

# HERRING FROM ALASKA TO LIBERIA

*improving nutrition at all ages*



## PROJECT REPORT

Herring for Liberia  
Alaska Seafood Marketing Institute

# A DEDICATION

We dedicate this report to Samaritan's Purse, its staff and partners and to all those who are fighting Ebola and striving to protect public health in Liberia.



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## A LETTER FROM BRUCE SCHACTLER

DIRECTOR OF THE ASMI GLOBAL FOOD AID PROGRAM

The Alaska Seafood Marketing Institute (ASMI) is proud to participate in food aid programs that bring critical nutrients to those who need them. While too many countries face economic disparity and health crises, we have seen that a small gesture of collaboration and friendship can do much to ease the burden. We are pleased to share these results from a pilot project in which Alaska Canned Herring was provided to Samaritan's Purse for the Liberian people. The project exceeded our expectations and warrants a larger randomized controlled trial to enhance the evidence base. With more pilot projects such as this, who knows how many people we can help around the world? This is only one example of how Alaskan products can mitigate hunger and foster international friendships.

Alaska is a natural partner in the fight against global hunger. Its rich heritage of seafood harvesting has come to define the state's identity. The seafood industry employs over 70,000 Alaskan fishermen, in small family operations and large companies. They have been setting sail and casting nets for generations. Alaskan seafood is known to be among the best available on the global market. Its addition to food aid programs will bring vital nutrients to malnourished people and will energize Alaska's fishing communities and economy.

Partnerships like this one, between the people of Alaska and the people of Liberia, give us hope that hunger can be decisively fought with empathy and common effort.

Sincerely

Bruce Schactler

Director ASMI Alaska Global Food Aid Program

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# EXECUTIVE SUMMARY

WHY ALASKA HERRING?

THE PILOT PROJECT

RESULTS

RECOMMENDATIONS



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**WHY ALASKA HERRING?** The Alaska Seafood Marketing Institute's Global Food Aid Program (AGFAP) is Alaska's initiative to bring nutritious Alaska seafood to people worldwide. Seafood makes a vital contribution to health at all ages throughout life. American and international health organizations support the consumption of fish (especially oily fish) and seafood to provide high quality marine protein and healthful fatty acids to diets worldwide. These nutrients are especially important for pregnant and breastfeeding mothers and their young children.

The World Health Organization (WHO) guidelines for malnourished children six to 59 months old recommend that 20% of protein should come from animal sources including fish. *(For more information on the benefits of Alaska marine protein and omega-3 fatty acids, go to [www.alaskaseafood.org/health](http://www.alaskaseafood.org/health))*

Herring is consumed all over the world. Alaska Canned Herring was developed to tap a sustainable, yet underutilized resource with global appeal and impact. In 2012, AGFAP partnered with Samaritan's Purse, a faith-based humanitarian organization with strong ties to Alaska, and donated 63,000 cans of Alaska Herring to document its acceptability and strengthen the evidence base about its nutritional benefits in food assistance programs.

**THE PILOT PROJECT** The pilot was conducted in Liberia in a diverse population of preschool-age children in early child education centers, adult women in literacy programs and people living with HIV/AIDS participating in voluntary counseling and treatment programs, whose health was exacerbated by food insecurity, low body weight and malnutrition.



## RESPONSIBLE FISHING IN ALASKA

Alaska is the only U.S. state whose constitution mandates sustainable fishing practices. Fishermen must:

- Use techniques that protect against overfishing
- Have minimal impact on other species and marine life
- Protect the ecosystem and environment

# RESULTS

Over 500 beneficiaries of Samaritan’s Purse programs in Liberia participated in a nine-month pilot program which introduced nutritious Alaska Canned Herring from April 2012 through January 2013. The objective of the pilot was to assess its acceptability as a nutritional input for food insecure children and adults in a range of food assistance program settings. Participants unanimously found the Alaska Herring to be tasty from the first bite (they said it was “sweet” or “delicious”), and we were able to move from an acceptability trial to a nine-month pilot study of the nutritional benefits of the herring. The herring was so effective that two of the programs continued for an additional four months.

**HIGH ACCEPTABILITY** All participants raved about the Alaska Canned Herring’s flavor and how easy it was to integrate into typical meals and recipes in both households and institutional settings.

**BETTER NUTRITION** There were positive, statistically significant improvements in nutrition metrics at all project sites. The strongest and most reliable results were among the people with HIV/AIDS in the Voluntary Counseling and Testing (VCT) program in Foya County. The HIV-positive adults in the VCT center showed significant improvements in their nutrition status as measured by Body Mass Index (BMI), the standard metric for nutrition status among adults.

Over 71% of malnourished participants living with HIV/AIDS had better nutrition status after nine months of herring consumption that at the start and 57% improved all the way to a normal, healthy nutrition status.

Overall, participants made clear improvements in nutrition status. The percentage of all recipients who were identified as severely, moderately or mildly malnourished decreased from 23% to 17%, a 26% reduction. Individuals who were classified as having a normal weight increased from 77% to 83%. The overall increase in normal weight participants is statistically significant (p=0.001).

46% of participants identified as mildly, moderately, or severely malnourished at their first visit advanced to a more healthy nutrition status by the end of the project. Of these participants, 91% fully regained a normal weight.

## THE MAJORITY AGREED

- Alaska Canned Herring was “highly acceptable” in flavor and recognized as nutritious
- Canned Herring was easily incorporated into existing recipes and traditional meals
- Canned Herring was generally preferred over “Boni”, a popular local fish
- Participants requested to receive more of the Canned Herring

## PROGRESS CONTINUES

The project heightened sensitivity of local staff to the importance of measuring nutrition in their programs. With tools and knowledge in place to weigh and measure participants, the team in Liberia continued to identify those at-risk for malnutrition and refer them to local health centers for treatment as needed.

## RECOMMENDATIONS

The pilot project yielded very positive results, especially in terms of improved nutrition for those participants living with HIV/AIDS. The findings suggest that the herring, a rich source of high quality marine protein and healthful essential omega-3 fats, should be considered instrumental for improving nutrition in the fight against HIV/AIDS and malnutrition. Based on its widespread appeal among Liberians of all ages, Alaska Canned Herring could easily be adopted by other programs in other countries, institutions and food aid settings. ASMI is continuing to develop the evidence of the nutritional benefits of this product. In May, 2015, AGFAP began a four village randomized control study in Guinea-Bissau to test the effectiveness of Alaska Herring for the prevention of childhood malnutrition during the rainy season.

OVERALL CHANGE IN NUTRITIONAL STATUS

NUTRITIONAL STATUS	BASELINE	ENDLINE
Normal	77.2%	83.01%
Mild	17.4%	14.1%
Moderate	4.1%	2.32%
Severe	1.4%	0.58%





# THE PILOT PROJECT

## CREATING THE EVIDENCE BASE



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# CREATING THE EVIDENCE BASE

Recent studies have provided evidence of the real-world benefits of oily fish like herring and salmon for health and nutrition throughout the life cycle. Roos and colleagues demonstrated that fish are important sources of specific vitamins and minerals for populations in low income countries (Roos et al 2007). A review of diets in 13 countries identified a lack of consumption of essential fatty acids (omega-3) for mothers and children in the first two years of life and recommended increased consumption of fish to enrich their diets (Michaelsen et al 2009, 2011). Fish added to porridges of children with moderate acute malnutrition (MAM) in a food aid program worked as well as porridges enriched with dairy protein to improve growth and nutrition outcomes (Roos et al, 2013). The United States Dietary Guidelines of Americans (2010) and the American Heart Association (2014) recommend that people consume at least 8 ounces of fish per week.

