UNDERNUTRITION IN MYANMAR

Part 2: A Secondary Analysis of LIFT 2013 Household Survey Data

March 2016

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This report was prepared by Zaw Win and Jennifer Cashin for the Leveraging Essential Nutrition Actions to Reduce Malnutrition (LEARN) programme, funded by Livelihoods and Food Security Trust Fund (LIFT).

About the Leveraging Essential Nutrition Actions to Reduce Malnutrition (LEARN)

In 2012, LIFT funded the LEARN consortium of Save the Children, Action Contre la Faim (ACF) and Helen Keller International (HKI) to support non-government organisations to implement more nutrition-sensitive programmes.

Our goal is to increase the capacity of LIFT implementing partners to deliver a more comprehensive approach to food security that includes all three food security pillars: Availability, Access and Utilisation.

Our objectives are:

- Increase capacity of LIFT implementing partners to deliver nutrition-related activities in their target communities;
- Integrate nutrition into current and forthcoming LIFT funded food security and livelihood programmes; and,
- Support implementing partners in collecting nutrition-related data and to contribute in building the evidence base in LIFT project areas.

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Cover photo: Cooking sessions ensure mothers learn better cooking methods and practices, as well as dietary diversity in Kywe Boke, Magway Region, Myanmar. Photo Credit: Lynette Lim/Save the Children

Acronyms

ACF	Action Contre la Faim
BMI	Body mass index
FCS	Food consumption score
FSL	Food security and livelihoods
HAZ	Height-for-age z-score
HDDS	Household dietary diversity score
HKI	Helen Keller International
IDDS	Individual dietary diversity score
IP	Implementing partner
IYCF	Infant and young child feeding
LEARN	Leveraging Essential Nutrition Actions to Reduce Malnutrition
MDD	Minimum dietary diversity
RHC	Rural health center
SCI	Save the Children International
WASH	Water, sanitation and hygiene
WAZ	Weight-for-age z-score
WHZ	Weight-for-height z-score

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Left: Thein Thein Kwye nurses her 9 month old son in Mon Kan Village, Yaynanchaung Township, Dry Zone. Photo Credit: Elizabeth Whelan/ LEARN

Executive Summary

The multi-donor Livelihoods and Food Security Trust Fund (LIFT) commenced operations in Myanmar in 2010, supporting implementing partners (IPs) to assist poor families to increase their food availability and incomes in three of the country's main agro-ecological zones: the Uplands, Dry Zone, and Delta Zone. LIFT programming was later initiated in Rakhine State in the Coastal Zone. LIFT has funded a consortium of Save the Children (SCI), Action Contre la Faim (ACF) and Helen Keller International, to implement the LEARN project. The goal of this three-year project (December 2012 – December 2015) is to build the capacity of IPs and to provide technical support to LIFT to maximize the nutritional impact of their food security and livelihoods (FSL) programming throughout the country.

In 2013, LIFT contracted ICF International, Inc., which worked with Myanmar Survey Research, to carry out its second household survey that included 2,400 LIFT households and 800 comparison households in 200 villages. In order to better understand the contributing factors of undernutrition in LIFT program areas and the links between child nutritional status and independent variables of programmatic importance to LIFT (such as income, livelihoods, food security, and water, sanitation and hygiene [WASH]), LEARN commissioned a secondary analysis of nutrition-related data from the 2013 LIFT Household Survey. The purpose of this report is to present the findings of this analysis.

Methodology

Multiple and simple logistic regression analysis was used to explore risk factors for child undernutrition and contributing factors to adequate dietary diversity. There were five dependent variables of interest in this study: stunting, wasting, underweight, dietary diversity, and diarrhea. Forty independent variables in the following categories were identified and considered for analysis: household characteristics, characteristics of caregivers, residence in a LIFT or comparison village, geographic area, dietary diversity and village characteristics. For the Dry Zone, results from this study were also compared to the results of the WFP et al. (2014) Nutrition and Food Security Assessment in the Dry Zone of Myanmar. As a complement to logistic regression analysis, summary prevalence tables were computed to provide the reader with additional information about the differences in undernutrition prevalence by a variety of background characteristics, including household size, income, land access, ethnicity, and disease status, among others. In addition, prevalence estimates of the five dependent variables of interest were disaggregated by age group and agro-ecological zone to provide insights into the different nutrition situations in each geographic area and to identify groups that are at particularly high risk of undernutrition.

Summary of Findings

Undernutrition affects a significant proportion of children under five in LIFT program areas. Nearly 4 out of every 10 children are stunted, and about 8% of children are acutely malnourished. Evidence suggests that young children are routinely ill, with about 15% of children reportedly suffering from diarrhea in the past two weeks. At the same time, dietary quality of young children is poor. Indeed only about one-fifth of children 6 to 23 months of age in LIFT program areas receive an adequately diverse diet.

While the rate of undernutrition in all LIFT program areas is high, there are some key differences by zone. The Uplands is characterized by very high rates of stunting and low

levels of wasting. Diarrhea is also more common in the Uplands than in the other two zones. Chin State, which is characterized by very high rates of stunting and diarrhea and extremely poor dietary diversity, stands out as being far worse off than other states in the Uplands are.

The Dry Zone is characterized by medium levels of stunting and high levels of wasting. Diarrhea is less prevalent in the Dry Zone than in the Uplands and the Coastal/Delta Zone, though the latter difference was not found to be statistically significant. While about 30% of children 12 to 23 months of age in the Dry Zone have adequate dietary diversity, only about 5% of infants 6 to 11 months had consumed four or more food groups in the previous day.

The Coastal/Delta Zone has roughly the same levels of undernutrition as the Dry Zone. About one- third of children under five are stunted and about 10% are wasted. Diarrhea is less common in the Coastal/Delta Zone than in the Uplands. The diets of infants 6 to 11 months of age in the Coastal/Delta Zone are extremely poor. In fact, almost no children in this age group have an adequately diverse diet.

The prevalence of stunting is higher among older children while the prevalence of wasting is higher among younger children, particularly from 6 to 23 months of age. Growth faltering caused by repeated bouts of illness and acute malnutrition may be a risk factor for stunting later in childhood. This underscores the importance of ensuring good nutrition for children in the critical window from birth to 2 years, as well as for mothers during pregnancy.

Immediate causes of undernutrition: Inadequate dietary intake and disease

In this study, poor dietary diversity was identified as a significant risk factor for underweight in LIFT program areas. It was not found to significantly impact stunting, wasting or diarrhea prevalence in any agro-ecological zone. As would be expected, children in wealthier households with better educated caregivers and more land for cultivation have better dietary diversity than children in poor households with less land and less educated caregivers. Children in Chin and Rakhine states appear to have particularly poor dietary diversity.

Diarrhea and other illnesses are known contributing factors to undernutrition. Diarrhea was found to be a risk factor for stunting in LIFT areas as a whole and in the Uplands specifically, where diarrhea affects more than 18% of children under five. Diarrhea was also a risk factor for underweight in all three zones as well as a risk factor for wasting in the Coastal/Delta Zone.

Underlying causes of undernutrition: Food, care, and environment

Household food security, environment and practices relating to care for mothers and children are important underlying contributors to child nutritional status. Access to land is understood as an important predictor of food security in Myanmar. In LIFT program areas, ownership of a larger plot of land is positively associated with better dietary diversity among children 6 to 23 months of age. In fact, children in households with one or more acres of land for cultivation were more likely to have consumed food from four or more food groups in the day preceding the survey in both the Uplands and the Dry

Zone. Ownership of a small plot of land (less than 1 acre) was identified as a risk factor for underweight in the Uplands and for diarrhea in the Uplands and the Dry Zone.

In terms of household environment, the LIFT datasets included indicators of safe water source and effective treatment of drinking water. However, the relationship between access to clean water and child nutritional status was not straightforward. In some areas children living in households with clean water sources were actually more likely to be undernourished than those living in households without clean water sources. However, this may be due to confounding factors related to water source contamination, hygiene practices such as hand washing and/or access to sanitation facilities, which were not measured during the 2013 LIFT survey.

Basic causes of undernutrition

Poverty, as measured by household income and wealth quintile, was found to be an important risk factor for undernutrition, diarrhea, and poor dietary diversity. Low household monthly income (less than 75,000 Myanmar Kyat (MMK)) was found to be a risk factor for stunting and underweight in LIFT program areas. Low income was also positively associated with diarrhea in the Uplands and in the total sample. Higher household income was found to be a contributing factor to adequate child dietary diversity in LIFT program areas and in the Uplands and the Coastal/Delta Zone specifically.

Lower wealth quintile was a significant risk factor for stunting and diarrhea in the Uplands as well as underweight in the Coastal/Delta Zone and in LIFT program areas overall. Interestingly, household income and wealth quintile was not associated with child nutritional status, diarrhea, or dietary diversity in the Dry Zone.

Poverty is a function of lack of access to capital, and education is an indispensible form of human capital that impacts nutritional status in a variety of important ways. Low caregiver education was found to be a risk factor for stunting and underweight in the Dry Zone. Better caregiver education was positively associated with adequate dietary diversity in the Coastal/Delta Zone and in LIFT program areas as a whole.

Demographic characteristics of households in LIFT program areas were found to be important contributing factors to child nutritional status. In particular, households with more than one child under the age of five are at increased risk of having a malnourished child. The risk of stunting and underweight increases with each additional child under five in the Uplands and the Dry and Coastal/Delta Zones. Households with fewer children under five are also more likely to have a child with adequate dietary diversity as well as, interestingly, a child with wasting (in the total sample).

