juba on the border of South Sudan. Goods pass along this road and Lodwar Town has multiple food markets. Lodwar also benefits from access to foods produced by the irrigated agricultural activities in the Kerio and Turkwell riverine livelihood zones.

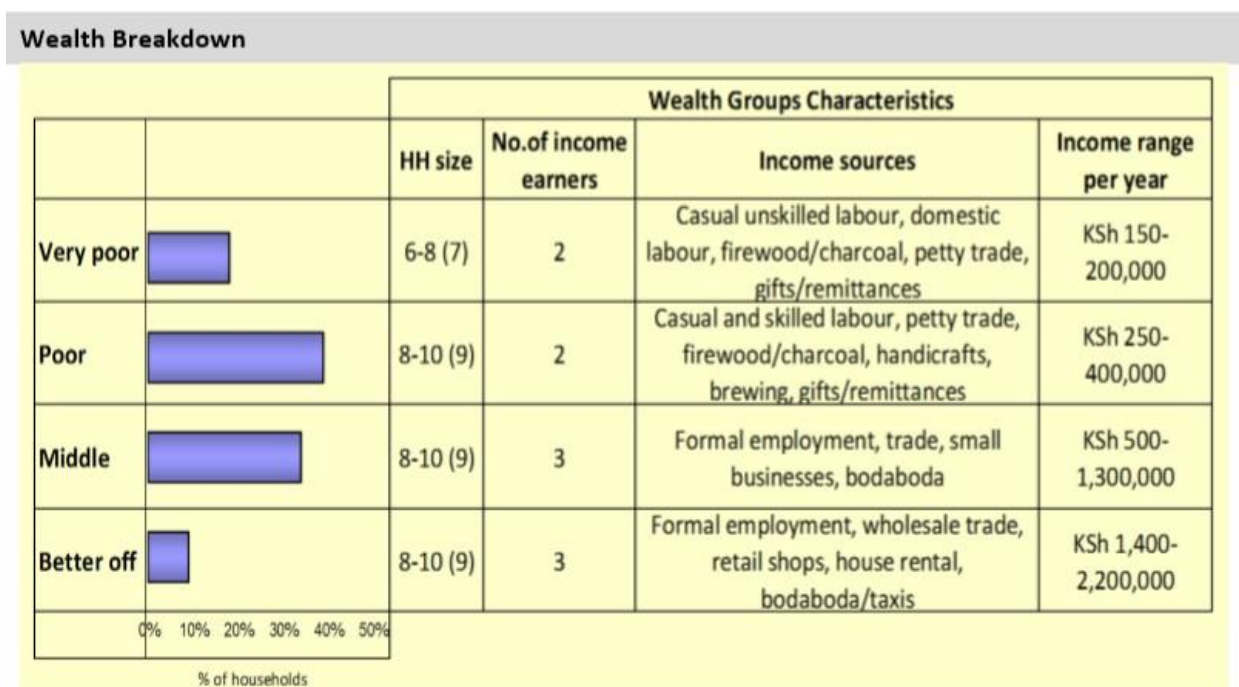
Lodwar’s geography is predominantly riverine as the permanent Turkwell River and seasonal Kawalathe River run through it. Livelihoods in this zone are primarily labor-based with many households relying on

¹⁷ Save the Children HEA update 2019-2020.

the natural resources present (i.e. selling firewood, charcoal, handicrafts, ballast). Casual unskilled and skilled labor opportunities associated with the shops and businesses in Lodwar Town provide residents with a variety of income earning opportunities. Previous Household Economy Approach (HEA) study has found that approximately 10% seek labor opportunities elsewhere during seasonal periods, including Kalokol during the high season for fishing and Kitale during the harvest season.

The wealth group characteristics in Lodwar Urban LZ can be found in Figure 6:

FIGURE 7. LODWAR URBAN LZ



The average household size ranges from 6 to 10; an average household size of 9 was used in the COD Analyses.

The population predominantly obtains water from taps. Households that do not have taps purchase jerrycans of water from neighbors that do. Those that cannot afford to purchase water collect water from one of the two rivers. HEA study in 2016-2017 found that “very poor” households spent 4,800 KES (US\$44.51)¹⁸ on water annually, “poor” households spent 14,520 KES (US\$134.63), and “middle” wealth group households spent 24,480 KES (US\$226.98) on the purchase of water, an important non- food expenditure.

FOOD PATTERNS AND AVAILABILITY IN FISHERIES AND LODWAR URBAN LZ, TURKANA

For the Cost of the Diet studies a list of 67 food items considered to be consumed and/or available throughout most of the year, along with an additional 15 fruits available at certain times of year, were included in both the Dietary Habits Interview, to determine food patterns, and in the Market Survey to determine cost and availability. In the two largest markets in the Fisheries LZ about half of these food

¹⁸ Annual exchange rate 2017: US\$1.00 = 107.85 Kenyan Shillings.

items were for sale, with fruits and vegetables quite limited. In one of the largest markets in the Lodwar Urban LZ a total of 54 food items were available. Markets in Lodwar Urban LZ had a greater variety of vegetables and fruits available than markets in the Fisheries LZ.

A total of 32 individual Dietary Habits Interviews were conducted in the Fisheries LZ. The most commonly consumed food items¹⁹ were: maize grain or flour, red beans, fresh fish, cabbage, tomatoes, *doum* palm fruit, vegetable oil and salt. Although historically the population of the Fisheries LZ were pastoralists and not inclined to consume fish, national campaigns to promote fish consumption appear to have been successful with 93% of women interviewed stating that their families “usually” or “often” consume fresh fish. Fishing labor is also often paid in kind with fresh fish.

A total of 32 individual Dietary Habits Interviews were conducted in the Lodwar Urban LZ. The most commonly consumed food items were: maize grain or flour, red beans, kale, onions (bulb and/or scallions), tomatoes, vegetable oil, brown sugar and salt. The diet in Lodwar Urban LZ was notable for greater consumption of vegetables with approximately 95% of women interviewed reporting their families “usually” or “often” consumed kale and/or tomatoes (87% for onions).

Although not intended to be studied as part of the Market Survey, it is interesting to note that the field team (which was half female/half male and conducted market surveys as pairs of female/male) surveyed almost as many established female Traders as male Traders.

During focus group discussions, all women (from both livelihood zones and both age groups, 15 to 20 and 21 to 49) were said to be the member of the family to most often go to the market and to have decision-making power over the purchase of a wide range of food items. Concerns about insecurity if travelling to market were mentioned by all focus groups in Lodwar Urban LZ but only mentioned once in the Fisheries LZ and in reference specifically to nighttime shopping. Many focus groups mentioned that the distance to larger markets (and workload time constraints) led them to purchase food items from local shops. As an example, one kilogram of rice could range in cost from 105 KES in a larger market to 117 KES in a smaller village store in the Fisheries LZ. In Lodwar Urban LZ it was specifically mentioned that the curfew imposed to decrease the spread of the coronavirus limited their ability to shop at larger markets.

Adolescent mothers were asked whether they live in their own house with their husband/partner or whether they live with other family members. Responses were evenly split in both livelihood zones.

Almost all focus groups in both livelihood zones noted that they grow “very little” or “none” of the basic foods they consume on a daily basis (maize and beans) and buy “almost all”. Most focus groups noted that there are opportunities for women to earn money which, per the HEA studies, tends to be selling firewood, charcoal or handicrafts made of local materials. When husbands/partners are away for extended periods of time, women note both advantages and disadvantages for their purchase of food. Disadvantages included men not leaving enough money at home for the length of their absence and a lack of credit at shops when husband is gone. Advantages were that women could earn money through activities such as burning charcoal or making mats, and spend this as they saw fit. However, in Lodwar Urban LZ several focus groups noted that it is difficult to work from home with infant and small children as they are a disruption to the work. Adolescent mothers noted that they stayed at their parents’ house when their husband/partner was gone.

¹⁹ Note that food item names are listed in their pre-cooked status as the Dietary Habits Interviews forms come from the Market Survey food items list.

GRAINS AND GRAIN-BASED PRODUCTS

For both Fisheries LZ and Lodwar Urban LZ, the grains and grain-based products most commonly reported as frequently eaten include MAIZE GRAIN, and MAIZE FLOUR, which is desirable for being “softer” and “more easily eaten by children”. MAIZE ON THE COB is only mentioned by mothers in the Lodwar Urban LZ.

The next most frequently mentioned carbohydrates are PASTA and RICE, both of which are noted to be “easy to cook” and “easy for children to eat”. PASTA (in forms of spaghetti and/or macaroni) comes in two pre-packaged sizes, 400 grams and 500 grams. Both are sold at the same price (50 KES) in both livelihood zones. When questioned about this, Traders stated that wholesalers offer it to them at the same price regardless of size. Younger women noted that elders do not like pasta as it “looks like worms” and mentioned that this attitude is sometimes passed on to young children, also.

WHEAT FLOUR, WHEAT WHOLE GRAIN, and prepared BREAD are also purchased for consumption, though more frequently in the Urban LZ than in the Fisheries LZ. SORGHUM is said to be infrequently purchased and consumed, while MILLET rarely.

The cheapest available food item in the grains category was MAIZE GRAIN at 4.8 KES per 100 grams in Fisheries LZ and 7.1 KES per 100 grams in Lodwar Urban LZ. This seems to contradict expectations of higher costs in Fisheries LZ due to greater transport distance. Additional prices of grains and grain products can be found in Table 2. Although three food items are cheaper in Lodwar Urban LZ, four are slightly higher priced.

TABLE 2. COMPARATIVE PRICES OF AVAILABLE GRAINS AND GRAIN PRODUCTS IN BOTH LIVELIHOOD ZONES

GRAINS	FISHERIES LZ	LODWAR URBAN LZ
Food Item	AVERAGE PRICE PER 100 GRAMS	AVERAGE PRICE PER 100 GRAMS
Maize grain	4.8 KES	7.1 KES
Maize flour	7.0 KES	7.0 KES
Rice	9.9 KES	11.1 KES
Pasta	11.8 KES	10.8 KES
Wheat flour	10.5 KES	8.1 KES
Wheat grain	Not available	10.7 KES
Sorghum	11.4 KES	12.4 KES
Millet, finger	14.7 KES	10.3 KES
Millet flour	Not available	11.3 KES
Bread	14.7 KES	15.0 KES

Exchange rate: US\$1 = 109.5 KES

A local commercial grain mix of finger millet flour and maize flour, with a souring agent, used to prepare PORRIDGE (“Ujimix”) was available at all markets in both livelihood zones at an average price of 15 to 16 KES per 100 grams but over 70% of mothers interviewed in both livelihood zones stated it was “rarely” or “never” consumed by their families and specifically noted that children disliked the sour taste.

ROOTS AND TUBERS

In Fisheries LZ, only POTATO was said to often be consumed while in Lodwar Urban LZ it was POTATO and SWEET POTATO. Beets and arrowroot are reported to be rarely or never consumed.

In the Fisheries LZ, potato was the only tuber available at markets but it was available at every market surveyed; in Lodwar Urban LZ potato, sweet potato, arrowroot and beets were all available at several of the larger markets, but only potato was available at all but one market (see Table 3 for prices).

TABLE 3. COMPARATIVE PRICES AND AVAILABILITY OF ROOTS AND TUBERS IN BOTH LIVELIHOOD ZONES

ROOTS AND TUBERS	FISHERIES LZ	LODWAR URBAN LZ
Food Item	AVERAGE PRICE PER 100 GRAMS	AVERAGE PRICE PER 100 GRAMS
Potato	5.3 KES	5.0 KES
Sweet potato	Not available	5.9 KES
Arrowroot	Not available	28.0 KES
Beets	Not available	47.6 KES

Exchange rate: US\$1 = 109.5 KES

POTATOES were mentioned by half of the focus groups among women in Fisheries LZ as being a food item they would like to buy but that is sometimes unavailable at markets.

LEGUMES, NUTS AND SEEDS

RED (KIDNEY) BEANS were the only legume reported to be frequently consumed in the Fisheries LZ, while in Lodwar Urban LZ RED BEANS are reported to be the most frequently consumed along with a wide variety of additional legumes, nuts and seeds -- predominantly GREEN GRAMS and LENTILS -- with GROUNDNUTS, VARIEGATED COLOR BEANS (known as *nyayo*), COWPEA BEANS and SESAME SEEDS mentioned with decreasing frequency.

In Fisheries LZ, RED BEANS were available at all markets; GREEN GRAMS and LENTILS were available at most markets but much higher priced; COWPEA BEANS were the cheapest legume but were only found in two larger markets.

In Lodwar Urban LZ, average prices were higher for all four commonly consumed legumes, and COWPEA BEANS were noticeably higher priced (Table 4).

TABLE 4. COMPARATIVE PRICES OF AVAILABLE LEGUMES IN BOTH LIVELIHOOD ZONES

LEGUMES	FISHERIES LZ	LODWAR URBAN LZ
Food Item	AVERAGE PRICE PER 100 GRAMS	AVERAGE PRICE PER 100 GRAMS
Cowpea beans	9.9 KES	23.1 KES
Red beans	10.3 KES	11.4 KES
Green grams	16.8 KES	21.2 KES
Lentils	19.9 KES	26.5 KES

Exchange rate: US\$1 = 109.5 KES

GROUNDNUTS and SESAME SEEDS were available in several of the markets in Lodwar Urban but were sold in small snack-like quantities of around 10 to 25 grams thus making their price per 100 grams much higher than the price of the legumes noted in Table 4; only GROUNDNUTS were available in a few markets in Fisheries LZ.

In Key Informant Interviews, Traders expressed their lack of control over prices and noted that they buy at whatever price is offered by the suppliers. In Lodwar Urban LZ, the average price per 100 grams of lentils ranged among Traders from 20.5 to 43 KES.

All focus groups among women age 21 to 49 in Lodwar Urban mentioned LENTILS as a food they would like to purchase but that is sometimes not available yet LENTILS were found in 5 of 6 markets. GREEN PEAS (*minji*) were also mentioned as a desirable but unavailable food item that was not found in markets. With a variety of legumes for sale at the larger markets in the Fisheries LZ, women in focus groups did not mention any concern about the availability of legumes.

In focus groups in Lodwar Urban LZ, women age 21 to 49 mentioned that BEANS “from Uganda” were a new and desirable food item to feed young children. During discussion of focus group results, the fieldwork team noted that beans from Uganda are cheaper and cook more easily so people are interested in purchasing. Given the constraints of wood and charcoal for cooking and the relatively long cooking time for legumes, this is an important concern.

In focus groups in both livelihood zones and among mothers of both age groups, GROUNDNUTS and PEANUTS were mentioned as prohibited for consumption during pregnancy as it would “add weight to the unborn child and cause complications during childbirth”. No other legume was contraindicated during pregnancy.

MEAT AND OFFAL

In the Fisheries LZ, GOAT MEAT was the type of meat two-thirds of women mentioned as consumed by families while more than a third stated it was rarely or never eaten. This was followed by GOAT INTESTINES/STOMACH for which the frequency of consumption was evenly divided 50/50 between “often” and “rarely”. DONKEY MEAT was mentioned by about 20% of women as being “often” consumed by the family, while 15% mentioned CAMEL MEAT as “often” consumed. CHICKEN and PORK was rated by 80% and 100% of women respectively as “never” consumed.

In the Fisheries LZ, GOAT MEAT was available at all six markets surveyed at an average price of 43.8 KES per 100 grams. GOAT INTESTINES/STOMACH were available at two markets at an average price of 35 KES per 100 grams while DONKEY MEAT was found at only one market at an average price of 29 KES per 100 grams. CAMEL MEAT, CHICKEN and PORK were not found at any market.