The ASMI Alaska Global Food Aid Program (AGFAP) has seen wide acceptability of Alaska Canned Salmon and Herring through a decade of consumer testing, recipe development and cooking demonstrations in domestic and international settings. Given the health and nutrition benefits of eating fish and the challenges of treating malnutrition, AGFAP chose to examine the potential nutritional improvements of eating Canned Salmon and Herring within the context of food insecurity. This was AGFAP's first opportunity to demonstrate the effects of the herring across a range of age-groups and health conditions, including people living with HIV/AIDS. Information on current treatment regimes with nutrition supplements and the changing nutritional needs of people living with HIV/AIDS as the disease progresses is inconclusive. In particular, the role of quality protein and healthful fats in deposition of lean body mass and weight gain during treatment is not well understood. The results of this pilot highlight the need for further research into the nutritional benefits of marine sources of protein and omega-3 fatty acids. A randomized controlled trial to test the effectiveness of Alaska Canned Herring in treating and preventing malnutrition in Guinea-Bissau was started in May, 2015.

## LIBERIA



Liberia is a vulnerable nation in West Africa, working to overcome a history of civil strife, a displaced population, poverty in many areas, a depleted infrastructure, and facing food insecurity and health care challenges compounded by a severe Ebola outbreak in 2014.

Liberia has one of the lowest GDPs in the world, according to the World Development Indicators (2014). The Core Welfare Indicator Questionnaire conducted in 2010 estimated that 68% of rural households and 55% of urban households live below the international poverty line – surviving on less than \$1.25 USD per day.

According to the 2010 Comprehensive Food and Nutrition Survey (CFNS), approximately 86% of Liberians have been displaced at least once since 1989, contributing to the increase of poverty among its citizens. Markets and road networks were left undeveloped after the war, and the capital city of Monrovia remains poorly connected to inland regions. All of this makes it hard to transport food and products within the country.

## FOOD INSECURITY AND MALNUTRITION

Food insecurity is a major concern, with 41% of the country inadequately nourished. Rural regions, such as Foya in Bong County, have a higher rate of insecurity compared to urban regions, like the capital, Monrovia (see Figure 2).

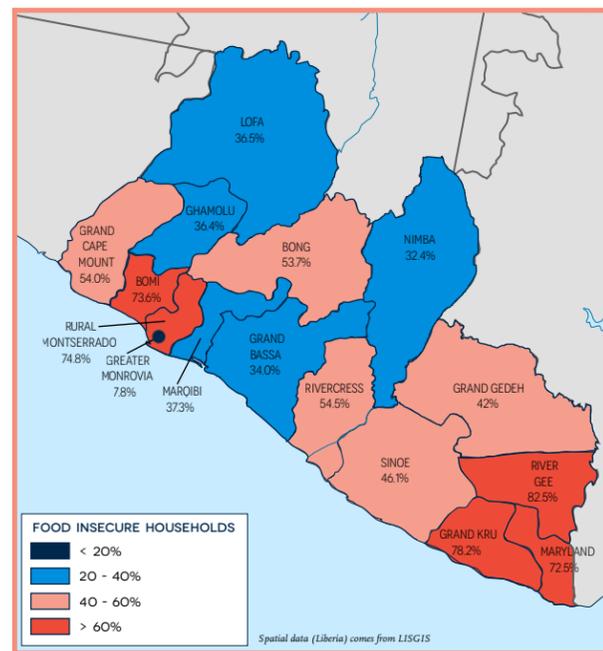


FIGURE 2: FOOD INSECURE HOUSEHOLDS



According to UNICEF (2012), Liberia has the 32nd highest mortality rate for children under five years of age in the world, at 75 per 1,000 live births. Malnutrition is also high; 14% of infants are born with low birth weight, 15% of children under five years of age are moderately or severely underweight (too thin for their height), 42% are stunted (too short for their age), and 2.7% are wasted (too thin for their age).

## FISH CONSUMPTION

In Liberia, high quality protein is expensive and not enough of it is consumed. The main source of animal protein is Boni, a dried, salted fish with minimal flesh. In 2010, 64% of all animal protein consumed in Liberia was marine animal protein with a consumption of “fish and/or seafood” at 2.5 pounds per capita in 2011, or just 0.6 grams of protein and 0.2 grams of fat per person per day from seafood.



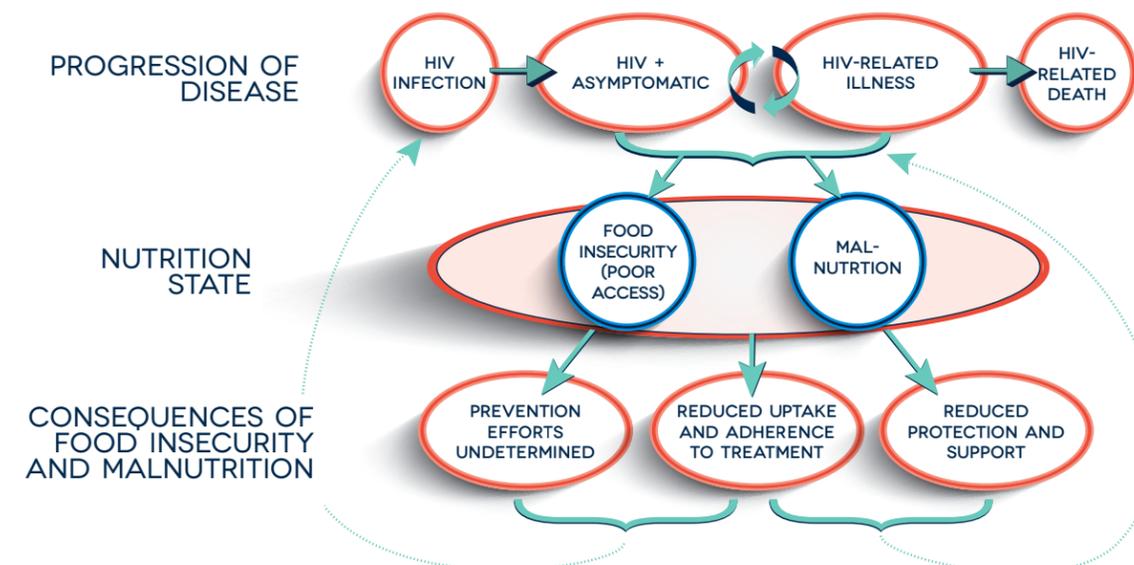
BONI IS A TYPE OF DRIED BONY FISH SIMILAR TO A SMALL HERRING

## SPECIAL CONSIDERATIONS REGARDING VULNERABLE POPULATIONS IN THE PILOT

### MALNUTRITION AND HIV: A VICIOUS CYCLE

HIV/AIDS undermines access to food, contributing to food-insecurity and malnutrition (Greenblott, Kara and Nzinga International, 2012 (see figure 3). Liberia has a low prevalence of people with HIV/AIDS. According to UNAIDS (2012) estimates, there are 22,000 HIV-positive people, or 0.9% of the total population, living in Liberia. HIV and nutritional intake affect each other. Food insecurity and malnutrition are factors in the spread of HIV (Ngwira, Bota and Loevinsohn 2001; Tsai, Hung, and Weiser 2012), and for those individuals who are HIV-positive, malnutrition hastens the progression of the disease from HIV to AIDS (Tang 2012).