In some contexts, larger household size is associated with better socioeconomic status because there are more income earners. However, larger household size in LIFT program areas seems to be associated with poor nutrition outcomes. Households in small, remote villages are at increased risk of undernutrition due to poor access to health services, markets , and other services. Children in small villages that are farther away from towns and health centers in the Uplands are more likely to be stunted and to have diarrhea. In the Coastal/Delta Zone, residence in a small village is a risk factor for underweight, yet children living in villages farther from town tend to have better dietary diversity.

Ethnic minority children are at increased risk of stunting in the Uplands and the Coastal/Delta Zone as well as underweight and diarrhea in the Uplands. However, Burmese

children are more likely to be wasted in LIFT program areas as a whole (perhaps due to the high level of wasting in the mostly-Burmese Dry Zone).

The relationship between child nutritional status and participation in LIFT projects or residence in a LIFT village was not straightforward, perhaps due to selection bias. Depending on the agro-ecological zone, children living in LIFT villages or benefiting from LIFT projects may be more or less likely to suffer from undernutrition and diarrhea.

Areas for further research

Additional research is needed to better understand the feeding practices of infants and young children. Dietary diversity is extremely poor in LIFT program areas, particularly for young children. Additional data are needed to understand whether this is due to household food insecurity or dietary restrictions being placed on young children due to a lack of understanding about the importance of a varied diet.

Despite the logical links between disease and WASH, in some areas lack of access to safe water and ineffective or no treatment of drinking water was not found to have the expected relationship with child nutritional status. Additional research is needed to identify which household WASH characteristics and behaviors are most important for preventing undernutrition. In particular, data on hand washing and access to safe sanitation facilities are needed.

A TDH-Italia beneficiary in Kywe Bon village in Yaynang-chaung Township, Dry Zone, washes her hands before preparing a meal for her family. Photo Credit: Elizabeth Whelan/ LEARN

At an Action Aid training center in Kamma Village, Pakkoku Township, women weave baskets. An onsite daycare center allows women to continue to breastfeed while developing skills to improve their livelihoods. Photo Credit: Elizabeth Whelan/ LEARN

1. Introduction

The multi-donor Livelihoods and Food Security Trust Fund (LIFT) in Myanmar has funded a consortium of Save the Children (SCI), Action Contre la Faim (ACF) and Helen Keller International, to implement the LEARN project. The goal of this three-year project (December 2012 – December 2015) is to build the capacity of LIFT implementing partners (IPs) and to provide technical support to LIFT to maximize the nutritional impact of their food security and livelihoods (FSL) programming throughout the country.

In 2014, the LIFT strategy was revised to include nutrition as one of its four strategic outcomes. LEARN will provide ongoing technical support to LIFT including advising on the programmatic design and approaches that will maximize nutrition impact.

Although there have been various assessments and some ongoing data collection related to food security and nutrition in recent years, LIFT partners identified the limited accessibility and usability of various data sources as a major challenge. To address this issue, LEARN commissioned a review of recent data on food and nutrition security in Myanmar. The results of this review are presented in a report entitled Undernutrition in Myanmar, Part 1: A Critical Review of Literature. The purpose of Part I is to provide a user-friendly synthesis of current data on the food and nutrition security situation in Myanmar to better understand the linkages between food security, livelihoods and nutrition in the country as a whole as well as in specific geographic areas of interest to LIFT.

The purpose of this report is to present the findings of a secondary analysis of the LIFT 2013 Household Survey. This analysis was conducted to better understand the contributing factors to undernutrition and the links between child nutritional status and independent variables of programmatic importance to LIFT (such as income, livelihoods, food security, and water, sanitation and hygiene). Section 2 will describe the methodology used in this analysis, while Section 3 will present key findings. Section 4 includes recommendations for future surveys and key areas for further research.

2. Methodology

Multiple and simple logistic regression analysis was used to explore risk factors for child undernutrition and contributing factors to child undernutrition, namely dietary diversity and prevalence of diarrhea. This section will provide a detailed description of the datasets, dependent and independent variables, weights applied, types of statistical analysis performed, and limitations of the analysis.

2.1. LIFT 2013 Household Survey datasets

Table 1 presents a list of the datasets that were available for this research study. Data on the dependent variables of interest were contained in the Anthropometric dataset. Data from the Village Information dataset and from the Household Information dataset

Table 1: LIFT 2013 Household Survey datasets

Data set	Sample size (n)
1. Village information	200
2. Anthropometric data	3296
3. Household expenditure and nutrition	1000
4. Household information	3200

were matched to cases in the Anthropometric dataset. Unfortunately, data from the Household Expenditure and Nutrition dataset could not be matched to cases in the Anthropometric dataset due to a lack of key variable(s) to match the datasets.

2.2. Dependent variables

There were five dependent variables of interest in this study: stunting, wasting, underweight, dietary diversity, and diarrhea.

Child nutritional status was measured using height/length, weight, and age data. Macros for IBM SPSS Statistics were used to calculate anthropometric indices using child age, sex, weight, and height/length data.[1] Extreme, biologically implausible values according to World Health Organization (WHO) standards were identified and flagged as missing[2], along with cases outside the target age range. After computing anthropometric indices, data were checked for any out-of-range values and cleaned accordingly.

Table 2 presents the anthropometric indicators calculated for this report. Weight-for-height (WHZ), weight-for-age (WAZ), and height-for-age (HAZ) are expressed as z-scores. A z-score indicates the number of standard deviations an individual value is away from the reference population mean. WHZ, HAZ, and WAZ measure whether a child's height, weight and age are appropriate with respect to others. This is possible because all populations of children have the same potential to grow in the first five years of life, regardless of their race or nationality. The measurements from this assessment have been compared to an international population of healthy children WHO compiled in 2006.

After a child's z-score is determined, it is used to categorize the child's nutritional status. A z-score < -3 and/or edema is an indicator of severe malnutrition and a z-score < -2 an indicator of moderate malnutrition. These cut-points are based on the fact that the probability of a child being malnourished increases as his/her z-score decreases. Using anthropometric indices, the prevalence of acute malnutrition, underweight, and stunting

1 Available at: http://www.who.int/childgrowth/software/en/

2 Weight-for-age z-score < -6 or > 5; Height-for-age z-score < -6 or > 6; Weight-for-height z-score < -5 or > 5.

Table 2: Anthropometric indicators, indices, and cut-points

Indicator	Index	Cut-points	Definition
Wasting	Weight-for-height z-score (WHZ)	WFH < -2	Acute malnutrition
		WFH < -3	Severe acute malnutrition
	Edema	Presence of bilateral pitting edema	Severe acute malnutrition
Stunting	Height-for-age z-score (HAZ)	HFA < -2	Stunting
		HFA < -3	Severe Stunting
Underweight	Weight-for-age z-score (WAZ)	WFA < -2	Underweight
		WFA < -3	Severe Underweight

were calculated.

Child dietary diversity was also included as a dependent variable because of the well-documented links between the quality of an individual's diet and nutritional status. Individual dietary diversity score (IDDS) for children was calculated using the guidelines of FAO and FANTA for children aged 6 to 23 months (Swindale & Bilinsky, 2006). IDDS was then dichotomized as minimum dietary diversity (MDD). Minimum dietary diversity is defined as the proportion of children 6 to 23 months of age receiving foods from four or more food groups in the 24 hours preceding the survey. The seven food groups used for the tabulation of this indicator are: 1) grains, roots and tubers; 2) legumes and nuts; 3) dairy products (milk, yogurt, cheese); 4) flesh foods (meat, fish, poultry and liver/organ meats), 5) eggs, 6) vitamin-A rich fruits and vegetables, and 7) other fruits and vegetables.

Prevalence of diarrhea in the past two weeks was also included as a dependent variable of interest because diarrhea and other illnesses are known contributing factors to undernutrition. A child was considered to have diarrhea if his/her caregiver responded "yes" to the question: "Did [name of child] have diarrhea in the last two weeks?" Diarrhea was defined as having 3 or more loose stools in any 24-hour period.

2.3. Independent variables

Forty independent variables in the following categories were identified and considered for analysis:

- **Household characteristics**

Six household variables were considered: main source for safe drinking water, wealth quintile, household size, number of children aged under five in the household, effective water treatment, and monthly household income.

- **Characteristics of caregivers**

A total of 13 variables including age, gender, ethnicity, religion and education level were considered.

- **LIFT or comparison village**

LIFT funded village/comparison village as well as beneficiary household of LIFT project/not a beneficiary of a LIFT project were also included as independent variables.

- **Geographical area**

To determine the effect of geographical areas, 9 states/regions and 3 zones were also used as independent variables.

- **Dietary diversity**

IDDS and MDD were included as independent variables (as well as dependent variables) to explore their relationship with undernutrition and diarrhea prevalence.

- **Village characteristics**

Four village characteristics were also considered as independent variables: total population in the village, distance from nearest town, distance from nearest RHC, and availability of electricity.

2.4. Wealth indexing

Information on the wealth index is based on data collected in the household questionnaire. This questionnaire includes questions concerning the household's ownership of a number of consumer items such as a television and car and dwelling characteristics related to wealth status.

Each household asset for which information is collected is assigned a weight or factor score generated through principal components analysis. The resulting asset scores are standardized in relation to a standard normal distribution with a mean of zero and a standard deviation of one. These standardized scores are then used to create the break points that define wealth quintiles as: lowest, second, middle, fourth, and highest.

Each household is assigned a standardized score for each asset, where the score differs depending on whether the household owned that asset. These scores are summed by household, and individuals are ranked according to the total score of the household in which they reside. The sample is then divided into population quintiles -- five groups with the same number of individuals in each.

A total of 27 household asset variables and housing materials were considered in constructing the wealth quintile.

2.5. Weights

Because the selection probabilities of each stratum (Uplands, Dry and Coastal/Delta) were not equal, weights were applied to the data to calculate prevalence estimates representative of the LIFT project area. The weights were generated based on the probability of selection of villages and households from the total number of villages in each of the three strata and total number of households in the sample villages.