GOAT LIVER, considered by nutritionists to be a food item with very high nutrient density, was found at two markets at a price of 41.8 KES per 100 grams; however, it was stated by all women in Fisheries LZ to be “rarely” or “never” consumed by families. In focus groups with women no specific taboos against the consumption of liver by pregnant women or young children under age two were mentioned.

In Lodwar Urban LZ, GOAT MEAT was the type of meat mentioned as consumed “often” or “usually” by over 60% of women with one-third of women reporting it was “rarely” eaten by their families. Around one third mentioned frequent consumption of GOAT INTESTINES/STOMACH and 14% mentioned LIVER. DONKEY MEAT was mentioned by roughly 10% of women as being “often”

consumed by the family. Approximately 70%, 75% and 100% reported CAMEL MEAT, CHICKEN and PORK as “never” consumed.

In Lodwar Urban LZ, GOAT MEAT was available in five of six markets at an average price of 49.3 KES per 100 grams. GOAT INTESTINES/STOMACH was found at three markets at an average price of 41.8 KES per 100 grams. GOAT LIVER was for sale at four of six markets at an average price of 56 KES per 100 grams. DONKEY MEAT was found at two markets at an average price of 37.2 KES per 100 grams. CAMEL MEAT, CHICKEN and PORK were not found at any market.

Table 25 can be found in section X. DISCUSSION showing the availability and cost of all animal-source food items.

EGGS

CHICKEN EGGS were noted by three-quarters of women in Fisheries LZ and one-half of women in Lodwar Urban LZ to be “rarely” or “never” consumed by the family. CHICKEN EGGS were found in three of the six markets in the Fisheries LZ at an average price of 35.8 KES per 100 grams; they were available in all six markets in Lodwar Urban LZ at an average price of 34.9 KES per 100 grams.

Taboos against the consumption of EGGS during pregnancy was among the most frequently noted food prohibitions in both livelihood zones with a concern that egg consumption “would increase the weight of the unborn and cause complications during childbirth”. Eggs were not mentioned as taboo for small children under age two in the Fisheries LZ, other than one comment that they “might cause nausea”. However, in Lodwar Urban LZ, eggs were mentioned by several focus groups as prohibited for children, noting specifically that children “would not learn to talk” if fed eggs.

FISH AND SEAFOOD

Although the population living in the Fisheries LZ were originally pastoralists several decades ago, they have embraced fish as a food item with almost half of women stating FRESH FISH is eaten at least 5 days per week while another 40% eat it from 1 to 4 days per week. As noted in the HEA baseline assessment for Turkana Fisheries LZ in 2016, fishing-related labor by those among the “very poor” and “poor” wealth groups is often paid in kind.

DRIED FISH is said by more than half of women to be frequently consumed, with a slightly lower percentage for SALTED FISH. This incorporation of fish into the diet was not as strong in the Lodwar Urban LZ with a little over a third of women stating that FRESH FISH or DRIED FISH is eaten frequently.

In the Fisheries LZ, DRIED FISH was available in four markets at an average price of 31.5 KES per 100 grams, followed by FRESH FISH in two markets at an average price of 9.2 KES per 100 grams and SALTED FISH at one market at an average price of 38 KES per 100 grams. The relatively low price for FRESH FISH may be due to fishing-related labor being paid in kind, as noted above.

In Lodwar Urban LZ, SALTED FISH was not found at any market. DRIED FISH was found at five of six markets at an average price of 65.1 KES per 100 grams, while FRESH FISH was found at two markets at an average price of 29 KES per 100 grams.

MILK AND MILK PRODUCTS

In both livelihood zones, POWDERED COW MILK was reported by well over half of women to be consumed frequently by families while UHT COW MILK (milk pasteurized at ultra-high temperature) was inversely reported as rarely consumed by a similar percentage of women. FRESH GOAT MILK was reported by 13% of women in Fisheries LZ as being “often” consumed but by only 3% in Lodwar Urban LZ. FRESH SHEEP MILK was reported in both Fisheries LZ and Lodwar Urban LZ as “rarely” or “never” consumed by families.

In Fisheries LZ, UHT COW MILK in 208 gram packages was available at all six markets in the Fisheries LZ at an average price of 22.8 KES per 100 grams. POWDERED COW MILK (whole) was available at five markets at an average price of 59.5 KES per 100 grams. FORTIFIED POWDERED COW MILK was found in only one market at an average price of 79 KES per 100 grams and was reported by one-third of women to be consumed frequently. As noted previously, an assessment of samples of other fortified food items in Kenya (though milk was not included) found fortification levels to be substandard.

In Lodwar Urban LZ, UHT COW MILK was available at all six markets at an average price of 17 KES per 100 grams; markets had different package sizes (at commensurately different prices), ranging from 208 grams to 468 grams to 520 grams. POWDERED COW MILK (whole) was also available at all markets, at an average price of 65.6 KES per 100 grams.

FRESH GOAT MILK is not usually sold in markets but rather sold by the cupful door-to-door by goat herders. The average price per 100 grams was 14.8 KES in Fisheries LZ and 18.5 KES in Lodwar Urban LZ. SHEEP MILK was not found in any market in either livelihood zone during this survey (which did occur at the end of a dry season before the heavy rains season). In focus groups, GOAT MILK was mentioned as a desirable food item that has become less available with changing weather patterns.

Although the cost of powdered milk appears higher than other milks, 100 grams is reconstituted into one liter of fluid milk. The prices per liter of milk provide a different perspective (Table 5). However, before recommending the purchase of (cheaper) powdered milk, one would need to assure that it will be reconstituted with safe water to avoid any childhood illness from contamination.

It is of note that fresh goat milk is much more expensive in Lodwar Urban, while UHT cow milk is much cheaper than in Fisheries LZ.

TABLE 5. COMPARATIVE PRICES OF FLUID MILK IN BOTH LIVELIHOOD ZONES

FLUID MILK	FISHERIES LZ	LODWAR URBAN LZ
Food Item	AVERAGE PRICE PER LITER	AVERAGE PRICE PER LITER
Powdered cow milk	59.54	65.60
Goat milk, fresh	148.81	185.20
UHT cow milk	228.40	170.00

Exchange rate: US\$1 = 109.5 KES

VEGETABLES

In both livelihood zones, CABBAGE was the vegetable most frequently reported as consumed “often”,

followed by KALE and ONIONS (both bulb and scallion) for two-thirds of households or more and for one-third of households “SPINACH” (a type of Swiss chard) and COWPEA LEAVES (*kunde*). Women reported greater diversity of vegetable consumption in Lodwar Urban LZ, with AMARANTH (*dodo*) and SOLANUM LEAVES (*suja* or *managu*) additionally mentioned by a third of women as frequently consumed by the family.

In the Fisheries LZ, only one or two vegetables (CABBAGE at an average price of 7 KES per 100 grams and ONIONS at 15 KES per 100 grams) were available in most markets. Onions, though relatively expensive and not nutritionally dense as compared to other vegetables such as kale, are likely appreciated for flavoring otherwise bland grain-based meals. Only the larger market had seven vegetables available, including KALE (9.3 KES per 100 grams), AMARANTH (6.6 KES per 100 grams), COWPEA LEAVES (6.8 KES per 100 grams) and SOLANUM (7 KES per 100 grams). Oddly one trader in Eliye market in the south had CARROTS for sale at 10 KES per 100 grams.

In Lodwar Urban LZ, all markets had a minimum of five types of vegetables available for sale while several had up to eight or nine. CABBAGE, ONIONS and also KALE were available at all markets. These and other vegetables generally available can be found in Table 6.

TABLE 6. PRICES OF VEGETABLES AVAILABLE IN LODWAR URBAN LZ, IN ASCENDING ORDER OF COST

Food Item	Price per 100 grams in KES
Cabbage	3.8
Kale	5.1
Cowpea leaves (<i>kunde</i>)	8.1
Amaranth (<i>dodo</i>)	8.2
Swiss chard	8.3
Onions	11.6
Solanum leaves (<i>suja</i> / <i>managu</i>)	12.7
Carrot	13.8
Scallions/spring onions	15.2
Squash, butternut	16.1

Exchange rate: US\$1 = 109.5 KES

Even CROTALARIA LEAVES (*mito*) were available in one market in Lodwar Urban LZ at an average price of 17.4 KES per 100 grams.

In Fisheries LZ, the prices for CABBAGE, ONIONS, KALE and CARROTS were higher than in Lodwar Urban LZ, while prices for AMARANTH, COWPEA LEAVES and SOLANUM LEAVES were lower, though these lower priced vegetables were only available in the larger market.

When asked in focus groups an open question of what foods (of any type) women would like to buy at market that are rarely available, KALE was the first food item mentioned followed by CABBAGE and SPINACH. As one woman noted “it completes the meal”. Adolescent mothers commented that older people do not consider cabbage a desirable food.

In one instance the COD fieldwork team had to return to a Lodwar market early a second day because vegetables and fruits had sold out by the time they arrived mid-morning. Although this survey was conducted before the start of the heavy rains season, markets in both livelihood zones do have connections with areas with irrigation although road condition is poor and transport costs, always high, are said to have increased during the coronavirus pandemic.

It is interesting to note the availability of kale in Lodwar market coupled with the desire expressed by women for this unavailable vegetable in the Fisheries LZ (found in only two of six markets). In Key Informant Interviews with Traders, one Trader with 18 years of experience noted her frustration with the lack of water (or irregular water supply) in the market which made it hard for her to keep vegetables “fresh” and available for sale on more than one day, resulting in unpredictable losses for her business.

FRUITS

In both livelihood zones, the fruits reported as often consumed, in descending order of frequency include: TOMATOES, BANANAS (ripe), MANGOS, and ORANGES. In addition, *DOUM PALM FRUIT* was reported as “usually” or “often” consumed by over 80% of women in Fisheries LZ and over 40% of women in Lodwar Urban LZ. AVOCADO was reported by one-third of mothers in Lodwar Urban LZ as frequently consumed, while it was reported as “rarely” or “never” consumed by most mothers in Fisheries LZ. TAMARIND (*ng’apedur*) was only reported as consumed in Fisheries LZ and only by one-fourth of respondents.

In Fisheries LZ, TOMATOES, which many perceive to be a vegetable, were sold in all markets at an average price of 15.8 KES per 100 grams which is relatively expensive compared to other vegetable prices. However, this is another food (like onion) that, although not nutritionally dense as compared to dark green leafy vegetables, it can provide a lot of flavor to a meal. MANGOS and/or ORANGES were found in four of six markets at an average price of 9.5 KES and 11.2 KES per 100 grams respectively. BANANAS, though reported as frequently consumed, were only found in two markets and at a price of 17 KES per 100 grams. Only one of the larger markets had a variety of six fruits.

In Lodwar Urban LZ, both TOMATOES and BANANAS (ripe) were found in all markets at an average price of 13 KES and 11 KES respectively. Half of the markets in Lodwar Urban LZ had from 10 to 12 different fruits available, including AVOCADO at an average price of 11 KES per 100 grams; the other half had from 3 to 6 different fruits available, including ORANGE at an average price of 13.4 KES per 100 grams, MANGO at 7.7 KES per 100 grams, and PAPAYA at 12.5 KES per 100 grams.

A summary of the prices of key fruits available in both livelihood zones is found in Table 7.

TABLE 7. PRICES AND AVAILABILITY OF FRUITS IN BOTH LIVELIHOOD ZONES, IN DESCENDING ORDER OF FREQUENCY OF CONSUMPTION

FRUITS	FISHERIES LZ	LODWAR URBAN LZ
Food Item	AVERAGE PRICE PER 100 GRAMS	AVERAGE PRICE PER 100 GRAMS
Tomato	15.8 KES	13.0 KES
Banana (ripe)	17.0 KES	11.0 KES
Mango	9.6 KES	7.7 KES
Orange	11.1 KES	13.4 KES
Avocado	10.2 KES	11.0 KES
Papaya	Not available	12.5 KES

Exchange rate: US\$1 = 109.5 KES

Oranges are well-known to contain vitamin C while mangos and papaya contain vitamin C and are also rich in vitamin A. Tomatoes contain some vitamin A and a moderate amount of Vitamin C. Bananas contain a moderate amount of nutrients but are easy to eat for small children, an important factor when thinking about the family diet. Avocados are energy-dense with their unusually high (for a fruit) fat

content. They are also soft for small children to eat but focus groups did mention that children will not eat them readily as they are “unknown”.

AVOCADO was noted in focus groups in both livelihood zones to be prohibited for consumption during pregnancy as it would “add weight to the unborn child and cause complications during childbirth”.

OILS, SUGARS, CONDIMENTS

VEGETABLE OIL is the type of oil or fat most frequently consumed by families with over 90% consuming “usually” or “often” in both livelihood zones. HYDROGENATED VEGETABLE OIL is the next most frequently consumed oil, by one-third of families in Fisheries LZ and one-sixth of families in Lodwar Urban LZ. MARGARINE was reported as “usually” or “often” consumed by roughly 15% of families in the Lodwar Urban LZ while no mothers reported margarine consumption in Fisheries LZ.

TABLE 8. COMPARATIVE PRICES OF AVAILABLE OILS AND FATS IN BOTH LIVELIHOOD ZONES

OILS AND FATS	FISHERIES LZ	LODWAR URBAN LZ
Food Item	AVERAGE PRICE PER 100 GRAMS	AVERAGE PRICE PER 100 GRAMS
Vegetable oil	30.3 KES	34.0 KES
Hydrogenated vegetable oil	29.4 KES	23.3 KES
Margarine, fortified	30.0 KES	42.9 KES

Exchange rate: US\$1 = 109.5 KES

All 3 types of oils and fats were available in all markets in Lodwar Urban LZ; vegetable oil was available in all markets in the Fisheries LZ, while hydrogenated (semi-solid) vegetable oil was found in 4 markets and margarine in 2 of the 6 markets surveyed. As seen in Table 8, vegetable oil is more expensive in Lodwar Urban LZ than in Fisheries LZ; it is also significantly more expensive than hydrogenated vegetable oil. Oil is one of the key staples of the diet; for development of an SBC strategy it would be worth finding out why vegetable oil is preferred when there is a potential for cost savings in the Lodwar Urban LZ.

BROWN and WHITE SUGAR are frequently consumed by approximately 65% of families in the Fisheries LZ, while BROWN SUGAR is frequently consumed by 80% in the Lodwar Urban LZ, with only 37% frequently consuming WHITE SUGAR. It is interesting to note that roughly one-fifth (Lodwar Urban LZ) to one-third of families (Fisheries LZ) report they “rarely” or “never” consume brown or white sugar. Prices for BROWN and WHITE SUGAR are similar in both livelihood zones, between 12 and 13 KES per 100 grams in Lodwar Urban LZ and 13 to 14 KES in the Fisheries LZ.

Approximately 95% of families in both livelihood zones consume SALT frequently and salt was widely available in all markets in both livelihood zones at an average price of 8 KES per 100 grams. The iodization of salt with the micronutrient iodine has been mandatory in Kenya since 1978²⁰ with some early success in the reduction of goiter among the population. However, the 2011 Kenya National Micronutrient Survey found over half of the samples of salt in both urban and rural areas to not be optimally iodized²¹. The same survey found 30.1% of non-pregnant women in rural areas of Kenya to have iodine deficiency. Iodine is critical for physical and mental development from conception onwards.

²⁰ Nutrition International (2020). *Food Fortification in Kenya: Policy Brief*.