FIGURE 3: THE DEBILITATING CYCLE OF HIV, FOOD INSECURITY AND MALNUTRITION

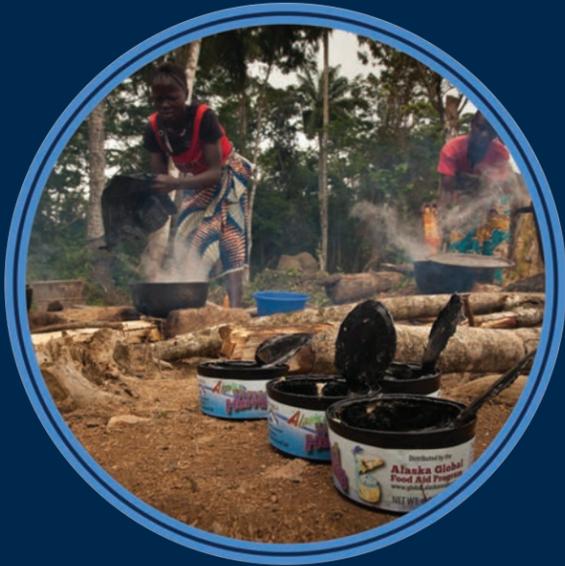


Food insecurity and malnutrition can undermine prevention efforts and destabilize treatment outcomes, leading to death and viral resistance.

# WOMEN AND CHILDREN

Young women, victims of human trafficking and survivors of gender based violence (GBV), are among those severely affected by the war and remain vulnerable to malnutrition and food insecurity.





# PILOT PROJECT RESULTS

## OBJECTIVES

1. Determine the acceptability of canned herring
2. Assess the effects of herring on growth and development over a nine-month period of consumption

## IMPLEMENTATION

AGFAP donated and shipped the herring and coordinated the pilot project, with research assistance and oversight from its Food & Nutrition Consultants<sup>1</sup>. Samaritan's Purse in Liberia implemented the field work.

<sup>1</sup> The Research Team included: Nina P. Schlossman, MS PhD, Nicole Coglianesse, MS RD, Paul Fuss, Lauren Wood, MS, Natalia Povelite of Global Food & Nutrition, ASMI's Washington DC-based Food Aid & Nutrition consultants.



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## PROJECT SITES

Programs were selected to represent diversity – in age (children vs. adults), regions (urban Monrovia vs. rural Foya) and program type (early child development, homes for abused and vulnerable young women and children, literacy classes for adult women, and voluntary counseling and testing center for people living with HIV/AIDS).

BORMA HOSPITAL  
AT THE VCT CENTER  
FOYA, LIBERIA



1. The Voluntary Counseling and Testing (VCT) Center works with a local hospital in Foya, Bong County that carries out the testing. For those who test positive for HIV, Samaritan's Purse follows up through individual home visits and by offering a voluntary attendance monthly support group.

A MOTHER  
ATTENDING  
SCHOOL WITH HER  
DAUGHTER AT THE  
THINK HOME  
MONROVIA, LIBERIA



2. The Touching Humanity in Need of Kindness (THINK) Home is a rehabilitation home for girls and young women affected by the Liberian Civil War: victims of human trafficking, survivors of gender-based violence, commercial sex workers and girls separated from their families. The home provides shelter, protection, medical care, psycho-social support and counseling, as well as academic classes, vocational and life skills training and child care for children under 5 years of age.

THE EARLY CHILD  
DEVELOPMENT  
CENTER  
GOBA TOWN,  
LIBERIA



3. Early Child Development (ECD) Centers provide stimulation and education for children 2-5 years of age. Three ECD Centers participated in the program.

A WOMAN  
RECEIVING  
ALASKA CANNED  
HERRING AT THE  
SAMARITANS  
PURSE WOMEN'S  
LITERACY  
PROGRAM  
FOYA, LIBERIA



4. The Women's Literacy Program provides literacy and education training for women through weekly meetings.

# ALASKA CANNED HERRING WAS HIGHLY ACCEPTED!

Acceptability was assessed through surveys and interviews with participants, cooks and parents of children who were too young to respond. Herring acceptability was measured on a five-point hedonic scale, with 5 being the highest (liked most) rating and 1 being the lowest (liked least) rating.

**FIGURE 1. HEDONIC SCALE QUESTIONNAIRE**

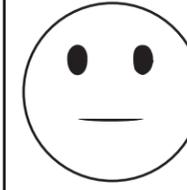
**Alaskan Canned Herring Pilot Project**  
Liberia, 2012/2013

Alaska Seafood Marketing Institute

**Hedonic Scale**  
5 Point Hedonic Scale Focus Group testing the Acceptability of Canned Herring

**Instructions:** Circle the face that best describes how you feel about the food prepared with the Canned Herring

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Location: \_\_\_\_\_

				
Dislike It Plenty 1	Dislike It Small 2	Don't Care For It 3	Like It Small 4	Like It Plenty 5

PARTICIPANTS IN FOCUS GROUPS WERE ASKED TO RATE THE HERRING ON A SCALE FROM 1 TO 5:

1. DISLIKE IT PLENTY
2. DISLIKE IT SMALL
3. DON'T CARE FOR IT
4. LIKE IT SMALL
5. LIKE IT PLENTY

Traditional Liberian cuisine includes vegetable and fish stews served over rice or fufu, starchy dough made from rice, plantain, cassava, corn, or yam flours. Stews are commonly referred to as soups. Herring was incorporated into many dishes and some favorite recipes are provided at the end of this report. Project site Canned Herring recipes were designed to have a healthy balance of carbohydrates, fats and proteins so that participants could get the maximum nutritional benefits from their meals. Participant sites and their clients, including children, women, and cooks, provided diverse feedback.