The prevalence of undernutrition and diarrhea among children under five as well as minimum dietary diversity and mean IDDS for children 6 to 23 months of age were computed using these weights. These prevalence rates were then disaggregated by age group (Section 3) and by significant independent variables (Annex 1).[3]

2.6. Analysis of risk factors

Before conducting analysis of contributing factors for undernutrition, dietary diversity and diarrhea, all independent variables were recoded into appropriate formats as dichotomous or polytomous variables. A test for multicolinearity (high internal correlation between independent variables) was then conducted. Ethnicities that were found to be highly correlated with their respective states were not included as independent variables in the study. Moreover Ayeyarwaddy Region was highly correlated with the Coastal/Delta Zone and was not included in the analysis.

Simple and multiple logistic regression analysis were then run by both Stepwise and Enter methods using IBM SPSS Statistics version 22. The results of simple logistic will be presented in Section 3 and discussed together with the prevalence of undernutrition, adequate dietary diversity, and diarrhea among children included in the sample. Multiple logistic regression results are included in Annex 2 and referenced when relevant. Given that the LIFT survey did not collect data on several important determinants of undernutrition (including infant and young child feeding [IYCF] as well as maternal nutrition), it

3 Because the purpose of this analysis was to better understand the risk factors for undernutrition and its determinants in LIFT program areas, statistical comparisons were not made between prevalence rates of key indicators by zone and by age group. However, p-values were calculated and used to draw conclusions about potential statistically significant differences.

was determined that presenting a multivariable model could be potentially misleading as well as no more programmatically useful than identifying risk factors for undernutrition through simple logistic regression.

2.7. Study limitations

Many variables in the Household Expenditure and Nutrition dataset could be potential determinants of undernutrition, diarrhea, and dietary diversity. However, they could not be included as independent variables in this study because there were no key variable(s) to match the Household Expenditure and Nutrition dataset and the Anthropometry dataset. In particular, it was unfortunate that the relationship between household food access, measured by household dietary diversity scores (HDDS), and child nutritional status could not be explored.

The breastfeeding indicator used in the 2013 LIFT Household Survey measures the proportion of children under-six months receiving breastmilk without solids, but does not take into account liquids. Therefore the prevalence of exclusive breastfeeding could not be calculated, and the relationship between exclusive breastfeeding and nutritional status could not be explored.

Some important determinants of nutritional status (i.e. IYCF practices, low birth weight, maternal nutrition, use of improved sanitation facilities, etc.) could not be included as independent variables in this analysis because data were not collected on these indicators in the LIFT 2013 Household Survey.

3. Results

This section will present key findings from the secondary analysis of the LIFT 2013 Household Survey. Section 3.1 will discuss the prevalence of undernutrition and important risk factors for undernutrition in the total sample of children, while Sections 3.2 – 3.4 will present results of the analysis for each zone. In Section 3.3, results of this analysis will also be compared with results from the Nutrition and Food Security Assessment in the Dry Zone of Myanmar conducted by WFP, Save the Children & Ministry of Livestock, Fisheries and Rural Development (2014).

3.1. Prevalence of undernutrition in LIFT program areas

This section will present data on the prevalence of undernutrition among children in LIFT program areas, disaggregated by age and compared by zone where relevant.[4] Estimates are only representative of LIFT program areas in each zone, and therefore cannot be used to describe the situation in zones or states and regions as a whole. Following prevalence estimates, risk factors for undernutrition in the total sample will be presented. Given the major differences in the environments and populations of the three zones where LIFT is working, it is recommended that data aggregated at the level of all LIFT program areas be interpreted with caution.

Stunting, or low height-for-age, is an anthropometric measure of linear growth that indicates chronic restriction of a child's potential growth and is associated with deficits in cognitive development, poor performance in school and reduced productivity in adulthood. As can be seen in Table 3, the prevalence of stunting in LIFT program areas is about 39%. The prevalence of stunting increases dramatically from about 10% among infants less than six months of age to about 35% among children 12 to 23 months of

4 Note that prevalence estimates in this study differ slightly from estimates in the 2013 LIFT Household Survey Report. This is due to a difference in the weights applied.

Table 3: Prevalence of stunting, wasting and underweight among children under-five in LIFT program areas by age group[1]

Age (months)	Stunting	Wasting	Underweight
0-5	10.0***	8.9***	18.5***
6-11	14.0***	12.1***	36.3***
12-23	35.0***	13.5***	38.7***
24-35	47.8***	5.8***	33.2***
36-47	51.5***	4.0***	29.0***
48-59	43.9***	4.7***	30.6***
Total	**38.9**	**7.8**	**32.0**
Number of children	*3465*	*3816*	*3828*

*p< 0.05; **p< 0.01; ***p< 0.001

[1]Asterisks indicate significant differences in undernutrition prevalence between age groups.

Figure 1: Prevalence of stunting, wasting and underweight among children under-five by age

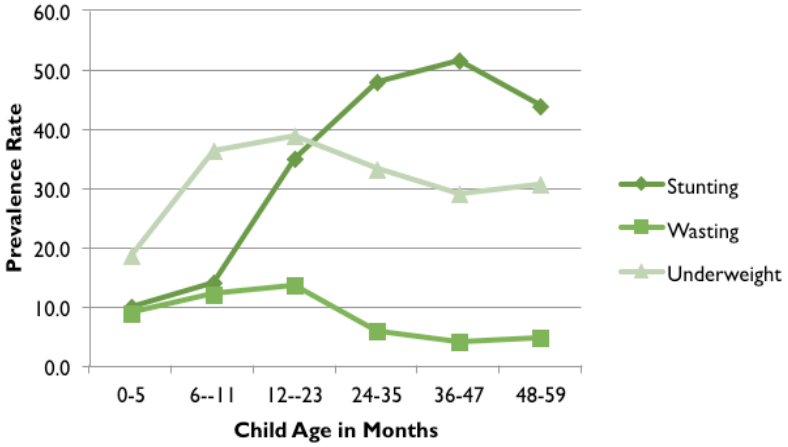
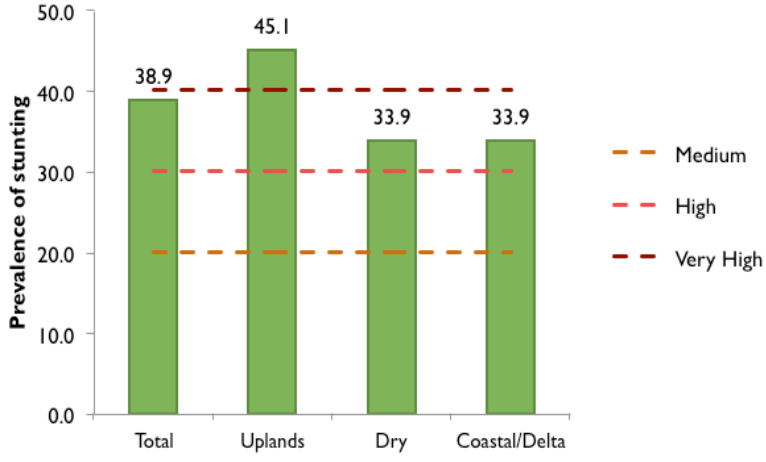


Figure 2: Stunting prevalence by zone with WHO classifications of severity



age and about 50% among children 36 to 47 months of age.

Acute malnutrition, also referred to as wasting and/or edema, is an indicator of recent or current undernutrition and is typically measured using weight-for-height or mid-upper arm circumference (MUAC) or presence of bilateral edema. Acutely malnourished children are at significantly increased risk of mortality compared with their well-nourished peers. The prevalence of wasting (low weight-for-height) among children under five in LIFT program areas is about 8%. Unlike stunting, younger children are more likely to be wasted than older children are. In fact, almost 14% of children 12 to 23 months are acutely malnourished.

Figure 1 illustrates the different patterns of undernutrition by age in the LIFT survey sample. Wasting disproportionately affects younger children and stunting older children. In longitudinal studies, instances of wasting or poor weight gain are risk factors for linear growth retardation (stunting). Children who experience wasting, have a highly variable weight-for-length z-score, or negative changes in their weight-for-length z-score in early childhood are at higher risk for stunting than are their well-nourished peers (Richard et al., 2012). Therefore, preventing wasting is likely to have a positive impact on stunting, though this will not address the entire problem of stunting.

Low weight-for-age, or underweight, is a composite measure that will identify children with wasting or stunting. The prevalence of underweight among children under five in LIFT program areas is about 32%. The prevalence of underweight is highest among children under-two years of age, with nearly 40% of children 12 to 23 month olds being underweight.

3.1.1. Stunting

Figure 2 presents the prevalence of stunting among children under five in LIFT program areas and by zone, along with the

WHO classifications of the severity of malnutrition. The level of stunting is high or very high in all zones. The prevalence of stunting is significantly higher in the Uplands (45%) than in the Dry and Coastal/Delta Zones (both about 34%).

Table 4 presents the prevalence of stunting among children under five in each zone by age group. The prevalence of stunting is highest among children 24 to 47 months of age in all three zones. The rate of stunting levels off or decreases by about 36 months

Table 4: Prevalence of stunting (%) among children under-five by age group in total sample and by zone[1]

Age (months)	TOTAL	Uplands	Dry Zone	Coastal/ Delta Zone	Number of Children
0-5	**10.0*****	15.7***	4.4***	10.1***	261
6-11	**14.0*****	17.9***	10.9***	4.3***	285
12-23	**35.0*****	42.7***	30.0***	26.1***	658
24-35	**47.8*****	60.0***	35.6***	50.5***	751
36-47	**51.5*****	53.1***	51.2***	44.2***	788
48-59	**43.9*****	50.1***	40.4***	34.5***	722
Total	**38.9**	**45.1*****	**33.9**	**33.9**	
Number of children	**3465**	1331	1003	1131	3465

*p< 0.05; **p< 0.01; ***p< 0.001

[1] Asterisks in all rows except "Total" indicate a significant difference between age groups. Asterisks in the "Total" row indicate a significant difference between zones.

in the Uplands and the Coastal/Delta Zone and by about 48 months in the Dry Zone.