²¹ Kenya Ministry of Health (2011). *Kenya National Micronutrient Survey*.

LEMON and (canned) TOMATO PASTE are categorized as condiments by the COD software. LEMON (average price 18.3 KES per 100 grams) is reported as “rarely” or “never” eaten by 90% of households in Fisheries LZ. TOMATO PASTE (38.1 KES) is reported as often eaten by 22% of households and “never” eaten by 69%. In Lodwar Urban LZ, LEMON (average price 20.3 KES per 100 grams) and (canned) TOMATO PASTE (32.9 KES) are reported as frequently eaten by only 13% and 9% of households, respectively.

WILD OR GATHERED FOODS

When developing the food list, three foods which are gathered were added to the food list as they may also be sold in the markets. These included: *Solanum nigrum* leaves (*sujaa/managu*), amaranth leaves (*dodo*), and the fruit of a palm tree (*Doum/eng’ol*).

Solanum leaves were available in only one market in the Fisheries LZ but in most markets in Lodwar Urban LZ. They are a good source of vitamins A and C, along with calcium. The leaves of the amaranth plant were found in several of the larger markets in the Fisheries LZ and most of the markets in Lodwar Urban LZ. *Solanum* and amaranth leaves are said to be “rarely” or “never” eaten by families in the Fisheries LZ but “usually” or “often” eaten by one-third of families in Lodwar Urban LZ. Amaranth leaves are high in zinc and calcium, while also containing a good amount of vitamins A and C. Both *Solanum* and amaranth are said to be gathered during the rainy seasons and to be potentially eaten by all family members.

Doum / eng’ol, the fruit of a local palm tree (*hyphaene compressa*), was mentioned in all focus groups as being a food gathered during the dry season and consumed by everyone; it was only available for sale in one of the larger markets in Lodwar Urban LZ at 24.3 KES per 100 grams. Besides providing 361 kilocalories per 100 grams, it is also known to contain calcium (284 mg), a micronutrient of concern during periods of rapid bone growth, such as for fetal development in the womb and during early childhood. As a mineral it is stored in the body and is of importance for young adolescent women before entering childbearing years. *Doum* also contains a significant amount of iron which is needed for the formation of red blood cells. (It also contains significant amounts of B vitamins but these are rarely lacking in grain-based diets.)

A long list of wild or gathered foods was obtained during focus group interviews (Annex D); little information was readily available on their scientific names and/or nutrient content²².

OTHER INFORMATION FROM KEY INFORMANT INTERVIEWS AND FOCUS GROUPS

Besides the Market Surveys and Dietary Habits Interviews, focus groups were conducted with adolescent mothers age 15 to 20 with children under age three and mothers age 21 to 49 with children under age three. Key Informant Interviews were also conducted with several of the established traders in the larger markets in each livelihood zone.

CONSUMER AND TRADER CONCERNS

²² A report from a workshop organized by CRS/Southern Sudan and sponsored by USAID/OFDA in April 2001 was held in April 2001 to discuss wild and gathered foods and their potential contribution to food security. The proceedings noted that Crop Resources of Tropical Agriculture (CRTA) had a long-range plan to assess known indigenous wild food plants.

In focus group discussions, women were asked what foods they did not trust to purchase at markets and why. The most common concern was weevil infestation of beans and maize followed by poor hygiene in the handling of meat and fish (“many flies”, “bad smells”). Disappointment with foods found to be rotten inside after purchase, such as avocados, mangos and bananas, was also noted. Expired foods was mentioned as a problem for packaged food items, such as wheat flour. One focus group in Lodwar Urban LZ also expressed a concern about adulteration of powdered milk with wheat flour.

More in-depth Key Informant Interviews were undertaken with five Traders. In response to the question “What are the biggest obstacles to selling more food?” almost all Traders mentioned a lack of capital or access to loans to expand business, but at the same time noted that “business is slow” or “demand is low” yet “competition is strong”. Two Traders specifically mentioned what they felt was “unfair competition” from wholesalers who sometimes sell large volumes as retailers and at lower prices than retailers.

When asked what types of infrastructure improvements they would like to see for markets the main answers were: (a) better constructed market stalls, (b) improved waste disposal to improve hygiene standards, (c) improved drainage for accessibility during the rainy season, (d) improved stability of electricity and water supplies. As noted previously, one Trader specifically mentioned that it was hard to try to maintain greens for sale as erratic water supplies made it difficult to keep them fresh for more than one day.

Poor road conditions from markets to larger cities and regional markets, fuel costs, and costs of rent were also noted by Traders as key challenges. One Trader noted limited parking near the market.

EFFECTS OF THE CORONAVIRUS PANDEMIC

In Lodwar Urban LZ, both mothers and Traders interviewed noted that the curfews enacted to reduce the spread of the coronavirus restricted consumers’ ability to purchase food items needed and reduced Traders sales. At times businesses were not allowed to operate at all.

Traders mentioned that there has been greater difficulty with transportation of goods since the coronavirus pandemic. “Lockdowns” also led to delays in supplies which led to price hikes. They noted that food availability was generally erratic from their suppliers with one specific mention of hoarding of legumes/beans by suppliers seeking a higher price. One Trader stated that due to the coronavirus pandemic more customers needed to buy on credit and that business overall was slower with less turnover of stock leading to reduced amounts being restocked.

Traders noted that the erratic water supply in markets was a specific constraint to good hygiene and handwashing during the coronavirus pandemic. One Trader noted that neither masks nor hand sanitizer was sold in the markets creating compliance difficulties for those customers who did not bring these items.

During Key Informant Interviews with Traders, they were asked about the price (retrospectively during the year 2020) of 9 food items taken from the list of foods in the World Food Programme Minimum Expenditure Baskets²³. Although prices or quantities sold may vary by season (usually higher in price during the extended dry season), Traders noted that several food items have gone up in price in an unseasonal manner since the end of 2020, with beans and lentils particularly cited. The Traders credit this to accumulated effects from the coronavirus pandemic. One Trader mentioned a country-wide shortage of sugar in 2020 leading to increased prices from suppliers. For food items such as dark leafy greens and vegetable oil, during some seasons the price is maintained but lesser volume is provided at

²³ Kenya Cash Working Group (July 2019). *Minimum Expenditure Basket: Interim Guidance Document*, Kenya.

the same price.

During focus groups discussions, women noted that the restrictions in markets due to the coronavirus pandemic eliminated a typical opportunity for socializing. They mentioned the need for handwashing and refusal of service if one would not have a mask. They noted some foods were not available and that availability of other foods was erratic. Issues of curfew and closure of markets was a key concern limiting their access to markets. Informally, women noted that the improvement in hygiene at markets due to coronavirus mandates was a positive aspect and that they hoped a concern for hygiene would continue with or without pandemic control measures.

DESIRABLE FOODS NOT ALWAYS AVAILABLE AT MARKETS

In focus groups both adolescent mothers and older mothers were asked if there were foods they would like to buy but that were not often available at markets. The foods most frequently mentioned by most focus groups included: fresh goat milk, sour milk, potatoes, lentils, green grams, green peas, kale, cabbage, bananas, and tomatoes.

A long list of foods were mentioned by individual focus groups, including: yellow maize, wheat flour, millet, pasta, rice, arrowroot, beans, goat's blood, meat and fish, eggs, onions, multiple dark green leaves (amaranth, cowpea, jute, Solanum), and mangos.

FOODS LESS AVAILABLE DUE TO CHANGING WEATHER PATTERNS

In focus groups both adolescent mothers and older mothers were asked if there were any desirable foods that are less available in the markets specifically due to changing weather patterns. They mentioned popular dark green leafy vegetables (kale, spinach, cowpea leaves), multiple fruits (noting that they are only available in the rainy season – yet fruits were found during these COD Market Surveys), and fresh goat milk. They also talked about changing weather patterns reducing their household income and thereby constraining what they could purchase at markets. Several focus groups specifically noted that bulgur was less available than previously at markets.

SOCIAL AND BEHAVIORAL CHANGE STRATEGY INPUT

Adolescent mothers were asked if there are “newer” foods considered desirable by their generation. They particularly highlighted pasta and rice as being “easy to cook” and “easy for small children to eat”. As noted previously, foods that use little firewood to prepare are likely to be desirable. The field team mentioned that beans recently imported from Uganda cooked more quickly than the traditional red bean. Older mothers in Lodwar Urban LZ mentioned yoghurt and (packaged) fruit juice as desirable as they are “readily available for consumption”. Adolescent mothers have clearly received some nutrition education as they mention that beans have protein, dark green leaves strengthen eyesight, and (various carbohydrates) provide energy.

So-called “junk foods” were not assessed during the Market Survey as the Cost of the Diet software would not choose to recommend these for a cost-efficient nutritious diet; however, during focus groups women were asked how often they purchased “sweets, snacks or drinks for your children or grandchildren” and the predominant response was “once or twice a week” in both Fisheries LZ and Lodwar Urban LZ.

Focus groups in Lodwar Urban LZ identified many more food taboos for pregnant women than focus groups on Fisheries LZ. Honey, various juices, and certain wild fruits are noted as causing miscarriage. MEAT was also cited as being prohibited. This was not noted in Fisheries LZ. In both livelihood zones, focus groups identified various nutritious foods as foods that should not be eaten by pregnant women as they would “add weight to the unborn baby and lead to complications during childbirth”. These included eggs, avocado, and groundnuts or peanuts. In Fisheries LZ, but not Lodwar Urban LZ, oils and fats were also included among this taboo.

Similar to taboos for children under age two, the intestines, brains, spleen and other organs of animals are prohibited for pregnant women and may cause a variety of negative outcomes (e.g. loss of blood, “weak newborn”, “insane child”). LIVER was only not cited in one focus group in Lodwar Urban LZ as being prohibited for small children; it was not identified as prohibited for pregnant women in either livelihood zone.

Women in focus groups were asked two different questions: “What foods are not permitted for small children under age two?” and “What foods will children not eat even if mothers try to give to them?”. It is not clear if focus group members differentiated between the two questions: combined responses in Table 9 below.

TABLE 9. REASONS FOR NOT GIVING CERTAIN FOODS TO SMALL CHILDREN UNDER AGE TWO

Fisheries LZ	Reason	Lodwar Urban LZ	Reason
Animal fats/oils	Causes respiratory problems; can lead to child obesity	Animal fats	Causes irritation
Beans or bean soup	Causes diarrhea	Beans, green peas, yellow peas, lentils	Causes upset stomach and/or diarrhea
Wheat or maize flour soup	Causes diarrhea	Sorghum or maize flour soup	Causes diarrhea
Eggs	May cause nausea	Eggs	Allergies; stomach swells; children refuse
Any animal meat	Children dislike	Mutton meat	Child vomits (some adults are also said to be allergic to only mutton among available meats)
Fish	Child vomits	Fish	Allergies
Ujimix	Too sour	Ujimix	Tastes sour
Avocado	Not exposed to them	Avocado	Children dislike
Pasta	Looks like worms	Potatoes	Hard to swallow
Kale	Smells bad to children	Milk or yoghurt	Child vomits
		Peanuts	Enlarges child’s liver
		Coagulated animal blood	Causes diarrhea

In addition to the food items noted in Table 9, women also identified foods that were difficult to chew for small children. They also note that children prefer foods that are sweet and may refuse “bland” foods, such as plain rice. It is concerning that several foods identified as prohibited or undesirable for children are key sources of protein for the diet.

It should be noted that several of the wild / gathered foods mentioned in focus groups and for which

nutritionally information is available are good sources of energy and micronutrients (e.g. *doum* palm fruit, *Solanum* leaves and amaranth leaves) and should be promoted for consumption.

COST OF THE DIET STANDARD ANALYSES

The Cost of the Diet software uses the Market Survey information and Dietary Habits Interviews to calculate four standard analyses:

- **ENERGY ONLY (EO):** This diet meets only the recommended energy, or calorie, needs of an average family in each livelihood zone.
- **MACRONUTRIENTS:** This diet meets the recommended intakes for energy, protein and fat for an average family in each livelihood zone, but does not meet each individual’s micronutrient needs.
- **NUTRITIOUS DIET:** This diet meets the recommended intakes for energy, protein, fat and 13 micronutrients for every member of an average family in each livelihood zone.
- **FOOD HABITS DIET:** This diet meets the recommended intakes for energy, protein, fat and 13 micronutrients of an average family but is based on typical dietary habits of households in each livelihood zone.

Based on HEA data, an average family size of seven was entered for standard analyses for the Fisheries LZ while an average family size of nine was entered for Lodwar Urban LZ. The “standard family” in the COD software includes the following members:

TABLE 10. STANDARD FAMILIES FOR COST OF THE DIET ANALYSES

Seven family members	Age	Nine family members	Age
Child, either sex	12 to 23 months	Child, either sex	12 to 23 months
		Child, either sex	5 to 6 years
Child, either sex	7 to 8 years	Child, either sex	7 to 8 years
Child, either sex	9 to 10 years	Child, either sex	9 to 10 years
Child, either sex	11 to 12 years	Child, either sex	11 to 12 years
Child, either sex	13 to 14 years	Child, either sex	13 to 14 years
		Child, either sex	15 to 16 years
Man, 50 kg, moderately active	30 to 59 years	Man, 50 kg, moderately active	30 to 59 years
Woman (lactating), 45 kg, moderately active	30 to 49 years	Woman (lactating), 45 kg, moderately active	30 to 49 years

The COD software assumes that the CHILD AGE 12-23 MONTHS is breastfeeding (and includes breast milk as a food item for that child in any standard analysis) and therefore that the MOTHER is lactating.

COST OF THE DIET FISHERIES LZ

Based on the Food List the Market Survey and Dietary Habits Interviews in Fisheries LZ looked at 82 food items in 12 food groups.

ENERGY ONLY DIET, FISHERIES LZ

The diet calculated by the COD software to meet only the energy needs for an average family in Fisheries LZ would cost 311.13 KES (US\$2.84) daily or 113,561 KES (US\$1,037) annually. It includes four different foods selected from only two food groups: Maize grain and maize flour, staples of the diet in the Fisheries LZ, and rice, which is the next cheapest among the food items in the GRAINS food group. BREASTMILK is the second food group and only for the youngest child.

MACRONUTRIENTS DIET, FISHERIES LZ

The diet calculated by the COD software to meet only the energy, protein and fat needs for an average family in Fisheries LZ would cost 326.72 KES (US\$2.98) daily or 119,253 KES (US\$1,089) annually. It includes 6 foods from 4 food groups: Breastmilk; Maize grain, maize flour and rice (GRAINS similar to the EO diet but with reduced quantities of rice), plus the traditional red kidney beans (LEGUMES) to help meet protein needs of the lactating mother and locally produced hydrogenated OIL to meet the recommended levels of fats for all family members' diet.

Although this diet exceeds the protein requirements for an average family in Fisheries LZ, the needs for all ESSENTIAL AMINO ACIDS to form COMPLETE protein should be taken into consideration. Only animal source foods contain all essential amino acids. Vegetarian diets need to mix food groups to “fill in” the essential amino acids missing from each group. The traditional combination of maize and beans provides complete protein with the lysine and tryptophan lacking in maize but found in beans and the methionine lacking in beans but found in maize.

As the standard analysis for the Macronutrients Diet does not take into consideration the micronutrient needs of the family, it is lacking in eight important micronutrients: Vitamin B12, calcium, vitamin A, vitamin C, folic acid, iron, vitamin B2, and pantothenic acid. The Macronutrients Diet does not quite reach 100% of needs for vitamin B6, also (Table 11).