### THE VOLUNTARY COUNSELING AND TESTING CENTER

VCT respondents “liked it plenty,” which means they enjoyed eating it and found it appealing. They ate the herring every other day with “protective foods” like greens and vegetables along with an “energy food” like rice. They enjoyed the herring so much they often ate it every day until their supply ran out, prior to the next distribution. **A favorite recipe of this group was potato green soup with herring.**

### THINK HOME

THINK Home participants “loved” the Canned Herring and preferred it to the other fish (including mackerel, sardines and snapper). Cooks and the head counselor agreed that the herring went very well in soups and was easy to work with. The women learned that the herring is high in protein and omega-3-fatty acids and that these nutrients would benefit their babies’ brain development. Participants were enthusiastic about a food that will “make their children smarter.” **A favorite recipe of this group was cassava leaf soup with herring.**

### EARLY CHILD DEVELOPMENT CENTERS

Children in ECDC liked Canned Herring very much and rapidly consumed their meals. They described it as “sweeter” than Boni and preferred the herring over other protein alternatives. According to the cooks, the Alaska Canned Herring was often the only source of high quality protein in the children’s meals. **The children’s favorite recipe was herring with gravy.**

### THE WOMEN’S LITERACY PROGRAM

Receiving Canned Herring incentivized the women to attend the literacy program and receive further education and training. They loved the herring but felt that they did not receive enough to share with their family even though it was easy to incorporate the herring into local dishes. Participants stated that their children got sick less often when they ate the herring. **The women especially enjoyed pumpkin stew with herring.**

# METHODS

Project staff and recipients enjoyed the herring so much that the project moved quickly from an acceptability trial to field testing.

**DATA COLLECTION** The feedback on acceptability was obtained via surveys and interviews and nutrition status was assessed with standard measurements of body weight and height compared at the beginning and end of the consumption period. The AGFAP research team developed the protocol and standard operating procedures (SOP) as well as the data collection instruments. The SOP, a manual prepared for training and use by data collectors and staff, included all the instruments, measurement techniques and data recording procedures. On the initial visit to Liberia the team worked with Samaritan’s Purse to train staff, conduct focus groups, distribute acceptability questionnaires, collect baseline data and conduct recipe development workshops combining the Alaska Canned Herring with local ingredients. AGFAP’s nutritionists and research consultants, experts in field-based nutrition surveys and data collection methods, trained Samaritan’s Purse and partner staff in proper weighing and measuring techniques and documentation procedures. The team returned to Liberia after nine months to visit project sites, observe implementation and data collection, and conduct exit interviews with participants and staff.

**METRICS** The local staff collected weights, heights and mid-upper arm circumference (MUAC) measurements at intervals during the life of the project. Accuracy was ensured across the project through the use of standard procedures and common techniques. Each participant was assigned a unique identification number that was cross-checked each time he/she was measured.

**GATHERING MEASUREMENTS** Three people measured the participant: one set the participant on the device, a second read out the measurement, and a third recorded the data. Participants were asked to remove any hats or hairpieces and/or shoes before measurement. Weights were measured using a Seca Clara 803, digital heights were recorded against a Seca 213 stadiometer, and MUAC was measured with a standard WHO MUAC tape.

**CLASSIFYING MALNUTRITION** Following standard anthropometric procedures (i.e. measurement of the human body), three different measures of nutritional status assessed progress of beneficiaries: Body Mass Index (BMI), Z-scores and MUAC, following the 2005 and 2012 WHO cutoff standards (Tables 1, 2 and 3) based on the age of the subject. Table 4 shows the herring distribution schedule and modalities.

**CONFIDENTIALITY & REFERRALS** Confidentiality was maintained throughout the project and data were made anonymous before transmittal to the AGFAP research team who analyzed the data and alerted Samaritan’s Purse when a participant was flagged as malnourished. Those participants could then be referred to a nearby hospital or clinic for treatment.

**TABLE 1: MALNUTRITION CUTOFFS FOR ADULTS (BODY MASS INDEX - BMI)**

MALNUTRITION CLASSIFICATION	CUT OFF
Normal Weight	BMI >18.5
Mild	17 <BMI < 18.5
Moderate	16 <BMI < 17
Severe	BMI <16



**TABLE 2: MALNUTRITION CUTOFFS FOR 5-19 YEAR OLD CHILDREN (Z-SCORES: WEIGHT FOR AGE - WAZ, HEIGHT FOR AGE - HAZ AND WEIGHT FOR HEIGHT - WHZ)**



MALNUTRITION CLASSIFICATION	CUT OFF
Normal Weight	>-1 SD
Mild	-1 <SD< -2
Moderate	-2 <SD < -3
Severe	<-3 SD

**TABLE 3: MALNUTRITION CUTOFFS FOR 0-2 YEAR OLD CHILDREN (MID UPPER ARM CIRCUMFERENCE - MUAC)**

MALNUTRITION CLASSIFICATION	CUT OFF
Normal Weight	MUAC>125 mm
Moderate	115 mm > MUAC <
Severe	MUAC<115 mm

*(Source: based on WHO Anthro Calculator)*



**TABLE 4: HERRING DISTRIBUTION SCHEDULE (SERVING SIZE: 3 OZ)**

PROGRAM SITE	SCHEDULE	METHOD OF DELIVERY
Voluntary Counseling & Testing Center (VCT)	4 Servings/wk	Take-Home Rations
THINK Home	3 Servings/wk	On-Site Meals
Women’s Literacy Program (LP)	2 Servings/wk	Take-Home Rations

**DATA QUALITY ASSURANCE** The AGFAP team observed the data collection at each program site and used a quality assurance checklist to evaluate the staff's techniques at baseline. Overall, the field staff followed protocol and recorded the heights and weights properly in the women's literacy program, VCT center and the ECD. Several children in the ECDs were incorrectly identified as severely or moderately malnourished and were dropped from the analysis.

**STATISTICAL ANALYSIS** Stata version 12 (Stata Corp, 2011), a statistical software and analysis package, was used to perform t-test mean sampling to test averages and the significance of changes in BMI, MUAC and z-scores. Before data could be analyzed, they were cleaned, organized and checked for errors and missing data. Baseline and midline data for levels of malnutrition were tested using paired t-tests, and compared overall, by site and within age groups. Independent t-tests were run to compare changes in BMI, MUAC, z-score and nutrition category across sites. Correlation was also tested for dosage (amount of herring received) and number of visits over time.

**BASELINE SAMPLE** The baseline sample consisted of 309 participants from seven of Samaritan's Purse programs in Liberia. This sample included 156 adults over 19 years of age (50.5%), 98 children 2-5 years of age (31.6%), 32 children and adolescents 5-19 years of age (10.2%), and 10 children under-2 years of age (3.2%).



**ENDLINE SAMPLE** At endline, 518 participants (Table 5) were measured. The sample included 27 (5%) children under 2 year of age, 152 (29%) children 2-5 years of age, 85 (16%) children and adolescents 5-19 years of age and 254 adults (49%) over 19 years of age. The largest population was the VCTs with 138 beneficiaries (29.6% of sample); these were primarily adults over 19 years of age.