Using simple logistic regression, risk factors for stunting in LIFT program areas were identified from the independent variables available in the LIFT 2013 Household Survey datasets.[5] Table 5 presents all significant risk factors, with their respective sample sizes (n), level of significance (p-value), odds-ratio, and 95% confidence interval.

Underweight is a risk factor for both stunting and wasting in all zones, which is not surprising given the relationship that weight-for-age (underweight) has with height-for-age (stunting) and weight-for-height (wasting). This finding was not included in the results of logistic regression because it does not provide any additional insight into the contributing factors to undernutrition in LIFT program areas.

There are a number of risk factors with small but significant associations with stunting in LIFT program areas, underscoring the fact that nutritional status is affected by a variety of factors at the individual, household and community levels. Households in the Uplands (especially Chin State), ethnic-minority, non-Buddhist households, and households with more children under five are more likely to have a stunted child. Recent incidence of diarrhea, low monthly household income (less than 75,000 MMK), and larger household size are also associated with stunting in LIFT program areas. Interestingly, children living in households with a safe drinking water source were more likely to be stunted than children with an unsafe drinking water source. However, this measure does not account for potential contamination of drinking water during storage and handling. Improper

5 Only statistically significant risk factors are presented.

Table 5: Risk factors for stunting among children under five in LIFT program areas (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Residence in Chin State[1]	2.837	(2.333, 3.452)	0.000	3465
Religion other than Buddhist	2.353	(1.995, 2.783)	0.000	3465
Additional child under 5 in household [1]	2.205	(1.942, 2.505)	0.000	3465
Ethnicity other than Burmese[1]	1.949	(1.7, 2.237)	0.000	3465
Residence in the Uplands	1.898	(1.652, 2.182)	0.000	3465
Residence outside the Coastal/Delta	1.513	(1.305, 1.751)	0.000	3465
Residence outside Magway Region	1.490	(1.231, 1.808)	0.000	3465
Diarrhea in the past two weeks	1.471	(1.219, 1.776)	0.000	3465
Residence outside the Dry Zone	1.364	(1.171, 1.59)	0.000	3465
Residence in Shan South	1.347	(1.082, 1.678)	0.008	3465
Low monthly income (≤75000)[1]	1.337	(1.159, 1.544)	0.000	3465
Larger household size (>5 members)	1.316	(1.141, 1.519)	0.000	3465
Safe drinking water source	1.230	(1.072, 1.411)	0.000	3465

[1] Significant association with stunting in both multiple and simple logistic regression

Figure 3: Prevalence of stunting by age group in each zone

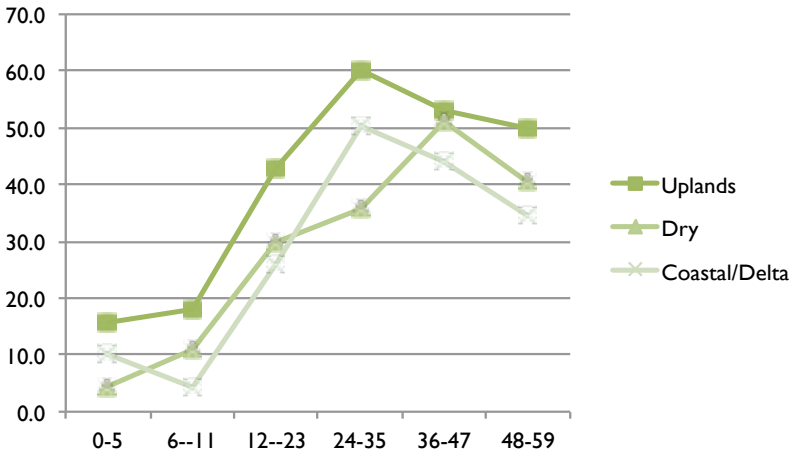
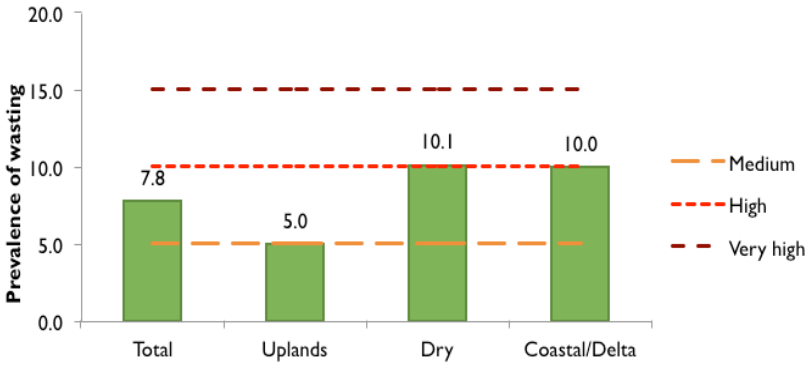


Figure 4: Prevalence of wasting by zone, with WHO classifications of severity



treatment of drinking water was not found to be a significant risk factor for stunting in this analysis.

As a complement to Table 5, Annex 2 includes a detailed breakdown of the prevalence of undernutrition by each risk factor identified through regression analysis.

3.1.2. Wasting

Figure 4 presents the prevalence of wasting or acute malnutrition among children under five in LIFT program areas by zone, including WHO classifications of the severity of the problem. The prevalence of wasting is significantly lower in the Uplands (5%) than in the Dry and Coastal/Delta Zones (about 10% in both).

Table 6 displays the prevalence of wasting by child age in the total sample and by zone. In LIFT program areas, children 6 to 23 months of age are most likely to be wasted. This pattern is not uncommon, as during this time young children are being introduced to solid foods and increasingly exposed to disease-causing pathogens in their food and environments. The high

Table 6: Prevalence of wasting (%) among children under five by age group in total sample and by zone

Age (months)	TOTAL	Uplands	Dry Zone	Coastal/ Delta Zone	Number of Children
0-5	8.9***	10.0**	5.5**	21.1	284
6-11	12.1***	6.9*	16.8	25.2*	375
12-23	13.5***	9.3**	17.7***	12.5*	782
24-35	5.8***	1.7**	10.1**	5.6*	796
36-47	4.0***	1.0*	6.8**	4.8	819
48-59	4.7***	5.2	4.1	6.5	760
Total	7.8	5.0***	10.1	10.0	
Number of children	3816	1520	1064	1232	3816

*p< 0.05; **p< 0.01; ***p< 0.001

[1] Asterisks in all rows except "Total" indicate a significant difference between age groups. Asterisks in the "Total" row indicate a significant difference between zones.

Figure 5: Prevalence of wasting among children under five in the Uplands, Dry and Delta/Coastal Zones

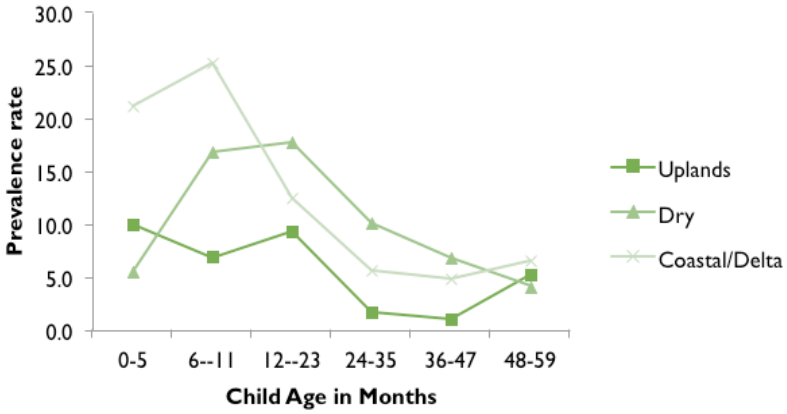
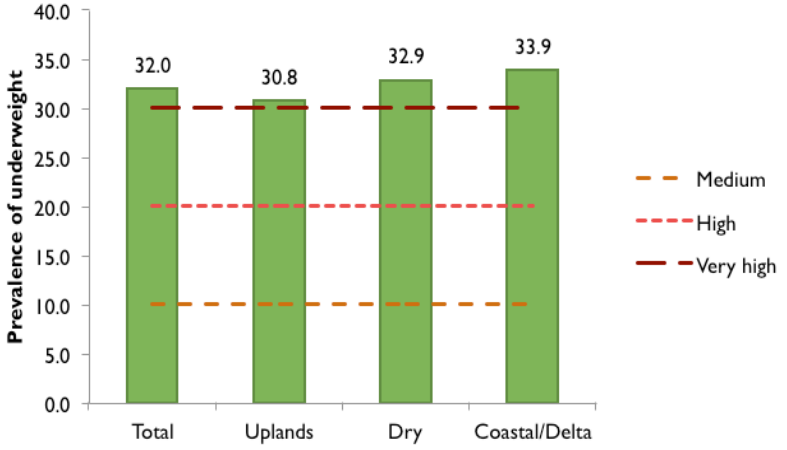


Figure 6: Prevalence of underweight by zone, with WHO classifications of severity



prevalence of wasting among children 6 to 23 months of age also suggests that complementary foods being provided to young children are inadequate to support their growth and development.

As can be seen in Figure 5, the prevalence of wasting among children under-one year of age the Coastal/Delta Zone is extremely high. After one year, the prevalence of wasting declines and continues to decline among older children. In the Uplands, the highest prevalence of wasting is seen among children under-six months of age. These patterns suggest that exclusive breastfeeding, which provides babies with all the nutrition they need for the first six months and protects them against disease, is not being widely practiced in these areas.

