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Full Length Research Paper

Child Nutrition Outcomes of Market Participation of Smallholder Farmers in Central Ethiopia

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One of the welfare indicators of the household is nutritional status of its members especially the children and women. Child nutritional status affected by household and village level characteristics', and by governments policy towards smallholder farmers. *The objective of this study was to identify and evaluate if there is significant difference in* preschoolers' children nutritional *outcomes of smallholder farmers at differing levels of market participation. The study used the 2009 ERHS dataset and 38 preschool children who were all the surveyed children in the dataset were included in the analysis. The result showed that 42% preschool children are stunted or too short for their age, 10% wasting or too thin for height, and 36.8% underweight.* Moreover, the One-way-ANOVA result showed that farm households with high degree of *market participation* are better-off in child nutrition outcomes than those with low degree of participation. In order for commercialization of agriculture policies to have dramatic effects on improving health and reducing malnutrition, attention must be given to health, sanitation, and environmental issues as complementary components of agriculture policies and programs.

Keywords: Child nutrition, Z-score, Smallholder, market participation, and One-way ANOVA

INTRODUCTION

Going beyond the critical role that smallholder market participation plays in economic development; good nutritional status is a cornerstone that affects the health of all people, enabling us to reach our fullest potential as individuals and societies. Accordingly, nutrition has long been recognized as a fundamental human right, enshrined in key international conventions. Freedom from hunger and malnutrition was declared a basic human right in the 1948 Universal Declaration of Human Rights. The convention in Article 25 ensures that "Everyone has the right to a standard of living adequate for the health and well-being of himself and his family…" (Benson, 2005).

Ethiopia has adopted commercialization of smallholder agriculture as a strategy for its economic transformation. The expansion of the agricultural services had significant impact on the intensity of input use, agricultural productivity, and market participation of Ethiopian smallholders. According to Gebremedhin et al. the status of smallholder commercialization in Ethiopia as a whole is 20.4 per cent of the output in 2009, while 63.7 per cent was used for own consumption by the households, and 12.9 per cent set aside for use as seed input. A small fraction of 3 per cent was used for animal feed, payment of non-household labor in kind, and other unspecified purposes. At a glance this demonstrates that Ethiopia is found at the first phase of commercialization. But there are significant variations within the country. At the high end there are many districts where the marketed output ranges between 30 and 35 per cent, and similarly many districts are found at the low end below 10 percent (Gebremedhin et al., 2009).

Market participation potentially influences preschooler nutritional status through number of pathways. One of these is through the impact on child-feeding patterns. If increased demands are placed on a mother's time to provide agricultural labor for a specific cash crop, early weaning or the early introduction of solid foods for preschoolers, or both, can occur. However, no significant differences are found in the weaning age between participant and nonparticipant households. In studies conducted in SSA countries, breast-feeding occurs for an extended period of time. Similarly, the age at which solid foods are first introduced to infants does not differ between the two groups. It is normally recommended that four to six months after birth, breast milk complements be added to an infant's diet (Kennedy, 2001).

On the other hand, the prevalence of stunted children in Ethiopia, which is the percentage of children under five years of age with abnormally low height for their age, is among the highest in the world. Although there has been some improvement in this indicator of long term nutritional deprivation in recent years, the national prevalence rate of 44 percent in 2011 was still significantly above the sub-Saharan average of 34 percent, and only slightly below the 1983 level of 60 percent. Moreover, malnutrition is pervasive; no region is exempt from this problem (EDHS, 2011).

Different researches (Kennedy, 2001; 1999 4a; EDHS, 2005, 2011; Kennedy and Cogil, 1987, Dewey, 1981, Immik and Alarcon, 1993; Bouis and Haddad, 1990; and Randolph, 1992) showed that several factors are responsible for poor nutritional status among preschool children. Although many studies in Ethiopia confirm that commercialization of smallholder farming has positive impact on household’s welfare but its outcome on preschool children nutritional status is negligible. Therefore, this study examined the implications of smallholders’ market participation on preschool children nutritional status.