TABLE 11. PERCENT OF FAMILY’S MACRO- AND MICRONUTRIENT NEEDS MET BY THE MACRONUTRIENTS DIET, FISHERIES LZ

Energy	Protein	Fat	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic acid	Vitamin B6	Folic acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
100.0	114.2	100.0	6.6	7.7	123.2	67.5	133.6	74.3	96.5	31.8	3.6	6.2	43.1	250.1	114.7

Among those micronutrients that this diet does not even provide half of the family’s needs are some extremely important micronutrients. Vitamin B12 is critical for the formation of red blood cells and a lack leads to macrocytic (“pernicious”) anemia while a lack of iron, also needed to form red blood cells, causes microcytic anemia. Calcium is well-recognized for its role in bone growth and maintenance. Besides its role in night vision, vitamin A also has a role in strengthening the body’s defenses against respiratory disease. Vitamin C has several key roles in the body, including the repair of tissues. Folic acid contributes to a range of functions in the body, including the formation of red blood cells. Meeting requirements during pregnancy can help to prevent neural tube birth defects. Folic acid may also have a role in preventing preterm birth.

NUTRITIOUS DIET, FISHERIES LZ

The diet calculated by the COD software to meet all of the macronutrient and micronutrient needs for an average family in Fisheries LZ would cost 480.82 KES (US\$4.39) daily or 175,497 KES (US\$1,603) annually. It includes 12 foods from 8 food groups. In addition to breastmilk for the child age 12-23 months, the foods chosen by food group are shown in Table 12.

TABLE 12. FOOD GROUPS AND FOOD ITEMS SELECTED FOR A NUTRITIOUS DIET IN FISHERIES LZ

FOOD GROUP	FOOD ITEMS
GRAINS	Maize grain and maize flour. Wheat flour is only included for the Lactating Mother age
LEGUMES	Red kidney beans and variegated color beans
MEATS AND OFFAL	Liver (for all family members)
FISH AND SEAFOOD	Dried freshwater fish (for all family members)
VEGETABLES	Kale for all but the child age 12-23 months and the lactating mother for whom Solanum leaves are chosen.
FRUITS	Avocado
OILS AND FATS	Hydrogenated vegetable oil

Along with vitamin A, most of the family’s needs for vitamin C are met through the consumption of kale and Solanum leaves (the COD software chooses Solanum leaves instead of kale for the youngest child and mother because Solanum is higher in pantothenic acid, a limiting nutrient – otherwise, kale is richer in all other micronutrients). Although nutritious fruits such as mangos and oranges are available, green leaves are cheaper and also provide iron which is lacking in fruits.

Table 13 shows that the challenge faced by the COD software to achieve 100% of all nutritionally requirements for the family was due to challenges in reaching 100% of requirements for pantothenic acid, iron and vitamin C.

TABLE 13. PERCENT OF FAMILY’S MICRONUTRIENT NEEDS MET BY THE NUTRITIOUS DIET, FISHERIES LZ

Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic Acid	Vitamin B6	Folic Acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
186.7	104.2	181.3	127.1	254.2	100.2	157.1	119.4	592.7	128.1	103.0	376.4	192.0

The COD Nutritious Diet chooses liver for all family members. It is an animal source food that is very nutrient-rich as it functions as a storage area for nutrients in animals. Liver from goats was found in almost all markets in both Fisheries LZ and Lodwar Urban LZ. Unfortunately, Dietary Habits Interviews showed that most families “rarely” or “never” eat liver, although no specific taboos against consumption by small children or pregnant women were noted in focus groups. It is important to remember that the Dietary Habits Interviews do not capture people’s specific likes and dislikes but rather their typical dietary patterns at the present time.

FOOD HABITS DIET, FISHERIES LZ

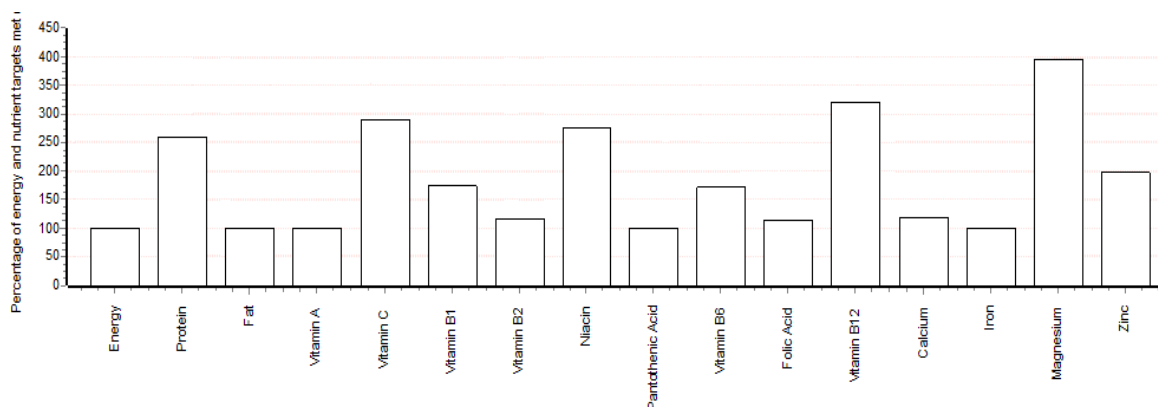
The diet calculated by the COD software to meet all macronutrient and micronutrient needs for an average family in Fisheries LZ while taking into account their typical dietary food patterns would cost 582.55 KES (US\$5.32) daily or 212,632 KES (US\$1,942) annually. It includes 16 foods from 10 food groups including grains, roots and tubers, legumes, meat, fish, eggs, vegetables, fruits and oils, along with breastmilk (Table 14).

TABLE 14. PORTIONS OF FOOD ITEMS PER FAMILY MEMBER, DAILY FOOD HABITS DIET, FISHERIES LZ

Average household, seven family members	Maize grain	Maize, flour	Rice	Wheat, flour	Potato	Bean, kidney, dried	Goat, meat, raw	Donkey meat, raw	Any type fish, raw	Fish, any type small, dried, freshwater	Egg, chicken,	Chard, Swiss	Kale	Avocado	Oil, vegetable	Breast milk
1 Child (either sex) 12-23 months	0	2	0	0	0	2	0	1	0	1	0	0	1	0	1	1
1 Child (either sex) 7-8 years	2	0	1	1	1	1	0	0	0	1	0	0	1	1	2	0
1 Child (either sex) 9-10 years	2	0	1	1	0	1	0	0	0	1	0	0	1	1	2	0
1 Child (either sex) 11-12 years	2	0	0	1	0	1	0	0	0	1	0	0	1	1	2	0
1 Child (either sex) 13-14 years	2	1	1	1	0	1	0	0	0	1	0	0	1	1	2	0
1 Man 30-59y 50kg, moderately active	2	1	1	0	0	1	0	0	0	1	0	0	1	1	1	0
1 Woman, 30-49y, 45 kg, moderately active and lactating	1	1	0	1	0	2	1	1	2	1	1	1	0	1	1	0
Total Servings	11	5	4	5	1	9	1	2	2	7	1	1	6	6	11	1

Figure 7 shows the percent of nutrient needs of the family met by the Food Habits Diet. Similar to the Nutritious Diet, the challenge faced in achieving 100% of micronutrient needs was due to the requirements for pantothenic acid and iron (the addition of potato to the Food Habits Diet adds a significant amount of vitamin C). Without liver (which was chosen by the Nutritious Diet but is not often eaten in Fisheries LZ), several nutrients just reach 100%, including vitamins A and B2.

FIGURE 8. PERCENT OF FAMILY'S NUTRIENT NEEDS MET BY THE FOOD HABITS DIET, FISHERIES LZ



As noted above, although protein needs are exceeded this is not all complete protein with the essential amino acids needed for growth and repair of the body. Complete protein comes from the goat and donkey meat, fish, and eggs. Due to the high nutrient needs of the lactating mother, she is assigned egg, goat meat, donkey meat and additional fish beyond what most of the family is allocated. The small child age 12 to 23 months is also allocated additional beans and donkey meat.

For more detail on the nutritional contribution of each food item see Annex E where the contribution of each food item is shown as an average of all of the family members' needs. (The percent contribution to individuals, such as the smallest child and the lactating mother who receive some nutrient-rich food items that the rest of the family are not allocated, would be much higher.) Maize, the staple of the diet, provides significant amounts of protein, fat, iron and folic acid. Small dried freshwater fish provide complete protein, vitamin B12, calcium and iron. Kale provides the bulk of the family's average needs for vitamins A and C. Folic acid which can be deficient in diets is provided by beans, kale and avocado, which also provides fat.

COST OF THE DIET ANALYSES: FEMALE ADOLESCENTS, FISHERIES LZ

Three different COD analyses were done to look at the nutritional needs of female adolescents: (a) an analysis for a standard family of seven but changing the oldest child to be a female adolescent 15 to 16 years of age; (b) comparing the cost of a diet for a pregnant adolescent 15 to 16 years of age to the cost for a pregnant woman age 30-49, last trimester of pregnancy for both, and (c) comparing the cost of the diet for a lactating adolescent mother age 15 to 16 to the cost for a lactating mother age 30-49, with infant age 7 to 12 months for both.

COST OF THE DIET ANALYSIS: FAMILY OF SEVEN WITH OLDEST CHILD AN ADOLESCENT FEMALE

As the energy and macronutrient requirements do not increase greatly when the family structure is changed from a "child, either sex, age 13 to 14" (which is an average of male and female nutrient needs) to a "female, age 15 to 16", analysis of the EO DIET and the MACRONUTRIENTS ONLY DIET showed only a slight difference in cost and/or content from the standard analyses for a family of seven in the Fisheries LZ.

Like the MACRONUTRIENTS DIET for a standard family of seven, the micronutrients well below 100% of needs were vitamins A, C, B2 and B12, pantothenic acid, folic acid, calcium and iron.

Analyses of a NUTRITIOUS DIET and a FOOD HABITS DIET showed sizeable cost increases due to the high micronutrient needs of an adolescent female aged 15 to 16 years, both due to the monthly micronutrient losses due to menses and due to the need to store micronutrients for future pregnancies.

NUTRITIOUS DIET FOR A FAMILY WITH FEMALE ADOLESCENT, FISHERIES LZ

For Fisheries LZ, the daily cost of a nutritious diet with a female adolescent age 15 to 16 as the oldest child within a standard family of seven is 555.72 KES (US\$5.08) daily or 202,838 KES (US\$1,852) annually. This is 75.40 KES (US\$0.69) higher per day and 27,341 KES (US\$250) higher per year when compared to 480.32 KES (US\$4.39) daily or 175,497 KES (US\$1,603) annually for a standard family of seven.

Like the Nutritious Diet for a standard family of seven, the Nutritious Diet for the family with an

adolescent female includes 1 more food item (rice) but from the same 8 food groups. The increased cost is due to the increased allocation to the female adolescent age 15 to 16 years of several key food items (beans, Solanum leaves and fat) and the higher cost nutrient-dense animal source foods (liver and fish) daily (Table 15).

TABLE 15. DAILY QUANTITY IN GRAMS OF A NUTRITIOUS DIET FOR A FAMILY OF SEVEN WITH A FEMALE ADOLESCENT CHILD, FISHERIES LZ

Standard family of seven with adolescent female as oldest child	Maize grain	Maize, flour	Rice	Wheat, flour	Bean, kidney, dried	Green gram, whole, dried	Liver, goat	Fish, any type small, dried, fresh water	Kale	Solanum leaves	Avocado	Fat, hydrogenated vegetable	Breast milk
1 Child (either sex) 12-23 m	0	57	0	5	68	4	4	16	0	13	0	5	532
1 Child (either sex) 7-8 years	132	102	52	0	43	0	3	36	19	0	106	17	0
1 Child (either sex) 9-10 years	156	97	102	0	40	0	3	36	23	0	61	30	0
1 Child (either sex) 11-12 years	183	141	35	0	91	0	3	69	22	0	107	27	0
1 Female 15-16 years	203	69	0	0	187	0	12	123	0	316	27	40	0
1 Man, 30-59 years, 50 kg, moderately active	224	172	155	0	63	0	5	51	35	0	11	38	0
1 Lactating Woman, 30-49 years, 45 kg, moderately active	187	144	0	44	173	0	20	147	0	140	80	20	0
Total edible weight	1,084	781	343	48	664	4	49	477	98	782	529	176	532

FOOD HABITS DIET FOR A FAMILY WITH FEMALE ADOLESCENT, FISHERIES LZ

For Fisheries LZ, the daily cost of the Food Habits Diet for a family with a female adolescent as the oldest child within a standard family of seven is 693.47 KES (US\$6.33) daily or 253,118 KES (US\$2,312) annually. **This is 19 percent higher**, or 110.92 KES (US\$1.02) higher per day and 40,486 KES (US\$370) higher per year when compared to 582.55 KES (US\$5.32) daily or 212,632 KES (US\$1,942) annually for a standard family of seven.

Like the Food Habits Diet for a standard family of seven, the Food Habits Diet for a family with a female adolescent includes 17 food items in 10 food groups. The diet is similar to a Food Habits Diet for a standard family of seven but with egg, goat meat, donkey meat and additional fish allocated to the lactating mother and the female adolescent and larger portions of beans and additional leafy greens to the female adolescent (swiss chard and cowpea leaves).

The most challenging micronutrients to meet were vitamin A, iron and pantothenic acid.

COST OF THE DIET ANALYSIS: FEMALE ADOLESCENT COMPARED TO WOMAN AGE 30-49

As the average family size for an adolescent mother would only be three or four people, it is not useful to compare to the needs of an average family of seven in Fisheries LZ. COD Analysis of the daily nutrient needs and Cost of the Diet for a pregnant adolescent age 15 to 16 were compared to the needs of a pregnant woman age 30 to 49 in Fisheries LZ. The analysis was done for the last trimester of pregnancy for both when nutrient needs are highest.

A Food Habits Diet for a pregnant adolescent mother age 15 to 16 costs eight percent more than that for a pregnant woman age 30 to 49, at 184.21 KES (US\$1.68) daily and 67,237 KES (US\$614) annually vs. 170.40 KES (US\$1.56) daily and 62,197 KES (US\$568) annually in Fisheries LZ.

TABLE 16. COMPARISON OF DAILY QUANTITY IN GRAMS OF A FOOD HABITS DIET FOR A PREGNANT ADOLESCENT AGE 15 TO 16 VERSUS A PREGNANT WOMAN AGE 30 TO 49 YEARS, FISHERIES LZ

Food Habits Diet	Maize, dried grain	Wheat, flour	Beans, kidney, dried	Goat meat	Donkey meat	Fish, any type, raw	Fish, any type, small, dried, fresh water	Swiss chard	Cowpea leaves	Avocado	Oil, vegetable
I Female 15-16 years (Pregnancy, third trimester)	405	8	125	47	47	156	78	260	91	84	32
I Female 30-49 years (Pregnancy, third trimester)	374	51	115	43	43	144	72	229	86	84	16

Table 16 shows the higher consumption of those food items besides basic grains that are needed by the pregnant adolescent mother to meet her own micronutrient needs and those of the developing fetus. COD Analysis of the daily nutrient needs and Cost of the Diet for a lactating adolescent mother age 15 to 16 were compared to the needs of a lactating mother age 30 to 49, both with an infant 7 to 12 months of age in Fisheries LZ.

Due to the higher micronutrient needs of the adolescent mother, a Food Habits Diet for a lactating adolescent mother age 15 to 16 costs six percent more than that for a lactating woman age 30 to 49, at 192.69 KES (US\$1.76) daily and 70,332 KES (US\$642) annually vs. 181.28 KES (US\$1.66) daily and 66,166 KES (US\$604) annually in Fisheries LZ.