Table 7 presents risk factors for wasting among children under five in LIFT program areas. Children living in the Uplands (especially Chin State) are significantly less likely to be wasted than children living in the Dry Zone or Coastal/Delta Zone. Unlike stunting, households with fewer children under five are more likely to have a child with acute malnutrition. Ineffective or no treatment of drinking water is also a risk factor for wasting. Children living in LIFT villages and in households with bene-

Table 7: Risk factors for wasting among children under-five in LIFT program areas (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Residence in Chin state[1]	4.202	(2.443, 7.235)	0.000	3816
Buddhist	2.541	(1.755, 3.682)	0.000	3816
Residence outside the Uplands [1]	2.439	(1.842, 3.226)	0.000	3816
Burmese ethnicity	2.311	(1.774, 3.012)	0.000	3816
Residence in Mandalay Region	1.751	(1.218, 2.516)	0.002	3816
Residence in Sagaing Region	1.746	(1.099, 2.772)	0.018	3816
Residence outside Shan (South)	1.610	(1.011, 2.569)	0.045	3816
Residence in Dry Zone	1.589	(1.241, 2.034)	0.000	3816
Unsafe drinking water source	1.531	(1.208, 1.941)	0.000	3816
Residence in Coastal/Delta Zone	1.472	(1.157, 1.874)	0.002	3816
One less child under 5 in household [1]	1.458	(1.166, 1.823)	0.001	3816
Ineffective/no treatment of drinking water	1.387	(1.094, 1.758)	0.007	3816
Residence in comparison village	1.374	(1.062, 1.775)	0.015	3816
Not a LIFT beneficiary household[1]	1.364	(1.013, 1.654)	0.039	3816

[1] Significant association with wasting in both multiple and simple logistic regression

ficiaries of LIFT projects are less likely to be wasted than children living in comparison villages and households not involved with LIFT projects.

3.1.3. Underweight

As illustrated in Figure 6, the underweight prevalence in all three zones is considered "very high" by WHO standards. The rate of underweight is significantly higher in the Coastal/Delta Zone (about 34%) than in the Uplands and Dry Zone (about 31% and 33% respectively). Table 8 provides a detailed breakdown of the prevalence of underweight by age in each zone and in the total sample.

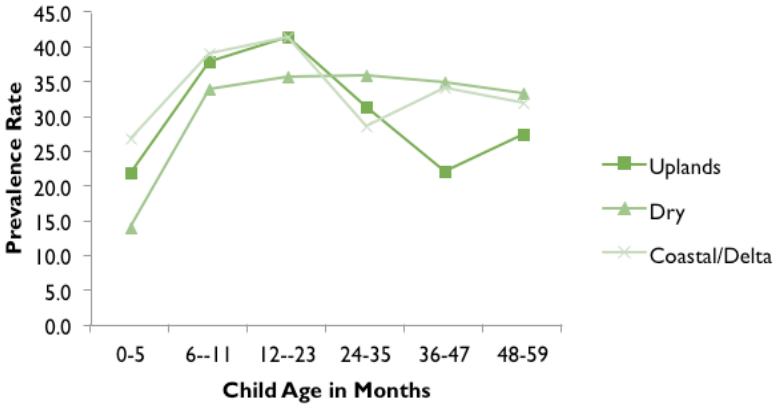
Table 8: Prevalence of underweight (%) among children under five by age group in total sample and by zone

Age (months)	TOTAL	Uplands	Dry Zone	Coastal/ Delta Zone	Number of Children
0-5	**18.6*** **	21.8	14.0***	26.8**	311
6-11	**36.4*** **	37.8***	33.9	39.1*	379
12-23	**38.8*** **	41.4***	35.7***	41.4**	783
24-35	**33.3*** **	31.4***	35.8***	28.5**	791
36-47	**29.1*** **	22.0***	34.9**	34.0	819
48-59	**30.7*** **	27.4***	33.2*	31.9	745
Total	**32.0**	**30.8*** **	**32.9**	**33.9*** **	
Number of children	**3828**	1521	1081	1226	3828

*p< 0.05; **p< 0.01; ***p< 0.001

[1] Asterisks in all rows except "Total" indicate a significant difference between age groups. Asterisks in the "Total" row indicate a significant difference between zones.

Figure 7: Prevalence of underweight among children under five in Uplands, Dry, and Coastal/Delta Zones



As can be seen in Figure 7, there is no clear pattern in the prevalence of underweight by age, perhaps because underweight is a composite measure that will identify either an acutely or chronically undernourished child. In general, the prevalence of underweight is lowest among infants under-six months of age, though even in this age group about 18.5% already have low weight for their age.

Table 9 presents significant risk factors for underweight identified through simple logistic regression. Stunting and wasting are not surprisingly significant risk factors for underweight. Households with more children under five are more likely to have an underweight child, as well as non-Buddhist, larger, ethnic minority households with lower monthly income. Recent incidence of diarrhea and inadequate dietary diversity were also found to be significant risk factors for underweight in LIFT program areas. LIFT beneficiary households were more likely to have an underweight child than households not involved with LIFT, which could be because worse-off households are preferentially selected as beneficiaries.

3.1.4. Diarrhea

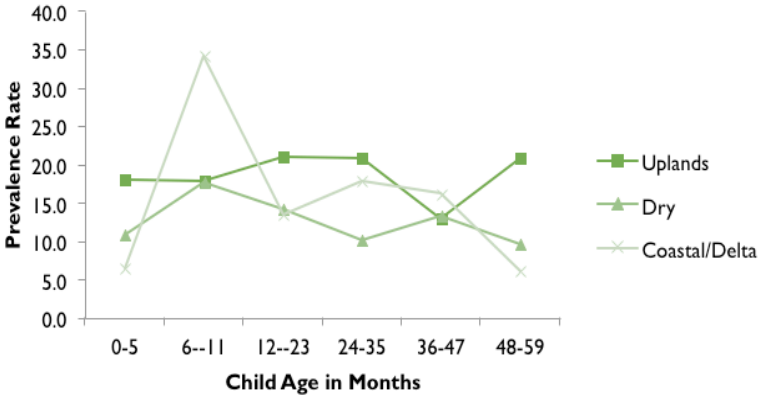
Frequent illness can initiate growth faltering among infants and young children and is

Table 9: Risk factors for underweight among children under-five in LIFT program areas (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Stunted[1]	13.999	(11.621, 16.864)	0.000	3828
Wasted[1]	6.740	(5.132, 8.85)	0.000	3828
Additional child under-five in household	2.501	(2.233, 2.803)	0.000	3828
Residence outside Shan (South)	2.457	(1.817, 3.323)	0.000	3828
Ethnicity other than Shan	2.410	(1.706, 3.401)	0.000	3828
Residence in Chin State	2.362	(1.983, 2.811)	0.000	3828
Religion other than Buddhist	1.957	(1.676, 2.284)	0.000	3828
Diarrhea in the past two weeks[1]	1.818	(1.518, 2.169)	0.000	3828
Larger household size (>5)[1]	1.549	(1.338, 1.795)	0.000	3828
Inadequate dietary diversity (IDDS < 4)	1.420	(1.06, 1.9)	0.019	3828
Residence outside Coastal/Delta Zone	1.321	(1.141, 1.531)	0.000	3828
Ethnicity other than Burmese	1.305	(1.141, 1.495)	0.000	3828
Lower monthly income (≤75,000 MMK)	1.264	(1.096, 1.459)	0.001	3828
Residence in the Uplands	1.240	(1.081, 1.422)	0.000	3828
LIFT beneficiary household	1.208	(1.055, 1.383)	0.006	3828
Lower wealth quintile	1.068	(1.017, 1.122)	0.008	3828

[1] Significant association with underweight in both multiple and simple logistic regression

Figure 8: Prevalence of diarrhea in each zone by age group



an immediate contributing factor to undernutrition. Contamination of food or water due to poor sanitation and hygiene often leads to illness, which in turn leads to a depressed appetite. As the child weakens due to the infection and inadequate food intake resulting from a loss of appetite, growth and cognitive development may be affected. Furthermore, the child is more likely to become sick again in this weakened state, effectively repeating the cycle.

Table 10 presents the proportion of children under five whose caregivers reported that they had suffered from diarrhea in the two weeks preceding the 2013 LIFT Household Survey. This measure of disease prevalence is subjective and to a certain extent dependent on the caregives' knowledge and awareness of their child's health status. Furthermore, the diarrhea incidence rate can be affected by seasonality. Depending on the context, diarrhea can either be more common in the rainy season (when standing water is present or water quality is poor) or the dry season (when water for washing is scarce).

About 15% of children in LIFT program areas reportedly had diarrhea in the past two weeks. The prevalence of diarrhea was significantly higher in the Uplands (about 19%) than in the Dry and Coastal/Delta Zones (about 12% and 15% respectively).

The prevalence of diarrhea also varies by age. In all LIFT program areas, the prevalence of diarrhea was highest among children 6 to 23 months of age, suggesting that young children are exposed to disease-causing bacteria in complementary foods as they begin eating and in the household environment as they become mobile. The highest estimated prevalence of diarrhea in any age group is among children 6 to 11 months of age in the Coastal/Delta Zone at about 34%.

Table 10: Prevalence of diarrhea (%) among children under-five by age group in the total sample and by zone

Age (months)	TOTAL	Uplands	Dry Zone	Coastal/ Delta Zone	Number of Children
0-5	**13.8***	18.1	10.8	6.5	417
6-11	**18.9****	17.9	17.7	34.1**	397
12-23	**17.2****	21.0	14.2	13.5**	800
24-35	**15.8***	20.9	10.1	17.8*	818
36-47	**13.4****	13.0	13.3	16.2	849
48-59	**14.1****	20.8	9.6	6.1**	786
Total	**15.4**	**18.6*****	**12.3**	**14.6**	
Number of children	**4067**	1641	1137	1289	4067

*p< 0.05; **p< 0.01; ***p< 0.001

[1] Asterisks in all rows except "Total" indicate a significant difference between age groups. Asterisks in the "Total" row indicate a significant difference between zones.