Measurement of Market Participation and Child Nutrition

Measuring nutritional status of preschool children

One approach according to Behrman and Deolalikar (1988) and WHO (2006) guideline, to study nutrition is to assess nutritional status on the basis of anthropometric indicators. These are based on physical body measurements such as height or weight (related the age and sex of the individual), and have the benefit of being both inexpensive and non-intrusive to collect. From an anthropometric perspective, nutritional status can be seen as the output of a health production function, where nutrient intake is one input, but where other individual, household, and community variables also feature.

Anthropometric indicators are useful both at an individual and population level. At an individual level, anthropometric indicators can be used to assess compromised health or nutrition well being. This information can be valuable for screening children for interventions and for assessing the response to interventions. At the population level, anthropometry can be used to assess the nutrition status within a country, region, community, or socioeconomic group, and to study both the determinants and consequences of malnutrition. These measures have limited value as indicators of malnutrition in their own right. In part, this is because weight and height depend on both age and gender. Moreover, physical characteristics are affected by many intervening factors other than nutrient intake, in particular genetic variation. However, even in the presence of such natural variation, it is possible to use physical measurements to assess the adequacy of diet and growth, in particular in infants and children. This is done by comparing indicators with the distribution of the same indicator for a “healthy” reference group, and identifying “extreme” or “abnormal” departures from this distribution. The three of the most commonly used anthropometric indicators for infants and children weight-for-height, height-for-age, and weight-for-age can be constructed by comparing indicators based on weight, height, age, and gender with reference data for “healthy” children.

Weight-for-height (W/H)

W/H measures body weight relative to height, and has the advantage of not requiring age data. Weight-for-height is normally used as an indicator of current nutritional status, and can be useful for screening children at risk and for measuring short-term changes in nutritional status. Low W/H relative to the child of the same sex and age in a reference population is referred to as “thinness”. Extreme cases of low W/H are commonly referred to as “wasting”. Wasting may be the consequence of starvation or severe disease (in particular diarrhea), but it can also be due to chronic conditions. It is important to note that a lack of evidence of a wasting in a population does not imply the absence of current nutritional problems such as low height-for-age.

Height-for-age (H/A)

H/A reflects cumulative linear growth. H/A deficits indicate past or chronic inadequacies nutrition and/or chronic or frequent illness, but cannot measure short-term changes in malnutrition. Low H/A relative to a child of the same sex and age in the reference population are referred to as “shortness”. Extreme cases of low H/A, where shortness is interpreted as pathological, is referred to as “stunting”. H/A is primarily used as a population indicator rather than for individual growth monitoring.

Weight-for-age (W/A)

W/A reflects body mass relative to age. W/A is, in effect, a composite measure of height-for-age and weight-for-height, making interpretation difficult. Low W/A relative to a child of the same sex and age in the reference population is referred to as “lightness”, while the term “underweight” is commonly used to refer to severe or pathological deficits in W/A. W/A is commonly used for monitoring growth and to assess changes in the magnitude of malnutrition over time. However, W/A confounds the effects of short- and long-term health and nutrition problems.

As noted, the construction of anthropometric indicators is based on comparisons with a “healthy” reference population. The international reference standard that is most commonly used (and recommended by the WHO) is based on data on the weights and heights of a statistically valid population (US National Center for Health Statistics (NCHS)) of health infants and children in the US. The validity of this reference standard stems from the empirical observation that well-nourished and healthy children will have a very similar distribution of height and weight to the US reference population, regardless of their ethnic background or where they live. In other words, although there are some differences in growth patterns across ethnic groups, the largest part of worldwide variation in anthropometric indicators can be attributed to differences in socioeconomic factors. Notwithstanding this empirical regularity, there is a long-standing debate about the appropriateness of the US reference standard for children in developing countries, in particular concerning the extent to which growth paths will depend on feeding practices. While these are important issues to address, analysts are currently recommended to use the NCHS/WHO reference data.