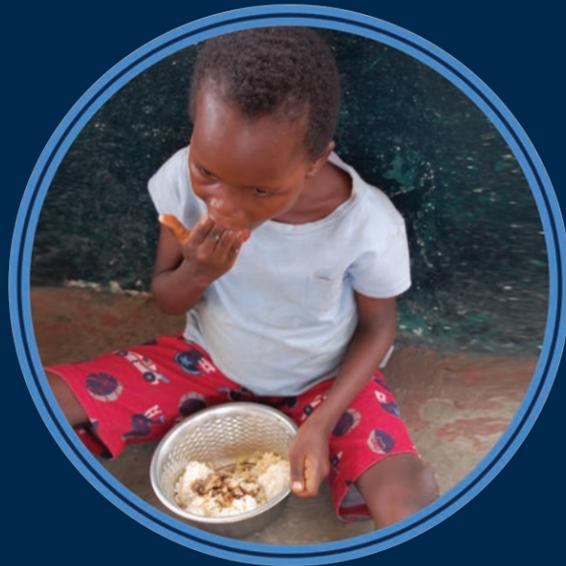
Not all recipients participated in the project for the full duration of the pilot. There were 142 beneficiaries with only one data point, either because they joined the project after it had begun, left the project site, or consumed the Alaska Canned Herring but did not participate in the monitoring portion of the study. For the children at the Juvenile Transit Center/Safe Home, only their data on acceptability were used.

**ANALYSIS SAMPLE** A total of 374 participants (72.48%) received Canned Herring for at least two months and had two or more data points. They were included in the analyses for change in nutrition status with 88 participants (17.05%) who had eight data collection points and were included in the longitudinal analyses of change over time. Data were pooled to maximize results.



**TABLE 5: TOTAL NUMBER OF PARTICIPANTS BY SITE AT ENDLINE**

SITE	NUMBER
Voluntary Counseling & Testing Center (VCT)	138
THINK Home	72
Early Child Development Centers (ECD)	198
Women's Literacy Program (LP)	97
Juvenile Transit Center and Safe Home* (JTC/SH)	13* (Acceptability Only)
Total	518



## RESULTS BY PROJECT SITE

VOLUNTARY COUNSELING & TESTING CENTER (VCT)

THINK HOME

WOMEN'S LITERACY PROGRAM (LP)

EARLY CHILD DEVELOPMENT CENTERS (ECD)



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## BASELINE

The majority of participants were adequately nourished (75%) at baseline, with 4% moderately malnourished and 2% severely malnourished. There were statistically significant improvements in BMI for adults in the VCT center and in MUAC for children under-two years of age. The z-score also rose in children two to five years at one of the ECD sites. We saw a slight correlation between the amount of Alaska Canned Herring given and change in BMI.

Overall, the herring had a clear and positive impact on the nutritional status of those individuals who participated in the pilot. The percentage of beneficiaries who were identified as severely, moderately or mildly malnourished decreased (from 23% to 17%) and the number of individuals who were classified as having a normal weight increased from 77% to 83% (Table 6).

TABLE 6: PREVALENCE OF MALNUTRITION AND NORMAL

SITE	% IN EACH CATEGORY AT BASELINE				% IN EACH CATEGORY AT ENDLINE (AT 9 MONTHS)			
	Severe	Moderate	Mild	Normal	Severe	Moderate	Mild	Normal
VCT	2.27%	5.30%	6.06%	86.26%	1.59%	0%	9.09%	89.39%
THINK Home	0%	1.39%	13.89%	84.7%	0%	2.78%	6.94%	90.28%
LP	1.03%	0%	11.34%	86.63%	1.03%	0%	8.25%	90.72%
Overall	1.4%	4.1%	17.4%	77.2%	0.58%	2.32%	14.1%	83.01%

\*The overall increase in normal weight participants is statically significant (p=0.001)

■ =improved     
 ■ =got worse     
 ■ =remained the same

Among the 110 beneficiaries identified as mildly, moderately or severely malnourished at the first visit, 42 people or 46% of beneficiaries improved. Of those who improved, 90.5% recovered to a normal nutrition status.

## VOLUNTARY COUNSELING & TESTING CENTER (VCT)

(4 SERVINGS OF TAKE HOME RATIONS PER WEEK)

Overall, the percentage of individuals classified as normal at the VCT center increased from baseline to endline (86.3% to 89.4%, respectively) and, more importantly, the percentage of malnourished participants decreased from 13.7% to 10.7%, a noteworthy change (Table 4 and Figure 7).

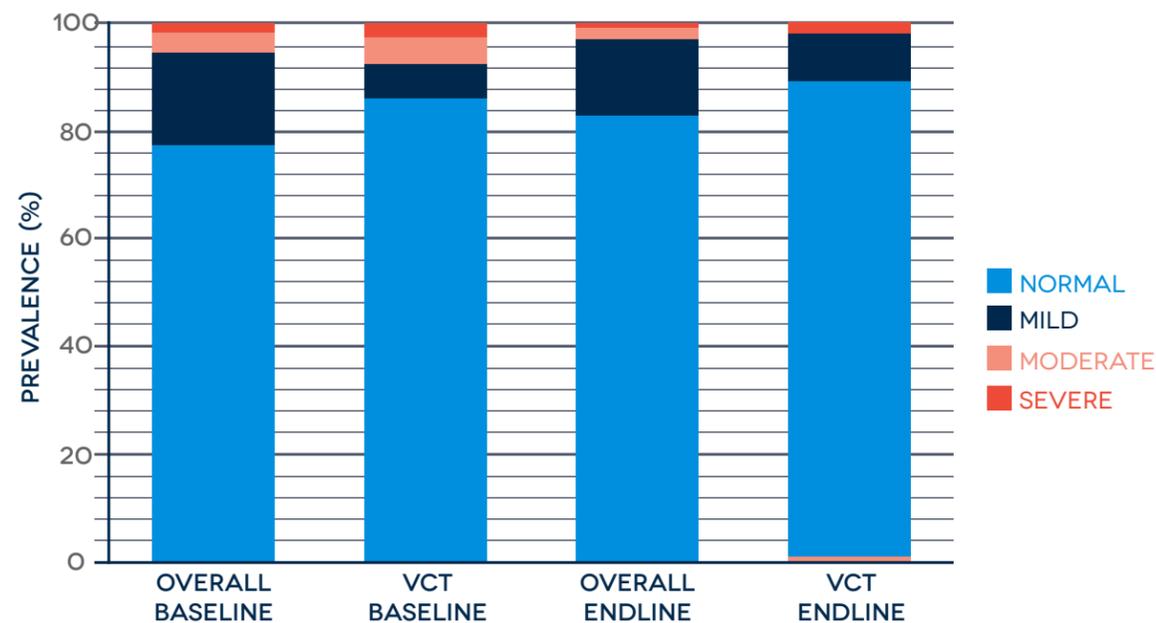


**TABLE 7: CHANGE IN NUTRITION STATUS FOR HIV-POSITIVE PARTICIPANTS**

NUTRITIONAL STATUS	BASELINE	ENDLINE
Normal	86.3%	89.4%
Mild	6.1%	9.1%
Moderate	5.3%	0%
Severe	2.3%	1.6%

71% of malnourished individuals with HIV improved their nutrition status to some degree and 57.2% recovered to a normal, healthy weight.

**FIGURE 4: CHANGE IN NUTRITION STATUS IN THE VCTS VS. OVERALL**



Among adults, the overall change in BMI was significant ( $p=0.043$ ). See Table 8. There was a statistically significant improvement in BMI among the VCTs ( $p=0.039$ ), with the more malnourished moving into the mild malnutrition and normal categories, but no detectable change in BMI among the LPs.