Table 11 presents risk factors for diarrhea among children under five in LIFT program areas. Children living in Chin State are 2.8 times more likely to have had an episode of diarrhea in the past two weeks than children living in other states and regions. Ethnic minority (except Shan) and non-Buddhist households are also more likely to have a child who recently had diarrhea. Children in the Dry Zone and Coastal/Delta are less likely to suffer from diarrhea than are children in the Uplands. Low monthly income, more children under five, and small plot size were also positively associated with diarrhea, along with residence in a small, remote village. Male children are more at risk for diarrhea than female children in LIFT program areas are. Despite what is known about the relationship between unsafe water and diarrhea, children with a safe water source were actually more likely to have had diarrhea in the past two weeks. Water source did not appear as a significant risk factor for diarrhea in multiple logistic regression (Annex 2), suggesting that another variable is confounding the relationship between water source and diarrhea.

Table 11: Risk factors for diarrhea among children under five in LIFT program areas (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Residence in Chin state[1]	2.809	(2.309, 3.418)	0.000	4067
Religion other than Buddhist	2.203	(1.833, 2.649)	0.000	4067
Residence out of Sagaing Region [1]	2.105	(1.234, 3.597)	0.006	4067
Ethnicity other than Shan	2.041	(1.28, 3.253)	0.003	4067
Residence outside Shan (North)	1.949	(1.309, 2.9)	0.001	4067
Ethnicity other than Burmese	1.845	(1.549, 2.196)	0.000	4067
Underweight[1]	1.815	(1.518, 2.169)	0.000	3828
Residence in The Uplands	1.812	(1.524, 2.152)	0.000	4067
Stunted	1.471	(1.219, 1.776)	0.000	3465
Residence out of Coastal/Delta Zone	1.462	(1.202, 1.779)	0.000	4067
Residence out of Dry Zone	1.435	(1.17, 1.759)	0.001	4067
Residence outside Magway Region	1.379	(1.063, 1.791)	0.016	4067
Lower monthly income (≤75,000 MMK)	1.346	(1.117, 1.621)	0.002	4067
Farther distance to nearest RHC (> 1 mile)	1.255	(1.056, 1.491)	0.01	4067
Male (child)	1.241	(1.044, 1.475)	0.014	4067
Safe drinking water source	1.236	(1.036, 1.475)	0.019	4067
Smaller plot of land (≤1 acre)	1.232	(1.029, 1.476)	0.023	4067
Residence in a village with electricity	1.189	(1.009, 1.424)	0.040	4067
Additional child under-5 in household	1.189	(1.043, 1.356)	0.010	4067
Farther distance to nearest town	1.146	(1.059, 1.239)	0.001	4067
Younger caregiver[1]	1.125	(1.007, 1.255)	0.036	4067
Residence in village with small population[1]	1.122	(1.052, 1.197)	0.001	4067

[1] Significant association with diarrhea in both multiple and simple logistic regression

3.1.5. Dietary diversity

Unlike household dietary diversity (HDDS), which is used to measure a household's socioeconomic access to food, IDDS is used as a proxy measure of the quality of an individual's diet. IDDS is a useful indicator for several reasons including, among others, the fact that a more diversified diet is an important outcome in and of itself and is associated with a number of improved health outcomes including birth weight, child anthropometric status and hemoglobin concentrations (Swindale & Bilinsky, 2006).

Table 12: Proportion of children 6 to 23 months of age with minimum dietary diversity (MDD) and mean IDDS in LIFT program areas and by zone

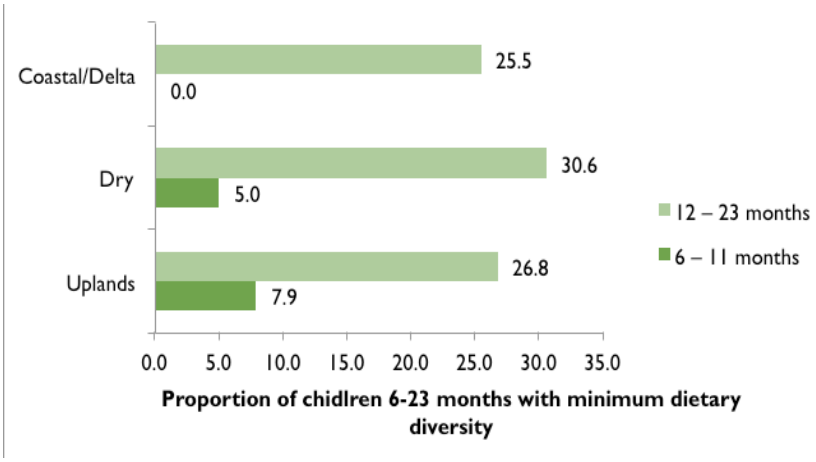
Age (months)	Total		Uplands		Dry Zone		Coastal/Delta		Number of Children
	MDD (%)	**Mean IDDS**	**MDD (%)**	**Mean IDDS**	**MDD (%)**	**Mean IDDS**	**MDD (%)**	**Mean IDDS**	
6-11	6.2***	1.7***	7.9***	1.7***	5.0***	1.6***	0.01***	1.9***	397
12-23	28.4***	2.8***	26.8***	2.8***	30.6***	2.9***	25.5***	2.7***	800
Total	**20.9**	**2.4**	**19.6**	**2.4**	**22.7**	**2.5**	**18.3**	**2.5**	
Number of Children	1197	1197	510	510	340	340	347	347	1197

*p< 0.05; **p< 0.01; ***p< 0.001

[1] Asterisks in all rows except "Total" indicate a significant difference between age groups. Asterisks in the "Total" row indicate a significant difference between zones.

Dietary diversity among children 6 to 23 months of age in LIFT program areas is extremely poor. Table 12 presents the mean IDDS and the proportion of children in the total sample and in each zone that have at least the minimum dietary diversity (MDD) recommended, having consumed foods from at least four food groups in the past 24 hours. Only about 21% of children 6 to 23 months of age in LIFT program areas have adequate dietary diversity, with a mean IDDS of only 2.4. Disaggregating by age reveals that younger children are far less likely to receive an adequately diverse diet than older children are. In fact, only 6% of children 6 to 11 months of age have reached the minimum IDDS of four or more.

Figure 9: Proportion of children 6 to 23 months of age with minimum dietary diversity in each zone



The proportion of children 6 to 23 months of age receiving an adequately diverse diet is highest in the Dry Zone, but the differences between zones are not significant.

Figure 9 illustrates the substantial difference in the quality of child diets by age group. For younger children, the situation is best in the Uplands (though still unacceptably poor). In the Coastal/Delta Zone almost no children 6 to 11 months of age receive an adequately diverse diet. Older children are more likely to receive an ade-

quately diverse diet, but still less than a third of all children in any zone have consumed four or more food groups in the past 24 hours.

Table 13 presents significant contributing factors to adequate dietary diversity among children 6 to 23 months of age in LIFT program areas. Logistic regression revealed that children's diets are particularly poor in Chin State and better in Kachin, Sagaing, and Shan (North). Households with higher monthly income, Buddhist households, and those with better-educated caregivers and fewer children under five were more likely to have a child with an adequately diverse diet. Children living in households with larger plots of land for cultivation were also more likely to have adequate dietary diversity, demonstrating the link between land ownership and food security in LIFT program areas.

Table 13: Contributing factors to minimum dietary diversity among children 6 to 23 months of age in LIFT program areas (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Residence outside Chin state[1]	4.184	(2.333, 3.452)	0.000	3465
Residence in Kachin State	2.586	(1.995, 2.783)	0.000	3465
Residence in Sagaing Region[1]	2.389	(1.942, 2.505)	0.000	3465
Higher monthly income (>75,000 MMK)[1]	2.017	(1.7, 2.237)	0.000	3465
Residence in Shan State (north)	1.683	(1.652, 2.182)	0.000	3465
Residence in a comparison village	1.653	(1.305, 1.751)	0.000	3465
Buddhist	1.648	(1.231, 1.808)	0.000	3465
Higher education level of caregiver	1.621	(1.219, 1.776)	0.000	3465
Larger plot size (> 1 acre)	1.615	(1.171, 1.59)	0.000	3465
Not underweight	1.420	(1.082, 1.678)	0.008	3465
One less child under-5 in household	1.353	(1.159, 1.544)	0.000	3465
Higher wealth quintile[1]	1.151	(1.141, 1.519)	0.000	3465

[1] Significant association with minimum dietary diversity in both multiple and simple logistic regression

Figure 10: Prevalence of undernutrition among children under-five in Uplands states: Chin, Kachin, Shan (South) and Shan (North)

3.2. Uplands

This section presents data on the prevalence of undernutrition and contributing factors to nutritional status (diarrhea and dietary diversity) in the Uplands along with significant risk factors. Figure 10 presents estimates of the prevalence of stunting, wasting and underweight in Chin, Kachin, Shan (South) and Shan (North). Stunting is a major public health problem in the Uplands states. The prevalence is highest in Chin State, where more than half of all children under five are stunted. Stunting was found to be lowest in Shan (North),

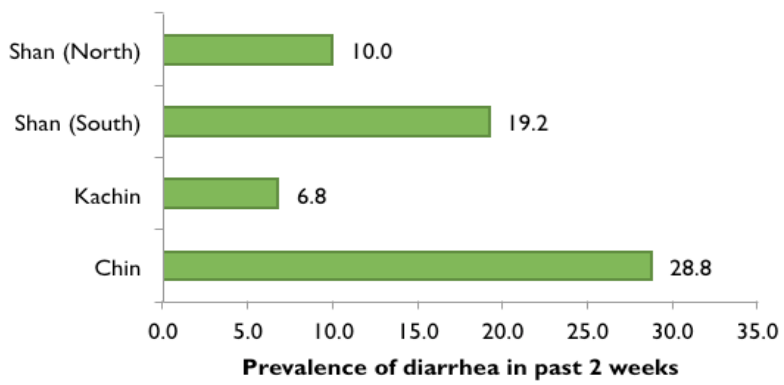
Nan Ohn Khin tends to her family's home garden in Honar Village, Hopone Township, Shan State. Her family received technical support and seeds from Metta. Photo Credit: Elizabeth Whelan/ LEARN

where still more than one-third of all children under five are too short for their age. The prevalence of acute malnutrition is lower in the Uplands than in the Dry and Coastal/ Delta Zones. In fact, only about 2% of children under five in Chin State are wasted. The rates of wasting in Kachin, Shan (South) and Shan (North) are higher at around 6.5% in each state.