Anthropometric indices are constructed by comparing relevant measures with those of comparable individuals (in terms of age and sex) in the reference data. There are three ways of expressing these comparisons:

a) Z-score (standard deviation score): the difference between the value for an individual and the median value of the reference population for the same age or height, divided by the standard deviation of the reference population.

b) Percent of median: ratio of a measured or observed value in the individual to the median value of the reference data for the same sex and age or height.

c) Percentile: rank position of an individual on a given reference distribution, stated in terms of what percentage of the group the individual equals or exceeds.

The preferred and most common way of expressing anthropometric indices is in the form of Z-scores. This approach has a number of advantages. Most importantly, Z-scores can be used to construct summary statistics (e.g. mean and standard deviation) for the population or sub-populations. This cannot be meaningfully done with percentiles. Moreover, at the extreme of the distribution, large changes in height or weight are not necessarily reflected in changes in percentile values. Percent of median also has disadvantages. In particular, percentages are not informative about where in the distribution an individual is located, and a given percentage corresponds to different Z-scores depending on the age or height of the individual.

The most commonly used cut-off to define abnormal anthropometry with Z-scores is -2 standard deviations, irrespective of the indicator used. For example, a child whose height-for-age Z-score is less than -2 is considered stunted. This provides the basis for estimating prevalence of malnutrition in populations or sub-populations. The WHO has also proposed a classification scheme for population-level malnutrition. While weight-for-height, height-for-age, and weight-for-age are the most commonly used anthropometric indicators for infants and children; they are by no means the only ones that have been used.

Measuring the level of market participation

Gabre-Madhin et al. (2007) used four approaches to measure the level of household commercialization: sales-to-output and sales-to-income ratios, net and absolute market positions (either as a net buyer, net seller or autarkic/self-sufficient household), and income diversification or level of specialization in agricultural production. According to Gabre-Madhin the four approaches are:-

1. The sales-to-output ratio measures the gross value of all agricultural sales by a household as a percentage of the total gross value of its agricultural production. This ratio is similar to what has been developed earlier by different authors (Abercrombie 1975; Cleave 1974; Ruthenburg 1980; Randolph 1992; von Braun et al. 1994 as cited on Gabre-Madhin et al. (2007)) as the percentage of agricultural output sold to total agricultural production.
2. The total sales-to-income ratio is the ratio of the gross value of total sales to total income from crop production. In this index, income from crop production is assumed as a proxy to total household income, ignoring income from livestock, and off- and non-farm sources.
3. The market position of a household is evaluated using the ratio of volume of sales and volume of purchases to the total volume of stock: the sum of storage from the previous production year and production in the current year.
4. The specialization index tries to capture to what extent farm households are specialized in their production to capture the benefits from comparative advantages: producing what they can efficiently produce and buying what they cannot. This index measures the proportion of the value of purchased agricultural products not produced by households to the gross value of agricultural production.

This research used the first approach to measure the level of smallholder farmers' market participation in Central Ethiopia.

METHODOLOGY

Data

The study used a dataset called the Ethiopian Rural Household Survey (ERHS) which is a unique longitudinal household data set covering households in a number of villages in rural Ethiopia. The survey was conducted in collaboration with Economics Department, Addis Ababa University (Economics/AAU) and the Centre for the Study of African Economies (CSAE), University of Oxford. Data collection started in 1989, when a team visited 6 farming villages in Central and Southern Ethiopia. In 1989, IFPRI conducted a survey in seven Peasant Associations located in the regions Amhara, Oromiya, and the Southern Ethiopian People's Association (SNNPR). Civil conflict prevented survey work from being undertaken in Tigray. Under extremely difficult field conditions, household data were collected in order to study the response of households to food crises. The study collected consumption, asset, and income data on about 450 households. In 1994, the survey was expanded to cover 15 villages across the country. An additional round was conducted in late 1994, with further rounds in 1995, 1997, 1999, 2004, and 2009. In addition, nine new villages were selected giving a sample of 1477 households. The nine additional communities were selected to account for the diversity in the farming systems in the country, including the grain-plough areas of the Northern and Central highlands, the enset-growing areas and the sorghum-hoe areas. Topics addressed in the survey include household characteristics, agriculture and livestock information, food consumption, health, women's activities, as well as community level data on electricity and water, sewage and toilet facilities, health services, education, NGO activity, migration, wages, and production and marketing. The study used the last rounds of the dataset. The study used all the surveyed preschool children a total of 38 in Adaa District of Oromiya Regional State.