TABLE 17. COMPARISON OF DAILY QUANTITY IN GRAMS OF KEY FOOD ITEMS IN A FOOD HABITS DIET FOR A LACTATING ADOLESCENT MOTHER AGE 15 TO 16 VERSUS A LACTATING MOTHER AGE 30 TO 49 YEARS, FISHERIES LZ

Food Habits Diet	Beans, kidney, dried	Goat meat	Donkey meat	Fish, any type, raw	Fish, any type small, dried, fresh water	Egg, chicken	Swiss chard	Avocado	Oil, vegetable
I Female 15-16 years (lactating)	125	46	47	156	78	13	279	94	32
I Female 30-49 years (lactating)	115	31	43	144	72	47	227	86	14

Table 17 shows the higher consumption of those food items besides basic grains that are needed by the lactating adolescent mother.

COST OF THE DIET STANDARD ANALYSES, LODWAR URBAN LZ

Based on the Food List the Market Survey and Dietary Habits Interviews in Lodwar Urbans LZ, the COD analyses looked at 82 food items in 12 food groups.

ENERGY ONLY DIET, LODWAR URBAN LZ

The diet calculated by the COD software to meet only the energy needs for an average family of nine in Lodwar Urban LZ would cost 398.30 KES (US\$3.64) daily or 145,379 KES (US\$1,328) annually. It includes 5 different foods selected from only 3 food groups: Maize grain, maize flour and wheat flour in the GRAINS food group. Hydrogenated vegetable oil in the OILS AND FATS food group, but only for the lactating mother to meet her higher caloric needs, and BREASTMILK only for the youngest child.

MACRONUTRIENTS DIET, LODWAR URBAN LZ

The diet calculated by the COD software to meet only the energy, protein and fat needs (macronutrients) for an average family in Lodwar Urban LZ would cost 411.97 KES (US\$3.76) daily or 150,368 KES (US\$1,373) annually. Like the Energy Only Diet, it includes 5 different foods from 3 food groups: Maize grain, maize flour and wheat flour in the GRAINS food group, but allocates the locally produced hydrogenated vegetable oil in the OILS AND FATS food groups to all family members in order to meet the recommended levels of fats for each member. BREASTMILK, as always, is included for the youngest child.

Although this diet exceeds the protein requirements for an average family in Lodwar Urban LZ, this diet contains no animal source foods. Only animal source foods contain all essential amino acids needed for COMPLETE PROTEIN to meet the body’s growth and repair needs.

As the standard analysis for the Macronutrients Diet does not take into consideration the micronutrient needs of the family, it is lacking in seven important micronutrients (in order of deficiency): vitamin A, vitamin B12, vitamin C, calcium, folic acid, iron, and panthothenic acid (Table 18).

TABLE 18. PERCENT OF FAMILY’S MACRO- AND MICRONUTRIENT NEEDS MET BY THE MACRONUTRIENTS DIET, LODWAR URBAN LZ

Energy	Protein	Fat	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Panthothenic acid	Vitamin B6	Folic acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
100.0	157.0	100.0	5.2	5.8	185.3	95.4	239.3	70.8	132.4	41.0	2.9	10.8	60.8	376.7	171.0

Opposite to that found in Fisheries LZ, the cost of wheat flour in Urban Lodwar LZ is cheaper than rice so the COD analysis chooses wheat flour as the third GRAIN. With rice as the third GRAIN for Fisheries LZ the Macronutrients Diet did not reach 100% of needs for nine micronutrients – the same seven deficient in the Macronutrients Diet for Lodwar Urban LZ but also vitamins B2 and B6.

NUTRITIOUS DIET, LODWAR URBAN LZ

The diet calculated by the COD software to meet all of the macronutrient and micronutrient needs for an

average family in Lodwar Urban LZ would cost 571.22 KES (US\$5.22) daily or 208,495 KES (US\$1,904) annually. It includes 12 foods from 7 food groups. In addition to breastmilk for the child age 12-23 months, the foods chosen by food group are shown in Table 19.

TABLE 19. FOOD GROUPS AND FOOD ITEMS SELECTED FOR A NUTRITIOUS DIET IN LODWAR URBAN LZ

FOOD GROUP	FOOD ITEMS
GRAINS	Maize flour, finger millet and wheat grain for most family members; wheat flour for all family members
LEGUMES	“Soya” (soymilk/curd made from soybeans) for all family members and red kidney beans for most family members
MEATS AND OFFAL	Liver (for all family members except the youngest child who receives breastmilk)
VEGETABLES	Kale for all family members
FRUITS	Avocado for some family members, including lactating mother; fruit from the <i>hyphaene compressa</i> palm (<i>doum/eng’ol</i>) only for the lactating mother to help meet caloric needs
OILS AND FATS	Hydrogenated vegetable oil

It should be noted that most of the family’s needs for vitamins A and C are met through the consumption of kale. Although larger markets in Lodwar Urban LZ had a wide range of fruits, including mangos and oranges, dark green leaves are cheaper and also provide iron which is lacking in fruits.

Table 20 shows that the challenge faced by the COD software to achieve 100% of all nutritionally requirements for the family was due to challenges in reaching 100% of requirements for pantothenic acid, folic acid, and calcium.

TABLE 20. PERCENT OF FAMILY’S MICRONUTRIENT NEEDS MET BY THE NUTRITIOUS DIET, LODWAR URBAN LZ

Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic acid	Vitamin B6	Folic acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
109.3	139.6	214.1	123.7	386.3	100.0	158.0	100.0	102.5	100.0	182.7	744.1	263.7

The COD Nutritious Diet chooses nutrient-rich liver for almost all family members. As noted previously liver from goats was found in almost all markets in both Fisheries LZ and Lodwar Urban LZ. However, Dietary Habits Interviews showed that most families “rarely” or “never” eat liver in either livelihood zone; however, Lodwar Urban LZ was different in that 16% stated that their families “often” eat liver.

“Soya” or soymilk/curd made from soybeans was chosen by the COD analysis for all family members. Almost all (94%) Dietary Habits Interviews rated “soya” as something “never” eaten.

The Nutritious Diet calculations do not take into account the Dietary Habits Interviews information on liver or “soya” consumption nor the fact that “soya” was sold in only one market.

The inclusion of the *hyphaene compressa* palm fruit to help meet the high caloric needs of the lactating mother is interesting. Dietary Habits Interviews showed that half of women stated their families eat this fruit “usually” or “often”. This food is also gathered and therefore free for consumption, too.

Unlike Fisheries LZ where the price of hydrogenated vegetable oil was almost the same as that for (liquid) vegetable oil, the prices vary by 10.7 KES so the COD analysis chooses the hydrogenated vegetable oil. However, over 80% of mothers stated that their families “rarely” or “never” consume hydrogenated vegetable oil.

FOOD HABITS DIET, LODWAR URBAN LZ

The diet calculated by the COD software to meet all macronutrient and micronutrient needs for an average family in Lodwar Urban LZ while taking into account their typical dietary food patterns would cost 872.37 KES (US\$7.97) daily or 318,416 KES (US\$2,908) annually. It includes 16 foods from 9 food groups including grains, legumes, meat, fish, eggs, vegetables, fruits and oils, along with breastmilk (Table 21).

TABLE 21. PORTIONS OF FOOD ITEMS PER FAMILY MEMBER, DAILY FOOD HABITS DIET, LODWAR URBAN LZ

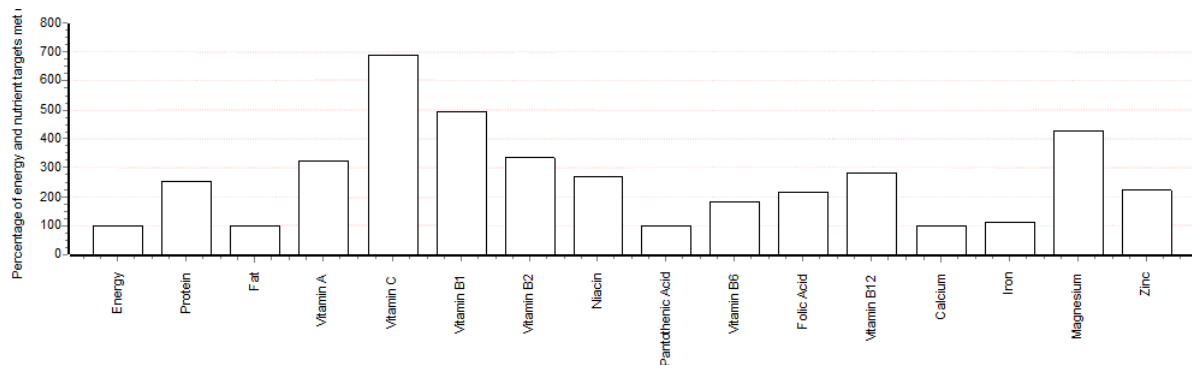
Standard family of nine	Maize, flour	Wheat, flour	Wheat, whole grain	Beans, kidney, dried	Groundnut, shelled, dried	Green gram, whole, dried	Beans, any color, dried	Liver, goat	Fish, any type small, dried, fresh water	Egg, chicken	Kale	Solanum leaves	Avocado	Palm fruit <i>hyphaene compressa</i>	Oil, vegetable	Breast milk
1 Child (either sex) 12-23 months	0	1	0	2	0	0	0	1	1	0	1	0	1	1	1	1
1 Child (either sex) 5-6 years	1	1	1	1	0	0	0	0	1	0	2	0	1	0	2	0
1 Child (either sex) 7-8 years	1	1	1	1	0	0	0	0	1	0	2	0	1	0	2	0
1 Child (either sex) 9-10 years	1	1	1	1	0	0	0	0	1	0	2	0	1	0	2	0
1 Child (either sex) 11-12 years	1	1	1	1	0	0	0	0	1	0	2	0	1	0	2	0
1 Child (either sex) 13-14 years	2	1	1	1	0	0	0	0	1	0	1	0	0	0	2	0
1 Child (either sex) 15-16 years	0	1	1	2	0	1	0	1	1	0	1	1	0	1	2	0
1 Man, 30-59 years, 50 kg, moderately active	2	1	1	1	0	0	0	1	0	0	2	0	0	0	2	0

Standard family of nine	Maize, flour	Wheat, flour	Wheat, whole grain	Beans, kidney, dried	Groundnut, shelled, dried	Green gram, whole, dried	Beans, any color, dried	Liver, goat	Fish, any type small, dried, fresh water	Egg, chicken	Kale	Solanum leaves	Avocado	Palm fruit <i>hyphaene compressa</i>	Oil, vegetable	Breast milk
1 Woman (lactating), 30-49 years, 45 kg, moderately active	1	1	1	2	1	1	1	1	1	1	0	1	1	1	1	0
Total Servings	9	9	8	12	1	2	1	4	8	1	13	2	6	3	16	1

One of the main protein and calcium sources for all family members is small dried freshwater fish. As noted for the Nutritious Diet for Lodwar Urban LZ, Dietary Habits Interviews found 16% of families eating liver “often” (while the rest eat it “rarely” or “never”) so the COD analysis chooses it only for the family members with the highest nutrient needs per body size (and stomach size), the small child age 12 to 23 months, the oldest child age 15 to 16 years, and the father and lactating mother. (Note that portion sizes of each food item are appropriately sized per individual family member’s age.) The lactating mother gets additional servings of foods high in protein and micronutrients, including beans, green grams, groundnut and an egg. The fruit of the *hyphaene compressa* palm primarily contributes extra calories to the smallest and oldest children, along with the lactating mother.

Figure 8 shows the percent of nutrient needs of the family met by the Food Habits Diet in Lodwar Urban LZ. The challenge faced in achieving 100% of micronutrient needs was due to the requirements for pantothenic acid, calcium and iron.

FIGURE 9. PERCENT OF FAMILY’S NUTRIENT NEEDS MET BY THE FOOD HABITS DIET, LODWAR URBAN LZ



For more detail on the nutritional contribution of each food item see Annex F where the contribution of each food item is shown as an average of all of the family members' needs. (The percent contribution to individuals, such as the smallest child and the lactating mother who receive some nutrient-rich food items that the rest of the family are not allocated, would be much higher.) The COD analysis chooses greater quantities of wheat grain and wheat flour over maize and this staple provides significant amounts of protein, fat, vitamin B6, folic acid and iron, along with energy. Goat liver is the key source of protein in the diet, followed by small dried freshwater fish, which also provides significant amounts of vitamin B12, calcium and some iron. (Note that liver is also high in iron but only a small quantity is included in the family diet while fish is allocated to all family members.) Beans are also an important source of protein, folic acid and iron. Kale provides almost all of the vitamin C and about half of the vitamin A and folic acid needed, along with a significant amount of calcium and iron.

COST OF THE DIET ANALYSES: FEMALE ADOLESCENTS, LODWAR URBAN LZ

Two different COD analyses were done to look at the nutritional needs of female adolescents in Lodwar Urban LZ: (a) analysis for a standard family of nine but changing the oldest child to be a female adolescent 15 to 16 years of age; (b) comparing the cost of a diet for a pregnant adolescent age 15 to 16 to a pregnant woman age 30 to 49, and (c) comparing the cost of a diet for a lactating adolescent age 15 to 16 to the cost for the standard analysis lactating woman age 30 to 49.

COST OF THE DIET ANALYSIS: FAMILY OF NINE WITH OLDEST CHILD AN ADOLESCENT FEMALE

Because the standard family of nine includes a “child, either sex, age 15 to 16”, the higher micronutrient needs of a female adolescent have already been

averaged into the standard analyses, so there is little difference seen between the Energy Only Diet, Macronutrients Diet, Nutritious Diet or Food Habits Diet, when changing the family structure to “female, age 15 to 16”. (In Fisheries LZ, where the oldest child in the standard family of seven was a “child, either sex, age 13 to 14” a significant increase in the cost of a Nutritious Diet and a Food Habits Diet was found on analysis.)

COST OF THE DIET ANALYSIS: FEMALE ADOLESCENT TO WOMAN AGE 30-49

As the average family size for an adolescent mother would only be three or four people, it is not useful to compare to the needs of an average family of nine in Lodwar Urban LZ. COD Analysis of the daily nutrient needs and Cost of the Diet for a pregnant adolescent age 15 to 16 were compared to the needs of a pregnant woman age 30 to 49 in Lodwar Urban LZ. The analysis was done for the last trimester of pregnancy for both when nutrient needs are highest.

A Food Habits Diet for a pregnant adolescent mother age 15 to 16 costs twelve percent more than that for a pregnant woman age 30 to 49, at 179.86 KES (US\$1.64) daily and 65,650 KES (US\$600) annually vs. 161.39 KES (US\$1.47) daily and 58,907 KES (US\$538) annually in Lodwar Urban LZ.

TABLE 22. COMPARISON OF DAILY QUANTITY IN GRAMS OF FOOD ITEMS IN A FOOD HABITS DIET FOR A PREGNANT ADOLESCENT AGE 15 TO 16 VERSUS A PREGNANT WOMAN AGE 30 TO 49 YEARS, LODWAR URBAN LZ

FHAB Diet Lodwar Urban LZ	Maize, flour	Wheat, flour	Wheat, whole grain	Beans, kidney, dried	Groundnut, shelled, dried	Green gram, whole, dried	Liver, goat	Fish, any type, small, dried, fresh water	Solanum leaves	Avocado	Fruit of <i>hyphaene compressa</i> palm	Oil, vegetable
1 Female 15-16 years (Pregnancy, third trimester)	12	156	172	125	16	62	15	42	131	12	125	56
1 Female 30-49 years (Pregnancy, third trimester)	59	144	158	115	14	58	20	28	116	23	115	37

Table 22 shows the higher consumption of those food items besides basic grains that are needed by the pregnant adolescent mother to meet her own micronutrient needs and those of the developing fetus.