As can be seen in Figure 11, the prevalence of diarrhea is also substantially higher in Chin State (about 29%) than in other states in the Uplands. Diarrhea prevalence was lowest among children in Kachin State at about 7%.

As can be seen in Figure 12, dietary diversity among children 6 to 23 months of age is low in all four states but particularly poor in Chin State, where only 4% of children receive an adequately diverse diet. The situation is better in Kachin, but still only about 35% of children have an IDDS of four or more.

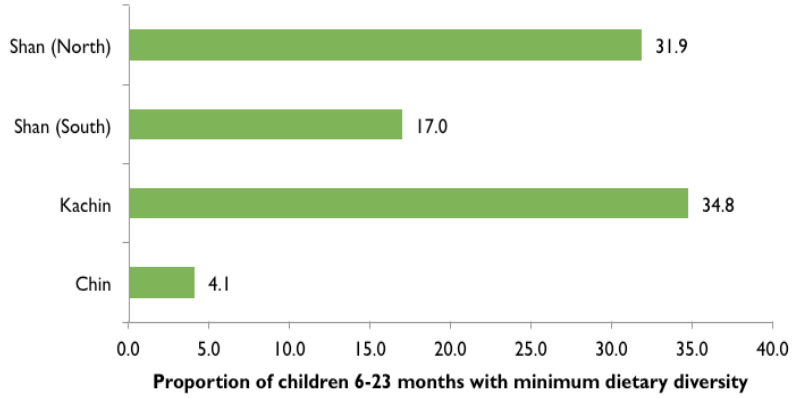
Figure 11: Prevalence of diarrhea among children under-five in Uplands states: Chin, Kachin, Shan (South) and Shan (North)



3.2.1. Risk factors for undernutrition in the Uplands

This section will present risk factors for undernutrition among children under five in the Uplands that were identified through simple logistic regression.

Figure 12: Proportion of children 6-23 months with minimum dietary diversity in Uplands states: Chin, Kachin, Shan (South) and Shan (North)



Stunting

Table 14 shows that, in the Uplands, ethnic minority households with more children under five and lower monthly income in Chin State or other states besides Shan (North) are at increased risk of having a stunted child.

Recent incidence of diarrhea and unsafe drinking water source were also risk factors for stunting. Interestingly, proper treatment of drinking water was associated with increased risk of stunting in the Uplands, though this risk factor was not found to be significant in multiple logistic regression analysis (see Annex 2).

Table 14: Risk factors for stunting among children under-five in the Uplands (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Ethnicity other than Burmese[1]	2.985	(1.7, 5.257)	0.000	1331
Number of children under 5 in the household[1]	2.404	(1.999, 2.89)	0.000	1331
Residence in Chin State	2.225	(1.773, 2.794)	0.000	1331
Residence in state other than Shan (North)	2.165	(1.653, 2.828)	0.000	1331
Ethnicity other than Shan	1.976	(1.465, 2.669)	0.000	1331
Religion other than Buddhist	1.969	(1.583, 2.446)	0.000	1331
Lower monthly income income (≤75,000 MMK)[1]	1.493	(1.193, 1.865)	0.000	1331
Diarrhea in the past two weeks	1.406	(1.069, 1.85)	0.000	1331
Unsafe drinking water source	1.337	(1.003, 1.784)	0.048	1331
Larger household size (>5)	1.325	(1.046, 1.681)	0.020	1331
Proper treatment of drinking water	1.306	(1.042, 1.636)	0.020	1331
Lower wealth quintile (5 to 1)	1.214	(1.109, 1.329)	0.000	1331
Residence in a village with small population	1.093	(1, 1.193)	0.048	1331

[1] Significant association with stunting in both multiple and simple logistic regression

Wasting

Table 15 presents risk factors for wasting among children under five in the Uplands. Residence in a state other than Chin is the most important risk factor for wasting. Indeed the prevalence of wasting in Chin is lower than in any other state included in the 2013 LIFT Household Survey. Children in households that are not LIFT beneficiaries are more than twice as likely to be wasted as children in LIFT beneficiary households. Children residing in comparison villages were also 1.8 times more likely to be wasted than children in LIFT villages. Having a female caregiver, unsafe drinking water source

Table 15: Risk factors for wasting among children under-five in the Uplands (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Residence outside Chin State[1]	2.681	(1.473, 4.869)	0.001	1520
Not in a LIFT beneficiary household[1]	2.079	(1.161, 3.733)	0.014	1520
Female caregiver[1]	2.024	(1.094, 3.745)	0.025	1520
Unsafe drinking water source	1.923	(1.111, 3.329)	0.019	1520
Ineffective/no treatment of drinking water	1.862	(1.138, 3.043)	0.013	1520
Residence in comparison village	1.828	(1.098, 3.042)	0.020	1520
Buddhist	1.670	(1.013, 2.753)	0.044	1520

[1] Significant association with wasting in both multiple and simple logistic regression

and ineffective or no water treatment were also risk factors for acute malnutrition in the Uplands.

Underweight

Table 16 presents risk factors for underweight among children under five in the Uplands, many of which are also important contributors to stunting and wasting. Because of the high rate of stunting in Chin State, children in Chin are also at increased risk of underweight. Larger, ethnic minority, non-Buddhist households with more children are

Table 16: Risk factors for underweight among children under-five in the Uplands (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Stunted [1]	18.349	(12.649, 26.64)	0.000	1521
Wasted [1]	6.327	(3.508, 11.415)	0.000	1498
Residence outside Shan (north)	3.195	(2.331, 4.382)	0.000	1521
Additional child under 5 in household [1]	3.043	(2.581, 3.588)	0.000	1521
Ethnicity other than Shan	3.012	(2.111, 4.292)	0.000	1521
Residence in Chin State [1]	2.828	(2.281, 3.51)	0.000	1521
Religion other than Buddhist	2.646	(2.122, 3.292)	0.000	1521
Ethnicity other than Burmese	2.342	(1.264, 4.347)	0.007	1521
Larger household size (>5)	1.990	(1.545, 2.562)	0.000	1521
Diarrhea in the past two weeks[1]	1.811	(1.407, 2.332)	0.000	1521
Inadequate dietary diversity (IDDS < 4)	1.808	(1.073, 2.685)	0.011	489
Residence outside Shan (south)	1.541	(1.202, 1.978)	0.001	1521
Effective treatment of drinking water	1.487	(1.187, 1.863)	0.001	1521
Lower monthly income (≤75,000 MMK)	1.383	(1.109, 1.727)	0.004	1521
Smaller plot of land (≤1 acre)	1.359	(1.101, 1.675)	0.004	1521
Lower wealth quintile (5,4,3,2,1)	1.267	(1.165, 1.379)	0.000	1521

[1] Significant association with wasting in both multiple and simple logistic regression

Nint Oan teaches her son how to hold his 21-day old baby sister in Tha Kawt Moo Village, Hopone Township, Shan State. Photo Credit: Elizabeth Whelan/ LEARN

at greater risk of having an underweight child. Children in poor households with low monthly income and small plots of land for cultivation are also at increased risk of underweight.

Children with diarrhea in the past two weeks and inadequate dietary diversity are also more likely to be underweight. Again, the relationship between water treatment and undernutrition is not as expected.

3.2.2. Risk factors for diarrhea in the Uplands

As can be seen in Table 17, children living in ethnic minority households outside Shan (North) and especially in Chin are particularly at risk of diarrhea. Poor households with low monthly income, small plots of land for cultivation residing in small, remote villages are more likely to have a child with a recent episode of diarrhea. Additionally, stunted and underweight children are more likely to have had diarrhea recently. However, wasting was not found to be significantly associated with diarrhea in the Uplands.