Empirical Model and Testing Techniques

Following von Braun et al. (1994), we can compute household crop output market participation in annual crops as the proportion of the value of crop sales to total value of crop production, which we refer to in this paper as crop-output market participation (MP) index, computed as follows:

$$\boldsymbol{MP_i} = \frac{\sum \overline{P_k} S_{ik}}{\sum \overline{P_k} Q_{ik}} \quad \textbf{(1)}$$

Where: S_{ik} is quantity of output k sold by household i evaluated at an average community level price (P_k), Q_{ik} is total quantity of output k produced by household i.

Given the nature of market participation level (MP_i) 1.Subsistence farmers (proportion of value sold is less than 25%) 2. Transition farmers (proportion of value sold is between 25% and 50%) 3. Commercial farmers (proportion of value sold is above 50%)

Following WHO (2006), the three most commonly used anthropometric indices to measure the nutritional status of children are weight-for-height (WHZ) height-for-age (HAZ) and weight-for-age (WAZ). For this study, the indices of nutritional status are expressed in standard deviation units (z-score) from the mean for the international reference population. For the purpose of this study, a one-way ANOVA (Analysis of Variance) was performed to test child nutrition outcomes among households at varying degrees of market participation. According to Moore and McCabe (2003) one-way ANOVA test is recommended if more than two or greater groups are needed to be compared.

RESULTS AND DISCUSSION

Results

Anthropometric indices calculated from combinations of height-age, weight-age, and weight-height, are stratified by age and gender. The indices are expressed in Z scores (standard deviation scores) with the Z score cut-off point being -2 SD. Classifications for high and very high prevalence rates for each indicator have been suggested by WHO (2006). The result from the surveyed 38 children under five years of age in Adaa District revealed that, 42% of children are stunted or too short for their age which indicates chronic malnutrition. Wasting (too thin for height), which is a sign of acute malnutrition, is far less common, only 10%. Moreover the proportion of underweight children is 36.8 percent. However the result varies across different age categories and gender. The result is in line with EDHS 2011 survey in which stunting was 44%, wasting 10%, and underweight 29%. (See Annex)

The statistical summary given in table 1 shows that a typical household head produced food crops valued approximately birr2 3525.79 ranging from birr 576 to 11024.4 From sells dimension, a typical household head, on average, sold food crops worth birr 916.48 ranging from selling nothing to birr 3988. The degree of market participation (which is defined as the ratio of the gross value of all crop sales to the gross value of all crop production times hundred) for the typical household head is computed to be 22.67% ; the most commercialized household head sold about 74.37% of the gross value of its total crop production. The level of market participation in the study areas is lower than the national average which ranges from 33-36%. This indicates that the level of market participation in the study areas is very low even in comparison to the national average, which is in itself considered to be low.

Table 1: **Statistical Summary of crop value produced and sold (in Birr)**

Variable	Obs	Mean	Std. Dev.	Min	Max
Food crop value	38	3525.79	2784.40	576	11024.4
Food crop revenue	38	916.48	1022.16	0	3988
Degree of mkt par.	38	22.67	16.82	0	74.37

Source: own computation from ERHS survey, 2009

In light of the above result, the ultimate objective of market participation is the attainment of better welfare for the smallholder farmer. Child nutrition is one of household welfare which is represented in Z score of mentioned indices. In this study degree of market participation (domp) is grouped into three categories: Low (<= 25% of output sold), Medium (26% - 50% of output sold) and High (> 50% of output sold). One-way ANOVA test was conducted to find out if there is statistically significant variation in child nutrition outcomes among farm households at the different levels of market participation. Table 2 shows the test results.