**TABLE 8- NUTRITION STATUS CHANGE: VCT AND LP COMPARISON (ADULTS ONLY)**

BMI: ADULTS 19 YEARS AND OLDER								
PROJECT SITE	NUMBER OF PEOPLE		BASELINE BMI	ENDLINE BMI	CHANGE IN BMI	% NORMAL AT BASELINE	% NORMAL AT ENDLINE	% WITH INCREASED BMI
VCT	108	Mean	21.01	22.84	0.89*	87.96%	88.89%	54.63%
		Median	22.17	22.01	0.27			
LP	97	Mean	21.94	21.98	0.04	87.63%	90.72%	49.48%
		Median	21.32	21.21	-0.02			
Overall	205	Mean	21.92	22.43	0.49*	87.01%	89.76%	52.40%
		Median	21.49	21.63	0.14			

■ =improved      ■ =got worse

**ACROSS PROJECT SITES**

In addition to the VCT, this pilot project was implemented in other Samaritan's Purse Programs with significant results: the THINK Home for abused women in Monrovia and their children and the women's Literacy Program (LP) in Foya.

## THINK HOME

**(3 SERVINGS PER WEEK PREPARED ON-SITE)**

No one in the THINK Home was severely malnourished at baseline or endline. The percentage of well nourished individuals increased from baseline to endline (84.7% to 90.28%) and the percent of malnourished individuals decreased correspondingly from 15.3% to 9.7%.

Among children 5-19 years of age, the percentage of well-nourished individuals jumped from 42.9 to 78.6%. The mean z-score increased by 0.85, and this change was statistically significant ( $p<.05$ ); 75% of mild and moderately malnourished individuals improved to normal by endline (see Table 9).

**TABLE 9: NUTRITION STATUS CHANGE: THINK HOME**

CHANGE IN NUTRITION STATUS FROM BASELINE TO ENDLINE FOR CHILDREN 5-19 YEARS OF AGE								
PROJECT SITE	NUMBER OF PEOPLE		BASELINE Z SCORE	JANUARY Z SCORE	CHANGE IN Z SCORE	% NORMAL AT BASELINE	% NORMAL AT JANUARY	% THAT IMPROVED OR STAYED IN SAME CATEGORY
THINK Home	14	Mean	0.12	0.75	0.85	42.86%	78.57%	78.57%
		Median	-0.08	0.5	0.43			

*There was a positive statistically significant change in Z score in the THINK Home ( $p=0.046$ ).*
  
■ =improved      ■ =got worse

# WOMAN'S LITERACY PROGRAM (LP)

## (2 SERVINGS PER WEEK, TAKE HOME RATIONS)

The percentage of malnourished participants in the Women's Literacy Program (LP) decreased from baseline to endline and the percentage classified as having a normal weight increased (from 86.3% to 90.7%). Of the malnourished individuals, 33.3% improved their nutrition status; all of whom improved to normal (see tables 7 & 9). There was a mean improvement in BMI of 0.004; however the change was not statistically significant.

Some beneficiaries were found to be sharing their supply of Canned Herring with 8-10 family members and were only receiving six cans of herring per month, so the results are not surprising, given the small amount of herring consumed per person.



## DISCUSSION

SPECIAL BENEFITS FOR HIV-POSITIVE INDIVIDUALS  
BENEFITS FOR CHILDREN AND ADOLESCENT GIRLS



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# SPECIAL BENEFITS FOR HIV-POSITIVE INDIVIDUALS

HIV-positive individuals have different dietary needs above the normal calorie intake. The additional calories needed to maintain their weight and help prevent AIDS-related wasting increases as patients become symptomatic and progress through the disease (see Table 10).

**TABLE 10- WORLD FOOD PROGRAMME (WFP) RECOMMENDATIONS FOR VITAMIN & MINERAL (MICRONUTRIENTS) INTAKES FOR PEOPLE LIVING WITH HIV**

HIV STATUS	RECOMMENDED INTAKE
HIV-positive without symptoms	10% increase
HIV-positive children without symptoms	10% increase
HIV-positive or AIDS with symptoms	20-30% increase
Children experiencing weight loss (HIV)	50-100% increase

Protein intake should remain between 10% and 12% of all calories consumed and fat should make up at least 17% of daily calories. The WFP's ration guide recommends that HIV-positive individuals continue to meet normal daily values for micronutrients since there is little evidence of the need for increased micronutrients in the different stages of HIV/AIDS. Most of the supplements designed to treat rapid weight loss (HIV-related wasting in this case) are for children and have a sweet peanutbutter taste profile. Adults typically prefer a savory taste profile. Canned Herring could provide a good alternative to these supplemental pastes and fortified cereals by providing much needed marine proteins and other essential nutrients, like omega-3 fatty acids and selenium.

The LP site could serve as a comparison group with the VCTs because the sites were primarily women over 19 years old and both received take home rations and were in nearby in Foya County. Significantly, the only known differences between the participants in the two groups were HIV status and the amount of herring the participants received; however, the change in BMI was significant in the VCTs, but not among the LPs.

LP participants were not tested for HIV or asked about their HIV status, so we do not know if any of them have HIV. For the purposes of this comparison we assumed that they were HIV-negative. The VCT participants received more servings of herring per person and had positive results, indicating a possible dose-response relationship that warrants further investigation. The nutritional composition of the herring might result in particular benefits for people with HIV. This potential benefit also warrants further and more rigorous investigation.

The high acceptability of the Canned Herring should be taken into consideration for HIV nutrition programming since many people feel queasy and have a changed sense of taste from their Antiretroviral Therapy (ART) drugs. As HIV progresses it damages the ability to smell and taste, which compounded with loss of appetite, can add to AIDS-related wasting. Studies by Graham, et al. (1995) on the taste thresholds of glutamic acid and quinine hydrochloride showed a "distortion" of taste in HIV patients. They were also unable to distinguish between two different mixtures in a comparison study, due to the course of the disease or the medication prescribed to treat it. Researchers concluded that reduced taste and smell reflexes did not properly stimulate the salivary glands and digestive tract to drive hunger and adequately digest the food, which could be another cause of the wasting common to HIV/AIDS patients. This reduction in taste would explain why some people in the other study groups mentioned a "fishy" flavor or scent that they thought was strong, but the HIV group made few comments on that subject.

**Canned Herring improved health and wellness of HIV-positive participants in two primary ways: it provided extra motivation for participants to return regularly to the center for needed medication and counseling and the nutritional benefits of the herring helped participants recover from malnutrition.**

Many HIV-positive adults at the VCT had to travel long distances to get to the center and the Canned Herring served as an additional draw. Participants received Canned Herring, Antiretroviral Therapy (ART drugs) and counseling. The combination of medications, counseling, education, along with the Canned Herring, aided in their recovery from malnutrition and helped strengthen their bodies to fight against AIDS-related wasting and secondary infections. The increased nutrition as measured by BMI in participants may have disrupted the cycle of malnutrition and HIV.

The HIV-positive population's nutrition status improved steadily from baseline, and the change was significant despite the likelihood of opportunistic infection, wasting, malabsorption and other HIV/AIDS related ailments. The results also show the importance of an incentive for routine health promotion and monitoring in this population. This hypothesis warrants further investigation as other factors may have played a role, including increased counseling among VCT patients.