COD Analysis of the daily nutrient needs and Cost of the Diet for a lactating adolescent mother age 15 to 16 were compared to the needs of a lactating mother age 30 to 49 in Lodwar Urban LZ. Due to the higher micronutrient needs of the adolescent mother, a Food Habits Diet for a lactating adolescent mother age 15 to 16 costs ten percent more than that for a lactating woman age 30 to 49, at 185.26 KES (US\$1.69) daily and 67,621 KES (US\$618) annually vs. 168.31 KES

(US\$1.54) daily and 61,433 KES (US\$561) annually in Lodwar Urban LZ.

Table 23 shows the higher consumption needs of the food items other than basic grains for the adolescent lactating mother as compared to the older lactating mother.

TABLE 23. COMPARISON OF DAILY QUANTITY IN GRAMS OF KEY FOOD ITEMS IN A FOOD HABITS DIET FOR A LACTATING ADOLESCENT MOTHER AGE 15 TO 16 VERSUS A LACTATING MOTHER AGE 30 TO 49 YEARS, LODWAR URBAN LZ

Food Habits Diet	Beans, kidney, dried	Groundnut, shelled, dried	Green gram, whole, dried	Liver, goat	Fish, any type, small, dried, fresh water	Egg, chicken	Solanum leaves	Avocado	Fruit from <i>hyphaene compressa</i> palm	Oil, vegetable
1 Female age 15-16 years (lactating)	125	16	62	15	28	8	147	94	125	44
1 Female age 30-49 years (lactating)	115	14	58	20	30	21	116	86	115	27

Not all food items in the Market Survey were cheaper in Lodwar Urban LZ as compared to Fisheries LZ. However, the cost of a Food Habits Diet for a lactating adolescent mother in Lodwar Urban LZ is four percent cheaper than in Fisheries LZ.

MODELING INTERVENTIONS TO THE COST OF THE DIET

Using the COD software to model the impact on the cost of the diet of various activities is somewhat crude. Models cannot estimate the actual cost to the household of any activity and the modeling output generally assumes that supported food items will be eaten by all family members every day. Few interventions can provide that much output. However, it does give an idea of the relative value, or reduction to the cost of the diet, of different options.

SUPPORT FOR GOAT MILK PRODUCTION

Reducing the cost of goat milk to a negligible 1 KES decreases the daily cost of the Food Habits Diet in Fisheries LZ by 70.04 KES (US\$0.64) and in Lodwar Urban LZ by 117.89 KES (US\$1.08) with every family member receiving from one-third to one-half cup (youngest) to one full cup (oldest).

If goat milk is limited to only the smallest child age 12 to 23 months and the lactating mother, the daily cost of the Food Habits Diet in Fisheries LZ is reduced by 8.84 KES (US\$0.08) and in Lodwar Urban LZ by 13.87 KES (US\$0.13). If this level of support could be maintained throughout the year the savings would add up to 3,228 KES (US\$29.48) in Fisheries LZ and 5,063 KES (US\$46.24) in Lodwar Urban LZ.

SUPPORT FOR HOME GARDEN PRODUCTION OF DARK LEAFY GREENS

As kale, Solanum leaves, Swiss chard, and cowpea leaves are allocated to all family members and chosen by the COD software to create both the Nutritious Diet and the Food Habits Diet in either LZ, support for home garden production of these greens could contribute to reductions in the cost of the diet. Reducing the cost of these greens to a negligible 1 KES decreases the daily cost of the Food Habits Diet in Fisheries LZ by 131.93 KES (US\$1.20) and in Lodwar Urban LZ by 229.12 KES (US\$2.09). If home garden production could be maintained throughout the year the savings would add up to 48,156 KES (US\$440) in Fisheries LZ and 83,628 KES (US\$764) in Lodwar Urban LZ.

GATHERED WILD FOODS

The fruit of the *hyphaene compressa* palm (*doum/eng'ol*) is a fruit that is both gathered in the wild and also sold in markets. Although Dietary Habits Interviews showed most families to consume *doum* in both Fisheries LZ and Lodwar Urban LZ, it was found only in one large market in Lodwar Urban LZ.

Because *doum* was not available for sale in Fisheries LZ, it was not chosen by the cost of the diet analysis for the Food Habits Diet. If gathered *doum* is modeled as available in markets at a negligible cost of 1 KES, the Food Habits Diet selects a serving of *doum* for all family members and the cost of the diet is reduced by 74.20 KES (US\$0.68) daily.

For Lodwar Urban LZ, the cost of the diet analysis chose (purchased) *doum* for the Food Habits Diet and allocated this food item only to the youngest child age 12 to 23 months and the lactating mother. *Doum* was also chosen specifically for diets for pregnant females age 15 to 16 or age 30 to 49. Its key contribution is calories but also a significant amount of iron and calcium. Reducing the cost of *doum* to a negligible 1 KES decreases the cost of the Food Habits Diet for a standard family in Lodwar Urban LZ by 134.49 KES (US\$1.23) daily and a portion of *doum* is allocated to all family members.

Focus groups noted that this fruit is gathered during the dry season. The potential savings for approximately six months could be 13,543 KES (US\$123.68) in Fisheries LZ and 24,545 KES (US\$224) in Lodwar Urban LZ.

VITAMIN A SUPPLEMENTATION

Kenya has a longstanding VAS program for children 6 to 59 months of age and for mothers in the immediate post-partum period. However, recent SMART

Survey in 2019 found only 24% and 20% of children age 12 to 59 months in Turkana North and Turkana Central respectively to have received at least two vitamin A supplements.

Daily requirements for vitamin A was one of the challenges for the Nutritious Diets and Food Habits Diets in both Fisheries LZ and Lodwar Urban LZ. When the Macronutrients Diet is calculated, the child age 12 to 23 months has only reached 66.5% of his/her vitamin A daily requirement in either LZ.

In Fisheries LZ, modeling the youngest child age 12 to 23 months to have received VAS at least once reduces the cost of the Food Habits Diet by 0.21 KES (<US\$0.01) daily and 77 KES (US\$0.70) annually. For Lodwar Urban LZ the cost of the diet is not reduced. Although vitamin A is a limiting nutrient for the child age 12 to 23 months, the cost of reaching iron and calcium requirements overrides the benefit of a vitamin A supplement when calculating the Food Habits Diet.

Although the cost reductions are not highly significant, the importance of vitamin A to the healthy growth and development of children underscores the value of a well-functioning VAS program. Also, as can be seen below, a combination of support for the family (including VAS) has great benefits.

COMBINING MODELING OPTIONS

The COD software was used to look at the impact on the cost of the diet if households received support from all of the options available including having the child age 12 to 23 months receive VAS and a daily serving of goat milk, the mother receive a daily serving of goat milk, and the entire family benefit from dark leafy greens from a home garden and gathering the fruit of the *hyphaene compressa* palm (*doum*).

For the average family of seven in Fisheries LZ, with these combined options the cost of the Food Habits Diet is reduced from 582.55 KES (US\$5.32) daily or 212,632 KES (US\$1,942) annually to 390.65 KES (US\$3.57) daily or 142,588 KES (US\$1,302) annually, **a savings of 33 percent of the cost of the diet.**

For the average family of nine in Lodwar Urban LZ, where *doum* was sold in the market and selected as part of the Food Habits Diet, when all of the above options are modeled the cost of the Food Habits Diet is reduced from 872.37 KES (US\$7.97) daily or 318,416 KES (US\$2,908) annually to 548.17 KES (US\$5.01) daily or 200,081 KES (US\$1,827) annually, **a savings of 37 percent of the cost of the diet.**

As noted for modeling the impact of home gardens and gathering wild *doum*, these activities would be difficult to maintain throughout the year, with home garden production potential during the two rainy seasons and *doum* gathering possible during the two dry seasons. USAID Nawiri is looking into providing support for goat milk production specifically during the dry months when grazing is difficult. The VAS program calls for supplementation every six months and therefore should be supported twice yearly.

DISCUSSION

AVAILABILITY OF A NUTRITIOUS DIET

First and foremost, the COD analysis has shown that families can meet their nutritional needs with foods that are available in the markets. This might not be so for every day of every season and in every market, but throughout the two livelihood zones these studies found the capacity for markets to provide a sufficiently nutritious diet for the average family even though the studies were done at the end of a dry season.

In Fisheries LZ, all of the grains (maize grain, maize flour, rice and wheat flour), beans, goat meat and vegetable oil chosen by the COD Food Habits Diet analysis were found in every market. Dried freshwater fish was available in four of the six markets surveyed and chicken egg in three of six. Donkey meat, raw fish, kale and Swiss chard were only available in the larger market of Kalokol. Avocado was only available in Eliye market to the south.

This limited availability of some key nutrient-dense foods would particularly be of concern for achieving a nutritious diet for a pregnant adolescent, a pregnant woman, a lactating adolescent or a lactating mother.

In Lodwar Urban LZ, almost all of the grains, beans, chicken eggs, kale, and vegetable oil chosen by the COD Food Habits Diet analysis were available in every market. Dried freshwater fish was available in five of six markets. Variegated color beans and goat liver were available in four of six markets and solanum leaves and avocado in three. Only the fruit of the *hyphaene compressa* palm tree was limited to one market but it can be gathered during the dry season. It is likely that households could find available the foods needed for a Food Habits Nutritious Diet.

Small dried freshwater fish is chosen by the COD software for nutritious diets in both livelihood zones, in spite of its high cost in Lodwar Urban LZ. One reason this food item is chosen by the software is because dried foods are more nutrient dense than non-dried foods due to the reduction of water content. Another reason is that it contains high amounts of calcium, a limiting nutrient in most diets, and which comes from the crushed small bones of the fish which are consumed.

Groundnuts and sesame seeds seem to be sold in small snack-like quantities in markets. The COD software identifies both as very nutritious.

The markets in Lodwar town have by far the greatest variety of food items. Lodwar town is a central point for further distribution to other markets in both Fisheries LZ and Lodwar Urban LZ. Further assessment of road conditions throughout the year and this relationship to market availability and market prices outside of Lodwar town in Lodwar Urban LZ and in Fisheries LZ might be informative.

AFFORDABILITY OF A NUTRITIOUS DIET

The “cost” of the diet, however, cannot be met by all wealth groups in both livelihood zones. For COD analysis of the income gap in meeting a nutritious Food Habits Diet, the household income in cash is calculated through studies done using the HEA approach and the value of home food production that is consumed (and in-kind payment in food) is added for the total household income. From this, necessary non-food expenditures, as recommended in a Saving and Livelihoods Protection Basket, are subtracted. This give the available income for purchase of a nutritious diet.

As seen in Table 24, in Fisheries LZ the gap between the cost of a nutritious Food Habits Diet and household income available for food purchase is 6,080 KES (US\$56) monthly or 72,958 KES (US\$666) for the Very Poor wealth group and 2,437 KES (US\$22) monthly or 29,238 KES (US\$267) annually for the Poor wealth group. The Middle Income group can afford a nutritious diet, along with necessary non- food expenditures.

TABLE 24. GAP BETWEEN HOUSEHOLD INCOME AVAILABLE FOR FOOD PURCHASE AND THE COST OF A NUTRITIOUS FOOD HABITS DIET IN FISHERIES LZ

TURKANA COUNTY FISHERIES LIVELIHOOD ZONE	WEALTH GROUPS		
	VERY POOR	POOR	MIDDLE
Total annual income available for nutritious diet 2021 (KES)	139,674	183,394	290,103
Annual cost of the Food Habits Diet 2021 (KES)	212,632	212,632	212,632
Annual GAP in Kenya Shillings (KES)	72,958	29,238	No gap
Annual GAP in US Dollars (US\$1 = 109.5 KES)	666	267	No gap
Monthly GAP in Kenya Shillings (KES)	6,080	2,437	No gap
Monthly GAP in US Dollars (US\$1 = 109.5 KES)	56	22	No gap

As seen in Table 25 in Lodwar Urban LZ the gap between the cost of a nutritious Food Habits Diet and household income available for food purchase is 12,800 KES (US\$117) monthly or 153,602 KES (US\$1,403) for the Very Poor wealth group and 2,869 KES (US\$26) monthly or 34,427 KES (US\$314) annually for the Poor. The Middle Income group can afford a nutritious diet.

TABLE 25. GAP BETWEEN HOUSEHOLD INCOME AVAILABLE FOR FOOD PURCHASE AND THE COST OF A NUTRITIOUS FOOD HABITS DIET IN LODWAR URBAN LZ

	WEALTH GROUPS

TURKANA COUNTY LODWAR URBAN LIVELIHOOD ZONE	VERY POOR	POOR	MIDDLE
Total annual income available for nutritious diet 2021 (KES)	164,814	283,989	762,946
Annual cost of the Food Habits Diet 2021 (KES)	318,416	318,416	318,416
Annual GAP in Kenya Shillings (KES)	153,602	34,427	no gap
Annual GAP in US Dollars (US\$1 = 109.5 KES)	1,403	314	no gap
Monthly GAP in Kenya Shillings (KES)	12,800	2,869	no gap
Monthly GAP in US Dollars (US\$1 = 109.5 KES)	117	26	no gap

The remaining wealth group in both livelihood zones – the “Better Off” – were not included in these COD studies; however, as anticipated, analysis shows they also can afford a nutritious diet. It is also noted that HEA study found that polygamy is predominantly practiced among those in the “Better Off” wealth group as they can afford the expenses of a much larger family.

One caveat for this gap analysis is that the household income was analyzed in 2019-2020 and has been multiplied by the national average rate of inflation (3.5%) for 2020 to compare with cost of the diet in 2021. Household income may not have kept pace with inflation and/or may have been different locally than at the national level.

As seen in Table 26, the relative cost of the youngest child’s portion of a Food Habits Diet is only 3.3 to 4.4 percent of the total cost for the family. Inadequate child feeding practices is most likely the limitation to a nutritious diet for a child age 12 to 23 months. The Food Habits Diet in Fisheries LZ calls for the child to receive a serving of dried freshwater fish and a serving of donkey meat along with the typical (family) diet of maize, beans, kale and vegetable oil. The Food Habits Diet in Lodwar Urban LZ calls for the child to receive servings of wheat flour, goat liver, dried freshwater fish and *doum*, along with the typical (family) diet of maize, beans, kale and vegetable oil.

TABLE 26. COST OF THE FOOD HABITS DIET FOR INDIVIDUAL FAMILY MEMBERS

FAMILY MEMBERS	Fisheries LZ			Lodwar Urban LZ		
	Individual cost		% of total family cost	Individual cost		% of total family cost
	KES	US\$		KES	US\$	
Child, either sex, age 12-23 months	25.86	0.24	4.4	28.57	0.26	3.3
Child, either sex, age 5 to 6 years				56.27	0.51	6.5
Child, either sex, age 7 to 8 years	64.87	0.59	11.1	69.08	0.63	7.9

Child, either sex, age 9 to 10 years	62.80	0.57	10.7	73.10	0.67	8.4
Child, either sex, age 11 to 12 years	85.29	0.78	14.6	101.55	0.93	11.6
Child, either sex, age 13 to 14 years	83.87	0.77	14.3	106.69	0.97	12.2
Child, either sex, age 15 to 16 years				172.92	1.58	19.8
Man, 50 kg, moderately active	78.59	0.72	13.5	95.88	0.87	11.0
Woman (lactating), 45 kg, moderately active	181.29	1.65	31.1	168.31	1.54	19.3
TOTAL	582.55	5.32		872.37	7.97	

Table 26 shows that the cost of the diet for the lactating mother is the highest portion of the family's cost at 31.1 percent in Fisheries LZ and 19.3 percent in Lodwar Urban LZ. Note that in Lodwar Urban LZ the cost of the female adolescent is averaged into the cost of the "child, either sex, age 15 to 16 years" and the relative portion of the family cost for this "either sex" adolescent is high at 19.8 percent.