Interestingly as we can see in the above one way ANOVA table, farm households with a high degree of market participation are better-off in terms of children nutrition than households with low level of market participation. Table 2 reveals that height-for-age z-score and Weight-for-age z-score have a consistent increasing pattern along the market participation index, low to high. Although this is not true for Weight-for-height z-score and BMI-for-age z-score the one-way ANOVA test results confirms that the variation in height-for-age z-score and Weight-for-age z-score among farm households at different levels of market participation is statistically significant at 1% but Weight-for-height z-score and BMI-for-age z-score are not. (See Annex-B) Therefore, this result indicates that the higher the degree of market participation the better the child nutrition status for smallholder farmers.

Table 2: Child nutrition outcomes for households with low, medium, and high doc

Child nutrition representative	Degree of Market participation			Prob > F
	Low	Medium	High	
Weight-for-age z-score (under weight)	-0.71	-0.87	7.54	0.0060***
Length/height-for-age z-score (stunting)	-4.25	-0.35	14.48	0.0000***
Weight-for- height z-score (wasting)	6.71	-0.52	-0.68	0.3132
BMI-for-age z-score	5.61	-0.42	-0.69	0.3739
Number of observations	13	19	6	38

Note: ***1% significance level, **5% significance level, *10% significance level

Discussions

One of the most contentious issues in the cash crop/food crop debate revolves around the impact of commercialization of agriculture on the health and nutritional status of women and children. It is typically assumed that increases in household income will ultimately result in health and nutritional benefits to individual household members. This income-mediated effect on health and nutrition operates through two main pathways. First, increased incomes can be used to purchase different mix of goods and services or more of the current market basket, for example, more access to health care, better housing, and so forth. This new or increased market basket could produce a positive health effect. Second, income-food consumption linkages, by improving an individual household member's energy or other nutrient intake, could improve nutritional status, which in turn could improve health (Kennedy, 2001).

In support of this view, there are studies that witness the adverse effects of smallholder commercialization on nutritional status of households, particularly preschool children. A study by Dewey (1981) in rural Mexico provided evidence that dietary diversity, dietary quality, and nutritional status of preschool children can be negatively associated with lower crop diversity and increased dependence on purchased foods. In smallholder commercialization, it is assumed that resources are being diverted from food crops to cash crop production which results in lower food availability from own production and more dependence on local food markets (Immink and Alarcon 1993).

Randolph (1992) also found that agricultural commercialization in Malawi exerted a negative influence on child nutrition, especially during the nutritional stress seasons. In addition, based on a case study from sugarcane-producing households in the Philippines, Bouis and Haddad (1990) also argued that raising household incomes appears to be a necessary but not a sufficient condition for substantially improving preschooler nutrition. This is noted due to the fact that higher-income households preferred to spend more of their cash crop income on non-food items.

Smallholder commercializations as a means to improve household health and nutrition status generally follow two directions. First, commercialization is assumed to enhance household income which helps to purchase a diversified mix of goods and services (like health care, better housing etc.), or increase the current market basket (Kennedy 1994a). Second, through the income–food–consumption linkage, commercialization is assumed to increase the food intake of household members, which could improve their nutritional and health status (Kennedy 1994a).

However, whether the income from commercialization is directly linked to household food consumption and whether all household members (particularly, women and children) also have equitable access to these gains appears to be an empirical issue. A common debate on the linkage between commercialization and nutrition is that income from commercial (cash) crops is under the control of men (Kennedy and Cogill 1987; Immink and Alarcon 1993; Tinker 1979 cited in Kennedy 1994a) and used more for non-food expenditures (Kennedy and Cogill 1987). Kennedy and Cogill (1987) showed that income control by women correlates with improved child nutritional status, suggesting that women are more likely to spend on food and health care. According to these authors, a 1% increase in sugarcane income in South Nyanza District in Kenya results in an increase in energy intake of 24 kilocalories per household per day. On average, sugarcane production increased household income by 15% which increased household energy intake by 360 kilocalories per day, or approximately 33 kilocalories per day per person in the household (Kennedy and Cogill 1987).