**ADDITIONAL RESEARCH RECOMMENDED** The benefits for HIV-positive patients were promising and should be examined in a randomized controlled trial to determine the full extent of the effects on improved nutritional status. Since the patients in this study successfully gained weight, research is needed on the changing body compositions of malnourished people as they put on weight to determine if they are gaining weight in a healthy way (fat and muscle mass). In most cases people gain fat when they begin to regain weight, but with high quality protein hopefully this outcome is lessened in favor of building lean muscle.



## BENEFITS FOR CHILDREN AND ADOLESCENT GIRLS

The results for children ages 5 to 19 (in the THINK Home) were promising and also warrant further study as more emphasis is placed on the health of women and girls prior to pregnancy and before motherhood. Children approaching puberty need to be properly fueled so that they continue to develop correctly and maintain their health (The Lancet, 2014).

Research by Nahar, Mascie-Taylor, & Begum (2006) showed that a mother's weight between the third and fifth months of pregnancy was the most important indicator of her child's birth weight. An underweight woman at the end of her first trimester was much more likely to give birth to a low-weight baby than a woman at a healthy weight at the same stage; low birth-weight and small-for-gestational age babies are often malnourished already at birth or become malnourished during the first six months. The correlation between pre-pregnancy weight and low-birth weight was less strong, but it is difficult for an underweight woman to gain enough weight during pregnancy to deliver a healthy baby.

**ADDITIONAL RESEARCH RECOMMENDED** This study increased evidence for herring's use as a nutritious food in adolescence. Anemia is a big concern for adolescent girls (and weaning-age infants). Further studies should be conducted to test the effect of herring on iron levels and/or the birth weight of babies whose mothers ate herring on a regular basis during pregnancy.

**LASTING BENEFITS AND SUSTAINABILITY** The instruments used were donated to Samaritan's Purse so that their staff could continue to monitor the participants and follow up in case any showed signs of malnutrition. The increased sensitivity to nutrition among program and partner staff helped to ensure that people identified with malnutrition could be more quickly referred to treatment.



## CONCLUSION

CONCLUSIONS AND FUTURE IMPLICATIONS

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PROJECT SITES AND POPULATION DESCRIPTIONS

NUTRITION INFORMATION

MEASUREMENT TOOLS

FAVORITE RECIPES



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## CONCLUSIONS AND FUTURE IMPLICATIONS

The overwhelming acceptance of Alaska Canned Herring, its nutritional benefits, easy integration into traditional recipes, and long shelf life make this product ideal for use in future food aid programs. Canned Herring (and other oily fish) may have particular benefits for adults at risk of wasting from HIV and for adolescent and reproductive age women and their babies. For best results based on the pilot, the Alaska Canned Herring should be consumed four times per week (serving size: 3 oz).

The nine-month pilot project yielded very positive results, especially in terms of improved nutrition for those participants living with HIV/AIDS – 71% of those identified as malnourished at baseline improved significantly, with 80% of them moving up to a normal weight. The findings suggest that the herring, a rich source of high quality marine protein and healthful essential omega-3 fats, should be considered instrumental for improving nutrition in the fight against HIV/AIDS and malnutrition and, based on its widespread appeal among Liberians of all ages, could easily be adopted by programs in other countries, institutions and food aid settings.

The results from this pilot project were so promising that ASMI decided to expand the evidence base. A four village randomized controlled trial in Guinea-Bissau was initiated in 2015 to test the effectiveness of the herring for the prevention of malnutrition during the rainy season when most children are at risk.



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# PROJECT SITES AND POPULATION DESCRIPTIONS

**THE THINK HOME** is a rehabilitation home for girls and young women associated with the effects of the Liberian Civil war. The THINK Home caters to war-affected girls and young women who have been victims of trafficking, survivors of gender based violence, commercial sex workers and girls separated from their families because of war. The home provides shelter, protection, medical care, psycho-social support and counseling; academic classes, vocational skills training, life skills training, and parenting and child care for children under 5. There were 23 women and 12 children in the THINK Home. The women and children received Alaskan Canned Herring 3 times per week (1.5 6 ounce cans per week) in their on-site meals. The beneficiaries continued to receive the herring until June 2013. During the pilot, there were 3 sets of beneficiaries from the THINK Home- one from April to June, one from June to August, and the last from September 2012 to June 2013. Anthropometric data were collected and reported monthly.

**THE SAFE HOME AND JUVENILE TRANSIT CENTER** provides confidential shelter, protection, security and psychological support, medical care and follow-up medical appointments, access to legal aid, creative art and recreation, classroom time, family tracing and follow-up visitations for women and children. Residents communicate with their parents and relatives by phone and are taken to secure locations for visitation. The Safe Home receives residents from the police and other INGO/NGOs (American Refugee Committee (ARC), Children Fund (CF), International Rescue Committee (IRC), the Norwegian Refugee Council (NRC), and United Nations High Commission on Refugees (UNHCR)- to date, 1,185 victims and survivors of violence and war. There were approximately 30 women, children and adolescents in the Safe Homes who received 3 servings (1.5 6 ounce cans) of Canned Herring per week in their on-site meals and continued to receive the herring until June 2013.

**THE EARLY CHILD CARE AND DEVELOPMENT CENTER** hosts over 160 children, 2-5 years of age. The beneficiaries received 3 servings (1.5 cans) of Canned Herring per week in on-site meals. There was one ECD sites left in the program in January; Gobatown with approximately 45 children. The beneficiaries in Gobatown received the herring until the January 2013. Due to logistical issues, the distribution in the other two sites, Kingsville and Kings Farm, ended in October 2012.

**THE VOLUNTARY COUNSELING AND TESTING CENTER (VCT)** received Canned Herring in take-home rations. The VCT program is a voluntary counseling and testing program carried out in conjunction with a local hospital in Foya. Samaritan's Purse provides the pre/post test counseling and the hospital carries out the testing. For those who test positive, Samaritan's Purse follows up regularly with a monthly support group that is available (voluntary attendance) and through individual home visits. There were approximately 100 HIV positive men and women. They received 4 servings of herring a week for themselves and extra servings for their family members (4 cans per week) in take-home rations from April to January. These individuals received 24 cans of herring starting in February 2013 and continued to receive rations until November 2013. TB patients also began receiving herring in January 2013 and continued until November.

**THE WOMEN'S LITERACY PROGRAM (WLP)** has 100 adult women who received herring in take-home rations. The women in this program meet on a weekly basis. The women received 2 servings of Canned Herring for themselves and extra for their family members (6 cans a month). The pilot in this site ended in January 2013.