Cost, rather than availability, would be the key limiting factor in achieving a nutritious diet for a pregnant adolescent age 15 to 16 years, a pregnant woman age 30 to 49 years, or a lactating adolescent age 15 to 16 years in Lodwar Urban LZ. In Fisheries LZ, both cost and availability would be limitations for the pregnant or lactating adolescent and the pregnant or lactating mother age 30 to 49 years as several of the selected food items for a Food Habits Diet were only available in a few markets. Comparing the cost of the diet for pregnant and lactating adolescents to pregnant and lactating woman highlights the high nutrient needs for adolescents to meet their own needs and that of the developing fetus or lactating child. The needs during the period of breastfeeding a child between age 7 and 12 months are particularly high.

It is important to remember that the COD analysis is not specifically a menu planner. It calculates whether all the nutritional needs of a family can be met with the food items that are available and which food items meet these needs on a daily basis at the lowest cost. This information is then extrapolated to a weekly, monthly and annual cost. For Fisheries LZ, both the Nutritious Diet and the Food Habits Diet identify avocado as a cost-effective source of needed nutrients but it would not be likely that every family member would be able to eat an avocado every day of the week. However, this information tells us that avocados are worth purchasing and worth supporting through market-based or agricultural interventions.

FINDINGS FROM DIETARY HABITS INTERVIEWS AND FOCUS GROUPS

There are several highly nutritious and cost-effective foods available that are reported as not consumed by most families. In particular, the COD software chooses goat liver in both livelihood zones (but it is not often eaten in either livelihood zone) and “soya” soybean milk/curd (which is not eaten in Fisheries LZ but by some in Lodwar Urban LZ). It is known that animal source foods are usually the most nutrient-dense foods available. Table 27 shows the relative cost of key animal source foods and their relative availability in Fisheries LZ and Lodwar Urban LZ.

TABLE 27. COST OF ANIMAL SOURCE FOODS AND THEIR AVAILABILITY IN MARKETS

Food Item	Fisheries LZ		Lodwar Urban LZ	
	Cost	Availability	Cost	Availability
Chicken eggs	35.8 KES	3 of 6 markets	34.9 KES	6 of 6 markets
Goat intestines/stomach	35.0 KES	2 of 6 markets	41.8 KES	3 of 6 markets
Goat liver	41.8 KES	2 of 6 markets	56.0 KES	4 of 6 markets
Goat meat	43.8 KES	6 of 6 markets	49.3 KES	5 of 6 markets
Donkey meat	29.0 KES	1 of 6 markets	37.2 KES	2 of 6 markets
Fish, small dried freshwater	31.5 KES	4 of 6 markets	65.1 KES	5 of 6 markets

Eggs are nutrient-dense but, as they are not reported as frequently eaten, the COD software did not choose egg for the whole family, only adding an egg to the lactating mother’s Food Habits Diet in Lodwar Urban LZ. Specific taboos against eggs for pregnant women in both livelihood zones were mentioned, with taboos against eggs for children mentioned by half of focus groups in Lodwar Urban LZ. Eggs are an excellent addition to infant and children’s porridge; a hardboiled egg for a pregnant or lactating woman is a very nutritious food to eat between meals when possible.

It is commendable that Kenya has put effort into national campaigns to convince a generally meat-eating or milk-drinking population of the value of fish. Dietary Habits Interviews found that around half of people in either Fisheries or Lodwar Urban LZ eat dried freshwater fish “usually” or “often”. Of course this means there are still a lot of families not taking advantage of this highly nutritious and available food item.

Only one source of food composition analysis was found for donkey meat but this source identified donkey meat as high in protein and rich in iron but leaner than other red meats²⁴. At its low price, it is a good choice for nutritious diets but was not identified by many women in either livelihood zone as being often eaten by families. Goat intestines/stomach are not as rich as meat in micronutrients but do contain protein at a price lower than goat meat. Liver was discussed

²⁴ McCarthy, Derrick B., editor (2017). Chapter 6: Quality and Nutritional Characteristics of Donkey Meat in Meat and Meat Processing, Nova Science Publishers.

above for its outstanding nutrient density.

Avocado was selected by the COD analysis for both the Nutritious Diet and the Food Habits Diet, indicating it is a cost-effective nutritious food; however, it is not clear if all family members have been introduced to avocados.

There are several food items that people are often consuming that are not nutrient-dense contributors to the family diet, including cabbage, onions and tomatoes. Mothers state a preference for kale to “complete the meal” but cabbage often fills that role. The COD software chooses kale, Solanum leaves, Swiss chard and cowpea leaves for a Nutritious Diet as these are rich in vitamins A and C. Cabbage is popular perhaps because one advantage of cabbage is that it lasts a long time before wilting or browning. The COD software identified carrot as a good contributor to the diet but as it is one of the more expensive vegetables available it was not selected in final COD analyses. Carrot was found in only one market in Fisheries LZ but in five of six markets in Lodwar Urban LZ. Besides being dense in vitamin A, carrot also has long lasting freshness. Onions and tomatoes are not cheap but are likely purchased because they add flavor to a meal.

Although mothers report multiple fruits as desirable, the COD analyses did not select any fruits other than avocado and *doum* palm fruit. The COD Nutritious Diets and Food Habits Diets achieved families’ micronutrient needs for the vitamins A and C that fruits would provide usually through liver and/or kale.

It should be noted that several of the wild / gathered foods mentioned in focus groups and for which nutritionally information is available are good sources of energy and micronutrients (e.g. *doum* palm fruit, Solanum leaves and amaranth leaves) and should be promoted for consumption.

In focus groups, mothers most often mentioned kale as one of the desirable food items that are not always available in markets. As noted above, the COD software identifies kale as a critical food item for achieving a nutritious diet in both livelihood zones. However, as one Trader noted, without reliable water in markets for Traders it is hard for them to invest in stocking more dark green leafy vegetables such as kale.

With firewood and charcoal precious resources, some food items are considered desirable by mothers because they are “easier to cook”; this list includes pasta, rice, and beans imported from Uganda.

Mothers in focus groups also expressed concern about weevil infestations of maize and beans purchased in markets. They applauded improved hygiene due to Covid-19 regulations and hoped the improvement would continue. They mentioned that “bad smells” and “flies” were off-putting for the purchase of nutrient-dense meat and fish. Avocado, selected as a nutritious food by the COD analysis, was also one of several foods that women expressed frustration with purchasing only to find them rotten inside once cut open at home.

It is concerning that multiple food taboos were mentioned for pregnant women and that they predominantly have taboos against nutrient-dense foods that would be optimal to consume during pregnancy, such as avocado, eggs, groundnuts or peanuts. The reason expressed for these prohibitions are to not “add weight to the unborn child which can lead to complications during childbirth”. This likely impacts Persistent Acute Malnutrition starting *in utero*. Taboos were not noted



against nutrient-dense liver for pregnant women or small children, however several other animal-source foods were mentioned as prohibited for small children.

Mothers report buying “sweets, snacks or drinks” for children at least once or twice a week in both livelihood zones. Ways in which to better utilize these expenditures towards a nutritious food item should be considered.

There is (perhaps misplaced) trust that foods labeled as “fortified” are fortified, although women do not fully understand what fortification means, and with which vitamins and minerals, etc. Some additional education of Kenya’s food fortification plan might be useful. Traders are also selling different sizes of packaged food items for the same price, such as pasta and tomato paste. Some additional education about looking at package size and on what is available throughout both livelihood zones might be useful.

MODELING POTENTIAL ACTIVITIES

The modeling done for support for the production of goat milk shows that if goat milk was available daily for every family member the cost of a nutritious diet would be greatly reduced (and therefore goat milk is a valuable cost-effective nutritious food item). Modeling also shows the benefit to the family in reducing the cost of the diet if goat milk is available daily for at least the youngest child age 12 to 23 months and the lactating mother. However, goat milk production is limited during all seasons and particularly during the dry seasons.

Support for home garden production of dark green leafy greens also reduces the cost of a nutritious diet but has similar seasonal constraints. Modeling of the contribution of a gathered fruit – *doum/eng’ol* from the *hyphaene compressa* palm tree – showed a reduction in the cost of the diet that was noteworthy. Modeling also showed that support for implementation of the Ministry of Health vitamin A supplementation program is of importance for the healthy growth of small children.

Importantly, modeling support to households for vitamin A supplementation for the child age 12 to 23 months, goat milk for the child and mother, dark leafy greens from home gardens and gathered palm fruit for all family members found that the cost of the daily diet could be reduced by 33 percent in Fisheries LZ and 37 percent in Lodwar Urban LZ. How much this daily savings could accumulate on an annual basis will be better understood as USAID Nawiri undertakes a “light touch” market survey during the other seasons of the year.

It is important to note that modeling the combination of all potential program activities shows a reduction in the cost of the Food Habits Diet resulting in **a savings of 33 percent (Fisheries LZ) to 37 percent (Lodwar Urban LZ) cost of the diet.**

RECOMMENDATIONS

These COD studies done in Fisheries LZ and Lodwar Urban LZ suggest the following recommendations in four areas of activities for the USAID Nawiri

Project:

1. SBC strategy:

- The COD analysis is based on the assumption that the child age 12 to 23 months has the benefit of continued breastfeeding. USAID Nawiri's plans for promotion of continued breastfeeding and support for Baby Friendly Community Initiatives are highly recommended.
- COD analysis shows that the needs of a female adolescent and an adolescent mother (during pregnancy and particularly during continued breastfeeding) are the highest among all household members. This information should be disseminated widely and to all persons who have influence over the female adolescent's diet. In any efforts to promote delayed marriage and/or pregnancy, this information on nutrient needs of the female adolescent should be included.
- Goat liver is fairly accessible, competitively priced and very nutrient-dense, particularly in nutrients that have requirements that are challenging to meet with the basic diet. Promotion of even the occasional consumption by infants and young children (and pregnant and lactating women of all ages, but particularly adolescent women) is highly recommended.
- Available nutrient content information for some of the local foods that are mentioned by women as being gathered and consumed by almost all family members shows these foods to have particular nutrient strengths to contribute to the diet, particularly dark leafy greens and wild fruits high in energy. Dissemination of awareness of their value is strongly encouraged.
- Roughly half of households in both livelihood zones are consuming available small dried freshwater fish which COD analysis shows to be dense in key nutrients needed for a nutritious diet. Perhaps having mothers who consume small dried freshwater fish (and even better, who mix it into maize porridge for their infants and young children) could help to model this behavior for other families.
- There are many taboos against pregnant women eating nutrient-dense foods out of fear of complications during childbirth if the baby is "large". SBC promotion of nutrient-dense foods as supporting the health of the developing fetus (along with collaboration with MOH, see below) might influence some of the early causes of the high levels of Persistent Acute Malnutrition (PAM) found in the zone.

2. Livelihoods activities:

- Any activities that increase household income and are accompanied by education on the most cost-efficient ways to use this income to improve the diet of women and vulnerable children will be of benefit. The COD analysis has provided this information, which should be included in income-generating strategies.
- A focus on the female adolescent for income generating activities would assist this most vulnerable group to achieve a nutritious diet as women in both age groups state they can make decisions over food purchases, particularly when using income they have earned.
- Modeling of potential key nutrient contribution to the diet of vulnerable women and children shows USAID Nawiri Project interest in supporting the production of goat milk throughout the year to be a worthwhile strategy.
- Modeling of the potential key nutrient contribution and reduction to the cost of the diet of the household shows USAID Nawiri Project interest in supporting home gardens to be worthwhile, as long as production of local dark green leafy vegetables is a part of the strategy.

3. Markets and infrastructure:

- Women commented favorably on improvements in hygiene at markets as part of coronavirus prevention efforts and unfavorably on the hygiene of some of the nutrient-dense foods such as fish and meat. Traders also desire more water and sanitation support in markets. This would be good to pursue with local government.
- Larger central markets have a good variety of nutritious food items while smaller outlying markets are more limited. Supporting connections between these markets so that the larger central markets are not only vendors in their market but become suppliers to the smaller outlying markets could help households access a nutritious diet.

4. Collaboration with the Ministry of Health (MOH):

- Low birth weight is likely a contributing factor to the high levels of PAM in the zone. In focus groups during the COD studies, women cited nutrition knowledge acquired from trusted Community Health Workers (CHWs). Working with CHWs to tackle the taboos against consumption of nutrient-dense foods during pregnancy, strengthening nutrition counseling during ante-natal care, and supporting links to safe delivery services available through the MOH is indicated.
- Kenya MOH's vitamin A supplementation (VAS) program has had good success over time but VAS requires continual outreach, especially in difficult to reach areas. Logistic and coordination support can help contribute to a successful VAS program.

5. Integration:

- As the COD modeling showed that integrating all suggested program activities leads to a **savings of 33 to 37 percent in the cost of the diet**, integration of activities at the household level is recommended.