In line with our finding Kennedy (1994a) analysis on child health and morbidity rates in several countries including the Gambia, Rwanda, Kenya, Malawi, Philippines and Guatemala found that there is no clear evidence that agricultural commercialization has an adverse effect on child nutrition. Another point of argument on health impacts of commercialization refers to the higher labour demand of commercial crops as reducing the household time spent on child care, particularly by women (Kennedy and Cogill 1987). Generally, the food security status of commercialized farm households is influenced by both household-level technological changes that permit increased food crop production on limited resources, and the meso and macro level environment consisting of marketing conditions, market prices, rural infrastructure, and access to credit (Immink and Alarcon 1993). The macro-level factors influence the level of income a commercialized household can earn and market prices that influence the household income–consumption linkage, whereas household-level technological changes could help to secure food self-sufficiency under a risky food-market environment.

CONCLUSIONS AND POLICY IMPLICATIONS

Conclusions

This study found out that farm households with high degree of market participation are better-off in child nutrition outcomes than those with low degree of participation. A one-way ANOVA test was performed to see if any significant difference existed among the households at different degree of market participation. Accordingly, households with high degree of market participation have higher nutritional status and two of the factors which are majorly used to measure nutritional status of preschool children were found to be statistically significant: Weight-for-age z-score (underweight) and Height-for-age z-score (stunting) both at 1%.

Policy Implications

The findings of this study provide the following policy implications:

• Existing government direction to transform smallholders from subsistence-oriented to market-oriented production system is proving to have an encouraging result by way of enhancing the child nutrition outcomes of those smallholders actively participating in the market. However, a lot needs to be done to enhance the level of market participation since the majority of smallholders are not well integrated with the market yet. Better welfare and child nutrition outcomes for highly commercialized households justify such investments.

• The results from study presented indicated that smallholder market participation improved preschoolers' nutritional status. In order for commercialization of agriculture policies to have dramatic effects on improving health and reducing malnutrition, attention must be given to health, sanitation, and environmental issues as complementary components of agriculture policies and programs.

Dedication

To my father my sister **Shewaye** and to my brother **Kinfe**. May their loving soul rest in peace.

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Acronyms

CSA Central Statistical Agency
CSAE Center for Study African Economy
DOMP Degree of Market participation
EEA Ethiopian Economics Association
ERHS Ethiopia Rural Household Survey
HH Household
IFPRI International Food Policy Research Institute
IIA Independence of Irrelevant Alternatives
MNL Multinomial logit
MoFED Ministry of Finance and Economic Development
PSN productivity safety net
SSA Sub-Saharan Africa

ANNEX
PREVALENCE OF MALNUTRITION AND Z SCORE RESULT FOR ADAA DISTRICT
Set 1: Sexes combined

Weight-for-age

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	Mean	SD
(0-60)	18	5.6	0	18.9	16.7	0	36.7	-0.74	1.64
(0-5)	1	0	0	50	0	0	50	0.22	
(6-11)	0								
(12-23)	6	0	0	8.3	0	0	8.3	0.41	1.43
(24-35)	3	0	0	16.7	0	0	16.7	-0.72	1.06
(36-47)	4	25	0	79.9	25	0	79.9	-1.43	2.3
(48-60)	4	0	0	12.5	50	0	111.5	-2.01	0.29