## NUTRITION INFORMATION

### Nutrition Facts

Table 1: Nutritional Value of Alaska Canned Herring

Nutrients	Herring (g per 6oz can)	% Daily Reference Value*
<b>Macronutrients</b>		
Calories	166	8.29
Protein	14.0	27.86
Fat	11.8	18.15
Total Omega-3	1.53	
Carbohydrate	0.0	
Fiber, total dietary	0.0	
<b>Minerals</b>		
Calcium	70.6	7.06
Iron	0.95	5.29
Iodine	56.1	
Magnesium	27.2	6.80
Phosphorous	193.8	19.38
Potassium	359.6	10.28
Sodium	62.9	2.62
Zinc	0.45	4.10
Copper	0.07	7.37
Manganese	0.04	1.67
Selenium	31.0	56.41
<b>Vitamins</b>		
Vitamin C	0.0	
Thiamin	0.0	3.4
Riboflavin	0.17	10.00
Niacin	1.87	9.35
Pantothenic Acid	0.85	8.5
Vitamin B-6	0.38	19.13
Folate	4.25	1.06
Vitamin B-12	8.5	141.67
Vitamin A	90.1	1.80

\*These amounts are based on the Daily Reference Value (DV) used as a guide for nutritional labeling; DV based on a daily intake of 2,000 calories and are for adults and children over 4 only.

# MEASUREMENT TOOLS

Three different measures of nutrition status were used to assess the health and progress of beneficiaries: Body Mass Index (BMI), z-scores and MUAC. Anthropometry instructions for program staff are included in the Standard Operating Procedures (SOP) manual.

**BODY MASS INDEX:** For adults over 19 years of age, Body Mass Index (BMI) was used. According to the World Health Organization (WHO), BMI is the most useful measure of malnutrition in adults (WHO, 2005). WHO uses BMI to classify individuals as underweight, normal weight, overweight, or obese. People in the underweight category are further classified as severely, moderately or mildly malnourished. BMI is calculated using an individual's weight and height.  $BMI = \text{weight (kg)} / \text{height (m)}$ . BMI classification is as follows:

**TABLE 1: MALNUTRITION CUTOFFS FOR ADULTS (BODY MASS INDEX - BMI)**

MALNUTRITION CLASSIFICATION	CUT OFF POINTS
Normal	BMI >18.5
Mild	17 < BMI < 18.5
Moderate	16 < BMI < 17
Severe	BMI < 16

**Z-SCORES** (standard deviation scores) are used for population-based assessment and are widely recognized as the best system for analysis and presentation of anthropometric data (WHO, 2012). Weight-for-height was used to calculate the z-score for children 2-5 years of age and weight-for-age was used to calculate the z-score for children 5-19 years old. The WHO growth charts were used for children 2-5 ([http://www.who.int/childgrowth/standards/technical\\_report/en/index.html](http://www.who.int/childgrowth/standards/technical_report/en/index.html)), and the WHO Anthro calculator (<http://www.who.int/childgrowth/software/en/>) was used to calculate z-scores for children 5-19 years of age. Z-scores are sex-independent and allow for population level analysis. Z-score classification is as follows:

**TABLE 2: MALNUTRITION CUTOFFS FOR 5-19 YEAR OLD CHILDREN (Z-SCORES: WEIGHT FOR AGE - WAZ, HEIGHT FOR AGE - HAZ AND WEIGHT FOR HEIGHT - WHZ)**

MALNUTRITION CLASSIFICATION	CUT OFF POINTS
Normal	>-1 SD
Mild	-1 < SD < -2
Moderate	-2 < SD < -3
Severe	<-3 SD



**MID-UPPER ARM CIRCUMFERENCE (MUAC)** was measured to assess nutrition classification for children under 2 years of age. It was not possible to take the heights of the children under 2 with the stadiometer used to measure older children and adults; thus, MUAC was used as a measure of malnutrition in this youngest age group. MUAC is determined by using a color-coded tape that is wrapped around the middle of the upper portion of the arm. Please see UNICEF instructions for the measurement technique used: (<http://www.unicef.org/nutrition/training/3.1.3/2.html>).

MUAC tape is easy to use with little chance of measurement error. According to UNICEF and WHO, MUAC is useful for assessing nutrition status and is a good predictor of mortality in children, particularly children under 5 years of age.

**TABLE 3: MALNUTRITION CUTOFFS FOR 0-2 YEAR OLD CHILDREN (MID UPPER ARM CIRCUMFERENCE - MUAC)**

MALNUTRITION CLASSIFICATION	CUT OFF POINTS
Normal	MUAC > 125 mm
Moderate	115 mm > MUAC <
Severe	MUAC < 115 mm

(Source: based on WHO Anthro Calculator)



## FAVORITE RECIPES

POTATO GREEN SOUP WITH HERRING

CASSAVA LEAF SOUP WITH HERRING

GRAVY WITH HERRING

PUMPKIN STEW



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## POTATO GREEN SOUP WITH HERRING

Serves: 8-10

### INGREDIENTS:

- 1/4 cup palm oil
- 1/2 liter water
- 2-3 onions, sliced
- Pile (approximately 1/4 cup) hot peppers, ground
- 4 6 oz. cans of Alaska Canned Herring
- Large pile (approximately 3 cups) potato greens, chopped
- Maggi or Vita Cube, to taste

### INSTRUCTIONS:

- Sautee onions and pepper in hot palm oil for 5 minutes
- add greens, herring and water, simmer 15 minutes
- Add Maggi Cubes
- Serve over a large bowl of rice



## CASSAVA LEAF SOUP WITH HERRING

Serves: 45 children

### INGREDIENTS:

- 1 liter of palm oil
- 4 onions, sliced
- 1/2 cup hot peppers, ground
- 24 6 oz. cans of Alaska canned herring
- 1 large bowl (approximately 10 cups) of cassava leaves
- 3 pinches of salt
- 2 Vita Cubes

### INSTRUCTIONS:

- Sautee onions and peppers in oil for approximately 5 minutes
- Add cassava leaves, salt and Vita Cube and simmer for 15-30 minutes
- Serve over approximately 1 cup of rice



## GRAVY WITH HERRING

**Serves:** 30

**INGREDIENTS:**

- 1 liter palm oil
- 4 onions, sliced
- 1 ½ cup hot peppers, ground
- 2 cups of water
- 15 6 oz. cans of herring  
(with juice herring is packaged in)
- 2 Vita Cubes
- 1 package (70g) of tomato paste
- 2 teaspoons of salt

**INSTRUCTIONS:**

- Sautee onions and peppers in oil for 5-10 minutes
- Add the “juice” from the Herring cans, water, Vita Cubes and tomato paste and simmer for 15 minutes, allowing the sauce to thicken
- Add herring to sauce, bring to a boil until herring is heated through
- Serve over rice



## PUMPKIN STEW WITH HERRING

**Serves:** 20-30 people

**INGREDIENTS:**

- 15 6 oz. cans Alaska canned herring
- 1 liter palm oil
- 3 large squash (pumpkin, or other squash variety), chopped
- 1 cup peppers, chopped
- 5 onions, chopped
- 2 cans tomatoes
- 12 Vita Cubes
- 1 tsp salt

**INSTRUCTIONS:**

- Heat oil in pot over heat
- Add squash to oil and sauté until soft
- Add onion, peppers, Vita Cubes, and salt to pot
- Add water and Canned Herring to pot, cover, and simmer until combined and heated through





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# PROJECT REPORT

Herring for Liberia  
Alaska Seafood Marketing Institute