ANNEXES

ANNEX A: COD FIELDWORK TEAM

No.	Name	Sex	Designation	Role
1	James Njiru	m	Nutrition Specialist_SCI	COD Lead
2	Thomas Ejore	m	Field Health and Nutrition Advisor_SCI	COD Lead Assistant
4	Fred Esinyen	m	Sub-County Nutrition Coordinator_T.C_MoH	Supervisor
5	Jamester kakuta	f	Sub-County Nutrition Coordinator_TN_MoH	Supervisor
6	Godfrey Machani	m	County M&E and Research Coordinator	Supervisor
7	June Cherutich	f	Health and Nutrition Officer_SCI	Data Clerk_Urban
8	Everlyne Obade	f	M&E Officer_SCI	Data Clerk_Urban
9	Julius Kamoni	m	HEA Officer_SCI	Data Clerk_Fisheries
10	Joseph Emase	m	MIS Officer_SCI	Data Clerk_Fisheries
11	Ekeno Samuel Edipo	m	Nutritionist	Enumerator
12	Albert Moraa Emily	m	Nutritionist	Enumerator
13	Khadija Ahmed Yussuf	f	Nutritionist	Enumerator
14	Tonny Ejikon Epuu	m	Nutritionist	Enumerator
15	Edapal Stanley Meyan	m	Nutritionist	Enumerator
16	Norah Emanikor	f	Nutritionist	Enumerator
17	Hildah Ewoi	f	Nutritionist	Enumerator
18	Lokol Michael	m	Nutritionist	Enumerator
19	Nawi Lokodabong Samuel	m	Nutritionist	Enumerator
20	Lokurichana Emoni David	m	Statistician	Enumerator

21	Rose Kapua Longole	f	Nutritionist	Enumerator
22	Martha Losike	f	Nutrition Technologist_MoH	Enumerator
23	Irene Bosibori	f	Nutrition Technologist_MoH	Enumerator
24	Atelo Ematuka Douglas	m	Community Health Officer Intern_MoH	Enumerator
25	Faith Eripon Eiton	f	Health Records Technologist Intern_MoH	Enumerator
26	Lokui Danson	m	Nutrition Technologist_MoH	Enumerator

ANNEX B: COD FIELDWORK SCHEDULE

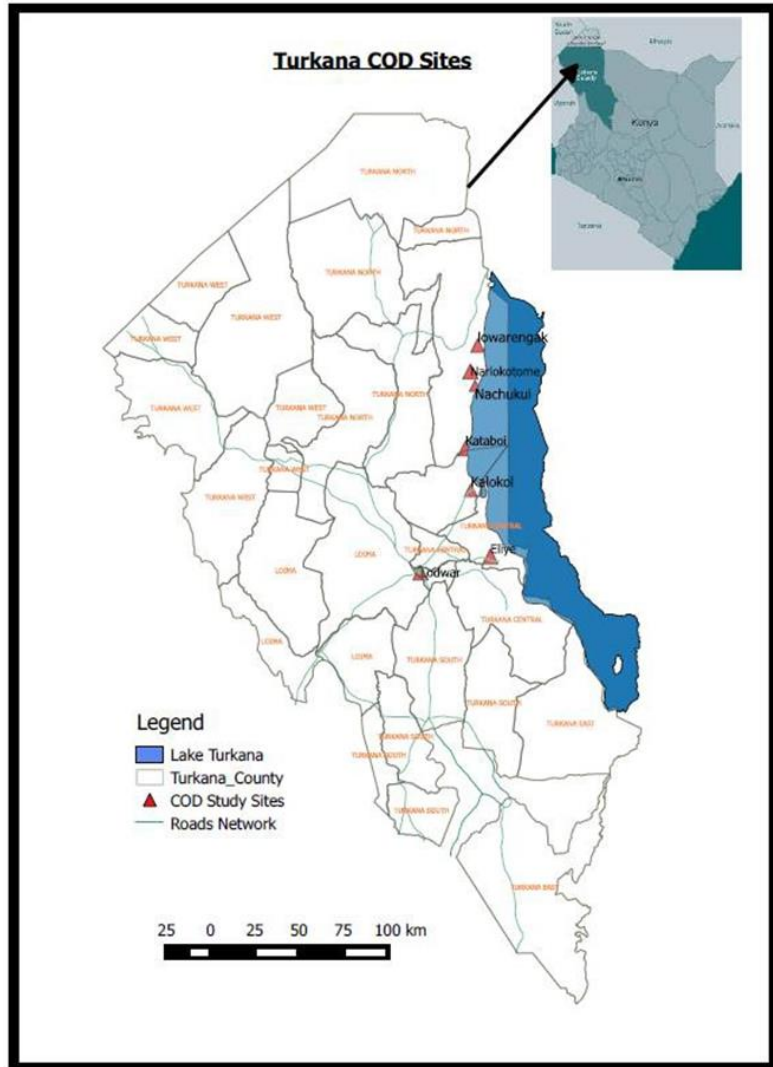
Activity	COD Turkana Fisheries Livelihood Zones				
	8/03/2021_Monday	9/03/2021_Tuesday	10/03/2021_Wednesday	11/03/2021_Thursday	12/03/2021_Friday
Morning Market Surveys	Team, A, B, C, D Supervisor to interview 1-3 traders at Kalokol Market	Team A: Lowareng'ak_market Team B: Nariokotome_market Mobilization/Preparation for FGDs: Team C: Lowareng'ak Team D: Nariokotome	Team C: Kataboi_market/nearby shops Team D: Nachukui_market/nearby shops Mobilization/preparation for FGDs: Team A: Kataboi Team B: Nachukui	Team A: Kalokol_Market Team B: Eliye Springs_small market/nearby shops Identification HH with adolescent/WRA for DHI: Team C: Kalokol Team D: Eliye Springs	All teams to Kalokol: Review forms for handwriting clarity, errors, etc.

Afternoon FGD or Dietary Habits Interview (DHI)	Drop off market survey forms for data entry and drive to next location	<p>Team A at Village 1: Lowareng'ak (Kambi miti or RukRuK) FGD WRA mothers age 21-49 with children <3</p> <p>Team B: Village 1 FGD adolescent mothers age 15-20 with children <3</p> <p>Team C at Village 2: Nariokotome (Nariokotome or Nariokotome Anam) FGD mothers age 21-49 with children <3</p> <p>Team D: Village 2 FGD mothers age 15-20 with children <3</p>	<p>Team C at Village 3: Kataboi_ (Kambi Safi A or Kambi Safi B) FGD mothers age 21-49 with children <3</p> <p>Team B: Village 3 FGD adolescent mothers age 15-20 with children <3</p> <p>Team D at Village 4: Nachukui_ village FGD mothers age 21-49 with children <3</p> <p>Team A: Village 4 FGD mothers age 15-20 with children <3</p>	<p>Team A at Village 5: Kalokol (Daraja or Nakatorong'ot) DHI 8 mothers age 21-49 w/children <3</p> <p>Team B: Village 5 DHI 8 mothers age 15-20 w/children <3</p> <p>Team C at Village 6: Eliye Spring (Eliye or Kenya Oil) DHI 8 mothers age 21-49 w/children <3</p> <p>Team D: Village 6 DHI 8 mothers age 15-20 w/children <3</p>	<p>Summarize FGD women age 20-49</p> <p>Summarize FGD women age 15-20</p>
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Activity	COD Turkana Urban Livelihood Zones				
	15/03/2021_Monday	16/03/2021_Tuesday	17/03/2021_Wednesday	18/03/2021_Thursday	19/03/2021_Friday
Morning Market Surveys	Team, A, B, C, D Lodwar Market (Supervisor does Key Informant Interview with 1-3 sellers)	<p>Team A: Kawalase _market</p> <p>Team B: Nakwalele _market</p>	<p>Team A at Village 1: Kawalase_ FGD mothers age 21-49 with children <3</p> <p>Team B: Village 1 FGD mothers age 15-20 with children <3</p>	<p>Team A: Lodwar_ market</p> <p>Team B: Kanamkemer Market/nearby shops</p>	All teams to Lodwar: Review forms for handwriting clarity, etc.

	Supervisor to interview 1-3 traders at Lodwar market	Team C: Nakwamekwi _Small market/ nearby shops Team D: California _Small market/nearby shops	Team C at Village 2: Nakwalele (Nakwalele or Namsungui) FGD mothers age 21-49 with children <3 Team D: Village 2 FGD mothers age 15-20 with children <3	Identification of HH with adolescent/WRA for FFQ: Team C: Lodwar Township Team D: Kanamkemer	
Afternoon FGD or Food Frequency Questionnaire	Drop off market survey forms for data entry and drive to next location	(FGDs postponed to Wednesday due to community meetings. Market Surveys originally scheduled for Wednesday morning were done on Tuesday).	Team C at Village 3: Nakwamekwi_ (IDP or Ng'amorong'ikirionok) FGD mothers age 21-49 with children <3 Team B: Village 3 FGD mothers age 15-20 with children <3 Team D at Village 4: California_ (California A or B) FGD mothers age 21-49 with children <3 Team A: Village 4 FGD mothers age 15-20 with children <3	Team A at Village 5: Lodwar Township_ (Kambi Mawe or Soweto) FFQ 8 mothers age 21-49 w/children <3 Team B: Village 5 FFQ 8 mothers age 15-20 w/children <3 Team C at Village 6: Kanamkemer_ (Jack City or Kailoseget) FFQ 8 mothers age 21-49 w/children <3 Team D: Village 6 FFQ 8 mothers age 15-20 w/children <3	Summarize FGD women age 20-49 Summarize FGD women age 15-20

ANNEX C TURKANA COD SITES



ANNEX D: LIST OF WILD GATHERED FOODS FROM FOCUS GROUP DISCUSSIONS

Food Item	English/Scientific Name	When Gathered	Who Eats
Dodo	Amaranth	Rainy season	Everyone
Edapal	Lubera	Rainy season	Everyone
Edome		Dry season	Everyone
Edung		Dry season	Everyone
Elamach		Rainy season	Everyone
Eng'omo		Rainy and dry season	Everyone
Eruut		Rainy season	Everyone
Esekan	Salvadora persica	Rainy season	Everyone
Loarakimak		Rainy season	Women
Mrere	Jute leaf	Rainy season	Everyone
Ng'akabulala		Rainy season	Everyone
Ng'akalalio	Hyssop Mauritania	Rainy season	Everyone
Ng'apedur	Tamarind	Rainy season	Everyone
Ng'idapalia		Rainy season	Everyone
Ng'idung'a		Dry season	Mothers and children
Ng'iff		Rainy season	Mothers and children
Ng'iminae	Acacia Senegal (gum)	Rainy season	Everyone
Sujaa/managu	Solanum	Rainy season	Everyone

ANNEX E: FHAB FISHERIES LZ

The edible weight and cost of the foods selected for the family for a nutritious Food Habits Diet with the percentage contribution of each food for macronutrients and eight vitamins and four minerals in the Fisheries LZ

Food List	Quantity (Kg)	% quantity	Cost (KES)	% cost	% energy	% protein	% fat	% vit A	% vit C	% vit B1	% vit B2	% niacin	% vit B6	% folic acid	% vit B12	% calcium	% iron	% zinc
Chard, Swiss	83	4.0	8 393	3.9	0.3	0.7	0.1	17.2	8.0	0.7	2.4	0.3	1.6	1.1	0.0	1.5	2.1	0.9
Fish, small, dried, freshwater	180	8.7	47 992	22.6	9.0	39.3	9.4	1.5	0.0	3.4	12.0	30.7	13.2	4.0	93.7	78.0	26.2	20.9
Avocado	175	8.5	23 981	11.3	5.2	1.6	18.2	0.8	5.6	2.5	7.2	3.2	8.6	13.8	0.0	0.7	1.4	3.4
Bean, kidney, dried	77	3.7	7 864	3.7	4.6	7.9	0.7	0.0	0.7	6.8	3.6	4.7	4.6	24.9	0.0	2.0	8.3	6.6
Breast milk	194	9.5	0	0.0	2.3	0.9	5.4	6.6	2.5	0.9	2.1	0.9	0.3	1.6	1.1	1.9	0.0	0.7
Egg, chicken	17	0.8	6 812	3.2	0.5	1.0	1.3	2.1	0.0	0.2	2.7	0.5	0.4	0.7	1.1	0.3	1.4	0.6
Goat meat	11	0.6	6 719	3.2	0.3	0.9	0.9	0.0	0.0	0.4	1.0	0.7	0.9	0.1	0.8	0.0	1.9	1.2
Kale	212	10.3	19 817	9.3	1.9	4.2	1.4	71.8	81.6	5.0	8.7	2.2	11.0	29.2	0.0	11.4	4.5	3.6
Maize grain	643	31.4	31 016	14.6	43.2	23.9	16.5	0.0	0.0	54.2	40.6	30.6	37.1	15.7	0.0	1.4	32.4	35.5
Maize flour	104	5.0	7 239	3.4	7.0	3.8	2.7	0.0	0.0	8.7	6.5	4.9	6.0	2.5	0.0	0.2	5.2	5.7
Oil, vegetable	56	2.7	17 071	8.0	9.0	0.0	40.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Potato	38	1.9	2 436	1.1	0.7	0.3	0.0	0.0	1.6	0.9	0.2	0.8	2.2	0.3	0.0	0.1	0.2	0.4
Rice	53	2.6	5 263	2.5	3.6	1.6	0.2	0.0	0.0	0.7	1.0	1.3	1.4	0.3	0.0	0.2	0.5	1.8
Donkey meat	19	0.9	7 983	3.8	0.5	1.9	0.6	0.0	0.1	0.5	0.6	0.9	1.4	0.0	3.4	0.0	5.2	1.7
Wheat flour	191	9.3	20 047	9.4	12.0	12.0	2.6	0.0	0.0	14.8	11.4	18.4	11.3	5.8	0.0	2.3	10.7	17.0
Total	2053	100	212 632	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% Target Met					100	260	100	100	290	174	116	276	172	115	319	118	100	197

Note this is an average for all family members.

ANNEX F: FHAB LODWAR URBAN LZ

The edible weight and cost of the foods selected for the family for a nutritious Food Habits Diet with the percentage contribution of each food for macronutrients and eight vitamins and four minerals in Lodwar Urban LZ

Food List	Quantity (Kg)	% quantity	Cost (KES)	% cost	% energy	% protein	% fat	% vit A	% vit C	% vit B1	% vit B2	% niacin	% vit B6	% folic acid	% vit B12	% calcium	% iron	% zinc
Palm fruit (<i>hyphaene compressa</i>)	105	3.8	27 028	8.5	5.4	0.9	0.2	0.0	0.0	58.6	63.7	3.2	0.0	0.0	0.0	9.7	11.9	14.9
Fish, small, dried, freshwater	60	2.2	39 030	12.3	2.9	13.0	3.1	0.0	0.0	0.4	1.4	9.9	3.7	0.7	38.6	33.2	7.0	6.6
Avocado	71	2.6	10 562	3.3	1.6	0.5	5.6	0.1	0.8	0.3	0.8	1.1	2.7	2.4	0.0	0.3	0.4	1.0
Bean, kidney, dried	225	8.1	25 552	8.0	10.6	18.6	1.6	0.0	0.7	5.6	3.0	11.4	10.4	31.7	0.0	5.3	15.7	13.4
Breast milk	194	7.0	0	0.0	1.8	0.8	4.1	1.6	0.8	0.2	0.6	0.7	0.3	0.7	1.0	1.8	0.0	0.5
Egg, chicken	8	0.3	2 926	0.9	0.2	0.3	0.4	0.2	0.0	0.0	0.3	0.2	0.1	0.1	0.4	0.1	0.4	0.2
Goat liver	14	0.5	7 702	2.4	0.2	0.9	0.3	34.5	0.2	0.1	3.2	1.4	0.8	1.2	60.0	0.0	3.2	1.3
Groundnut, shelled, dried	5	0.2	1 447	0.5	0.4	0.4	1.3	0.0	0.0	0.3	0.1	0.7	0.5	0.2	0.0	0.1	0.2	0.3
Kale	708	25.6	35 988	11.3	5.0	11.2	3.6	59.1	92.5	4.8	8.1	6.1	28.6	42.2	0.0	34.7	9.7	8.4
Maize flour	318	11.5	22 134	7.0	16.6	9.5	6.2	0.0	0.0	7.6	5.6	12.4	14.2	3.4	0.0	0.6	10.4	12.1
Green gram, whole, dried	47	1.7	9 956	3.1	2.2	4.1	0.3	0.0	0.0	1.3	1.6	2.7	3.5	2.8	0.0	2.1	3.4	2.7
Variegated color beans	9	0.3	1 462	0.5	0.4	0.7	0.1	0.0	0.1	0.4	0.2	0.1	0.6	1.9	0.0	0.3	0.4	0.4
Oil, vegetable	118	4.3	40 000	12.6	14.6	0.0	64.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solanum leaves	97	3.5	20 524	6.4	0.3	1.0	0.2	4.4	4.9	0.6	1.5	0.3	0.0	0.0	0.0	3.6	5.7	0.0
Wheat flour	389	14.1	31 597	9.9	19.0	19.7	4.0	0.0	0.0	8.5	6.5	30.9	17.9	5.1	0.0	4.3	14.1	23.9
Wheat grain	398	14.4	42 508	13.3	18.7	18.2	4.8	0.0	0.0	11.3	3.3	19.0	16.9	7.6	0.0	3.9	17.5	14.3

Total	2764	100	318	416	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% Target Met						100	252	100	322	690	497	335	268	181	213	282	100	111	222

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