Length/height-for-age

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	Mean	SD
(0-60)	18	16.7	0	36.7	27.8	4.3	51.2	-0.11	3.06
(0-5)	1	0	0	50	0	0	50	1.77	
(6-11)	0								
(12-23)	6	0	0	8.3	0	0	8.3	2.33	2.8
(24-35)	3	0	0	16.7	0	0	16.7	-0.42	1.08
(36-47)	4	25	0	79.9	25	0	79.9	-0.97	3.39
(48-60)	4	50	0	111.5	100	87.5	112.5	-3.13	1.1

Weight-for-length/height

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	%>+1SD	95%	C.I.	%>+2SD	95%	C.I.	%>+3SD	95%	C.I.	Mean	SD
(0-60)	18	0	0	2.8	16.7	0	36.7	0	0	2.8	0	0	2.8	0	0	2.8	-0.83	1.08
(0-5)	1	0	0	50	0	0	50	0	0	50	0	0	50	0	0	50	-1.29	
(6-11)	0																	
(12-23)	6	0	0	8.3	33.3	0	79.4	0	0	8.3	0	0	8.3	0	0	8.3	-1	1.32
(24-35)	3	0	0	16.7	0	0	16.7	0	0	16.7	0	0	16.7	0	0	16.7	-0.73	0.74
(36-47)	4	0	0	12.5	25	0	79.9	0	0	12.5	0	0	12.5	0	0	12.5	-1.27	1.14
(48-60)	4	0	0	12.5	0	0	12.5	0	0	12.5	0	0	12.5	0	0	12.5	-0.1	0.96

BMI-for-age

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	%>+1SD	95%	C.I.	%>+2SD	95%	C.I.	%>+3SD	95%	C.I.	Mean	SD
(0-60)	18	0	0	2.8	16.7	0	36.7	11.1	0	28.4	0	0	2.8	0	0	2.8	-0.8	1.22
(0-5)	1	0	0	50	0	0	50	0	0	50	0	0	50	0	0	50	-1.02	
(6-11)	0																	
(12-23)	6	0	0	8.3	33.3	0	79.4	16.7	0	54.8	0	0	8.3	0	0	8.3	-1.26	1.54
(24-35)	3	0	0	16.7	0	0	16.7	0	0	16.7	0	0	16.7	0	0	16.7	-0.72	0.59
(36-47)	4	0	0	12.5	25	0	79.9	0	0	12.5	0	0	12.5	0	0	12.5	-1.08	1.13
(48-60)	4	0	0	12.5	0	0	12.5	25	0	79.9	0	0	12.5	0	0	12.5	0.17	1.08

Set 2: Males Weight-for-age

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	Mean	SD
(0-60)	9	0	0	5.6	0	0	5.6	-0.87	0.91
(0-5)	0								
(6-11)	0								
(12-23)	3	0	0	16.7	0	0	16.7	-0.71	0.32
(24-35)	2	0	0	25	0	0	25	-0.45	1.34
(36-47)	2	0	0	25	0	0	25	-0.65	1.56
(48-60)	2	0	0	25	0	0	25	-1.76	0.15

Length/height-for-age

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	Mean	SD
(0-60)	9	11.1	0	37.2	22.2	0	54.9	-0.64	1.63
(0-5)	0								
(6-11)	0								
(12-23)	3	0	0	16.7	0	0	16.7	0.03	1.82
(24-35)	2	0	0	25	0	0	25	-0.05	1.25
(36-47)	2	0	0	25	0	0	25	-0.09	0.64
(48-60)	2	50	0	144.3	100	75	125	-2.76	1.04

Weight-for-length/height

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	%>+1SD	95%	C.I.	%>+2SD	95%	C.I.	%>+3SD	95%	C.I.	Mean	SD
(0-60)	9	0	0	5.6	22.2	0	54.9	0	0	5.6	0	0	5.6	0	0	5.6	-0.71	1.17
(0-5)	0																	
(6-11)	0																	
(12-23)	3	0	0	16.7	33.3	0	103.3	0	0	16.7	0	0	16.7	0	0	16.7	-1.01	1.57
(24-35)	2	0	0	25	0	0	25	0	0	25	0	0	25	0	0	25	-0.62	1.02
(36-47)	2	0	0	25	50	0	144.3	0	0	25	0	0	25	0	0	25	-0.92	1.84
(48-60)	2	0	0	25	0	0	25	0	0	25	0	0	25	0	0	25	-0.14	0.76

BMI-for- age

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	%>+1SD	95%	C.I.	%>+2SD	95%	C.I.	%>+3SD	95%	C.I.	Mean	SD
(0-60)	9	0	0	5.6	22.2	0	54.9	11.1	0	37.2	0	0	5.6	0	0	5.6	-0.68	1.34
(0-5)	0																	
(6-11)	0																	
(12-23)	3	0	0	16.7	33.3	0	103.3	33.3	0	103.3	0	0	16.7	0	0	16.7	-1.08	1.93
(24-35)	2	0	0	25	0	0	25	0	0	25	0	0	25	0	0	25	-0.65	0.83
(36-47)	2	0	0	25	50	0	144.3	0	0	25	0	0	25	0	0	25	-0.96	1.8
(48-60)	2	0	0	25	0	0	25	0	0	25	0	0	25	0	0	25	0.17	0.92

Set 3: Females Weight-for-age

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	Mean	SD
(0-60)	9	11.1	0	37.2	33.3	0	69.7	-0.6	2.2
(0-5)	1	0	0	50	0	0	50	0.22	
(6-11)	0								
(12-23)	3	0	0	16.7	0	0	16.7	1.53	1.12
(24-35)	1	0	0	50	0	0	50	-1.27	
(36-47)	2	50	0	144.3	50	0	144.3	-2.21	3.31
(48-60)	2	0	0	25	100	75	125	-2.25	0.06

Length/height-for-age

Age	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	Mean	SD
(0-60)	9	22.2	0	54.9	33.3	0	69.7	0.42	4.07
(0-5)	1	0	0	50	0	0	50	1.77	
(6-11)	0								
(12-23)	3	0	0	16.7	0	0	16.7	4.64	0.59
(24-35)	1	0	0	50	0	0	50	-1.14	
(36-47)	2	50	0	144.3	50	0	144.3	-1.86	5.56
(48-60)	2	50	0	144.3	100	75	125	-3.5	1.43

Weight-for-length/height

	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	%>+1SD	95%	C.I.	%>+2SD	95%	C.I.	%>+3SD	95%	C.I.	Mean
0)	9	0	0	5.6	11.1	0	37.2	0	0	5.6	0	0	5.6	0	0	5.6	-0.95
)	1	0	0	50	0	0	50	0	0	50	0	0	50	0	0	50	-1.29
1)	0																
23)	3	0	0	16.7	33.3	0	103.3	0	0	16.7	0	0	16.7	0	0	16.7	-0.98
35)	1	0	0	50	0	0	50	0	0	50	0	0	50	0	0	50	-0.95
47)	2	0	0	25	0	0	25	0	0	25	0	0	25	0	0	25	-1.62
60)	2	0	0	25	0	0	25	0	0	25	0	0	25	0	0	25	-0.06

BMI-for-age

	N	%<-3SD	95%	C.I.	%<-2SD	95%	C.I.	%>+1SD	95%	C.I.	%>+2SD	95%	C.I.	%>+3SD	95%	C.I.	Me
	9	0	0	5.6	11.1	0	37.2	11.1	0	37.2	0	0	5.6	0	0	5.6	-0
	1	0	0	50	0	0	50	0	0	50	0	0	50	0	0	50	-1
	0																
	3	0	0	16.7	33.3	0	103.3	0	0	16.7	0	0	16.7	0	0	16.7	-1
	1	0	0	50	0	0	50	0	0	50	0	0	50	0	0	50	-0
	2	0	0	25	0	0	25	0	0	25	0	0	25	0	0	25	-1
	2	0	0	25	0	0	25	50	0	144.3	0	0	25	0	0	25	0.