3.2.3. Contributing factors to minimum dietary diversity in the Uplands

As can be seen in Table 18, children in Chin State are at particular risk of having an inadequate diet. In fact, a child 6 to 23 months of age residing in Shan State or Kachin State is nearly five times more likely to meet the threshold for minimum dietary diversity than a child in Chin State. Children in households with higher income that are Buddhist and possess larger land plots are also more likely to have an adequately diverse diet. Children in comparison villages are more likely to have adequate dietary diversity than children in LIFT villages. Children who are not underweight are 1.8 times more likely

Table 17: Risk factors for diarrhea among children under-five in the Uplands (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Ethnicity other than Burmese[1]	8.333	(2.034, 34.335)	0.003	1641
Ethnicity other than Shan[1]	3.077	(1.917, 4.95)	0.000	1641
Residence outside Shan (North)	3.040	(2.02, 4.566)	0.000	1641
Residence in Chin state[1]	2.513	(2.102, 3.459)	0.000	1641
Religion other than Buddhist	2.058	(1.596, 2.656)	0.000	1641
Residence outside Kachin state	1.919	(1.251, 2.951)	0.000	1641
Lower monthly income (≤75,000 MMK)	1.629	(1.247, 2.125)	0.000	1641
Small plot of land (≤1 acre)	1.623	(1.265, 2.081)	0.000	1641
Farther distance to nearest RHC (>1 mile)	1.560	(1.22, 1.992)	0.000	1641
Stunted	1.406	(1.069, 1.85)	0.015	1331
Younger caregiver[1]	1.321	(1.131, 1.542)	0.000	1641
Residence in a village with small population[1]	1.259	(1.14, 1.392)	0.000	1641
Lower wealth quintile	1.247	(1.136, 1.372)	0.000	1641
Underweight	1.233	(0.429, 0.711)	0.000	1521
Farther distance to town[1]	1.204	(1.088, 1.334)	0.000	1641

[1] Significant association with diarrhea in both multiple and simple logistic regression

Table 18: Contributing factors to minimum dietary diversity among children 6-23 months of age in the Uplands (results of simple logistic regression)

Explanatory variable	(n)	p-value	Odds-ratio	95% CI
Residence outside Chin State[1]	510	0.000	4.926	(2.708, 8.951)
Residence in Kachin State	510	0.000	3.316	(1.89, 5.821)
Higher monthly income (>75,000 MMK)[1]	510	0.000	2.490	(1.592, 3.892)
Residence in Shan State (North)	510	0.002	2.175	(1.332, 3.55)
Buddhist	510	.004	1.957	(1.245, 3.079)
Larger plot size (>1 acre)	510	0.007	1.856	(1.187, 2.9)
Not underweight	510	0.011	1.808	(1.143, 2.859)
Residence in comparison village	510	.025	1.715	(1.068, 2.757)
Shan ethnicity	510	0.019	1.192	(1.113, 3.31)

[1] Significant association with dietary diversity in both multiple and single logistic regression

to have an adequate diet than children who are underweight.

3.3. Dry Zone

This section presents data on the prevalence of undernutrition and contributing factors to nutritional status in the Dry Zone along with significant risk factors for stunting, wasting, underweight, diarrhea and dietary diversity. Findings from this study are com-

Figure 13: Comparison of prevalence of undernutrition among children under five in the Dry Zone: LIFT (2013) and WFP (2014) household surveys

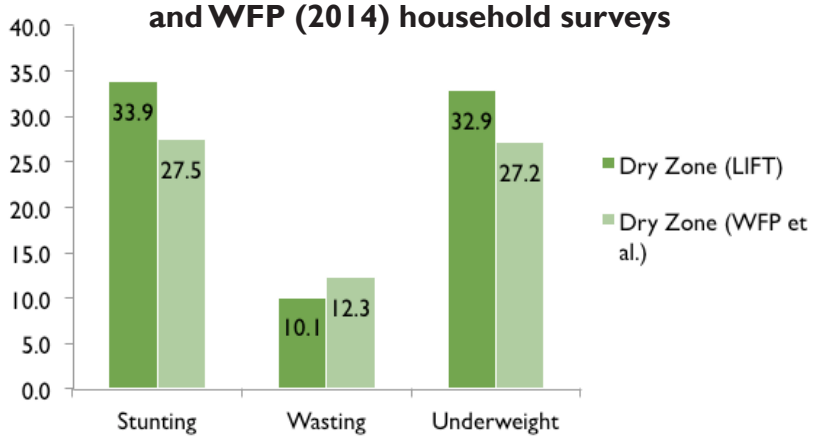


Figure 14: Prevalence of undernutrition in Dry Zone Regions: Sagaing, Magway, Mandalay

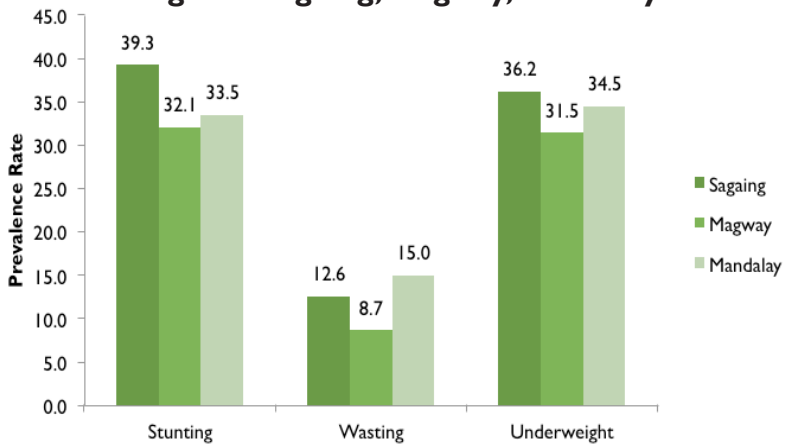


Figure 15: Prevalence of diarrhea among children under five in Dry Zone Regions and Dry Zone as a whole

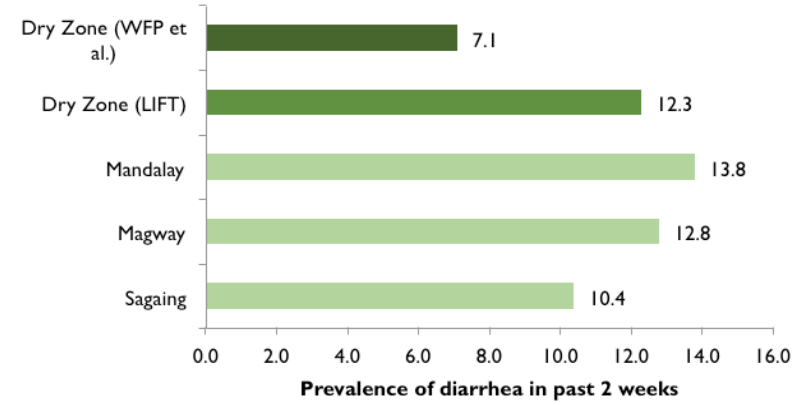
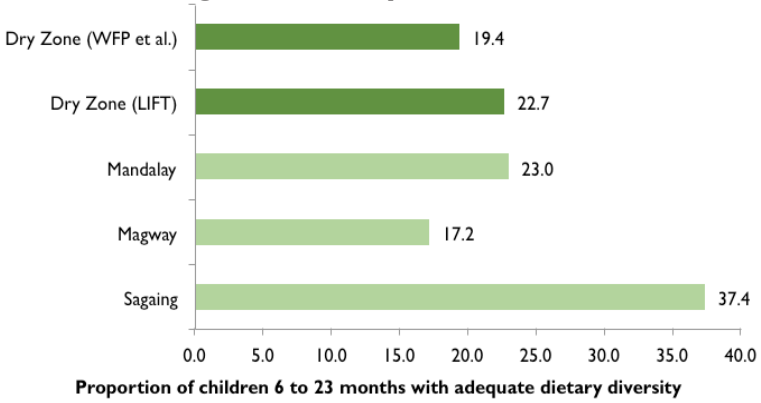


Figure 16: Proportion of children 6 to 23 months with adequate dietary diversity (IDDS > 3) in Dry Zone regions and Dry Zone as a whole



pared wherever relevant to results from the WFP et al. (2014) survey in the Dry Zone.

Figure 13 presents prevalence of undernutrition estimates for the Dry Zone (WFP et al., 2014) and for LIFT program areas in the Dry Zone (LIFT, 2013). Stunting seems to be more common and wasting less common in LIFT program areas than in the Dry Zone as a whole. However, seasonality may have affected estimates of undernutrition in the two surveys. The WFP et al. (2014) survey took place in the lean season (June – July) while the LIFT (2013) survey took place during months with better food availability (October – November). The results of both surveys indicate unacceptably high levels of undernutrition among children in the Dry Zone.[6]

Figure 14 presents the prevalence of stunting, wasting and underweight in LIFT program areas of Sagaing, Magway and Mandalay Regions. Stunting is highest in Sagaing Region at nearly 40%, while wasting is highest in Mandalay at 15%.

Figure 15 presents the prevalence of diarrhea in the Dry Zone as a whole (WFP et al., 2014) as well as in LIFT program areas in the Dry Zone and each region. An estimated 12% of children under five suffered from an episode of diarrhea in the two weeks preceding the LIFT (2013) survey. This rate is higher than the estimated 7% prevalence of diarrhea according to WFP et al. (2014). Again, incidences of diarrhea are reported by caregivers and therefore subjective.

Diarrhea seems to be most commonly reported in Mandalay Region (14%), where the highest prevalence of wasting was also found, and least common in Sagaing Region (10%).

Figure 16 presents the proportion of children 6 to 23 months of age in the Dry

6 Note that the 2013 LIFT Household Survey is representative only to LIFT program areas, while the WFP et al. (2014) Food Security and Nutrition Survey is representative to the entire Dry Zone.

A child sleeps in Mon Kan Village, Yaynanchaung Township, Dry Zone. Photo Credit: Elizabeth Whelan/ LEARN

Zone that have adequate dietary diversity. In LIFT program areas, about 23% of children 6 to 23 months of age consumed foods from four or more food groups in the past 24 hours (only 5% of children 6 to 11 months of age). This estimate is slightly higher than the 19.4% prevalence of minimum dietary diversity estimated by WFP et al. (2014), potentially due to seasonality. Dietary diversity seems to be best in LIFT program areas of Sagaing and worst in Magway.

3.3.1. Risk factors for undernutrition in the Dry Zone

This section will present significant risk factors for undernutrition among children under five in the Dry Zone. Wherever relevant, results will be compared with findings from the WFP et al. (2014) survey. The WFP et al. (2014) survey was a specifically designed to capture food security and nutrition trends and consequently collected data on numerous known determinants of child undernutrition, including maternal BMI and MUAC, access to and utilization of health services, and infant and young child feeding and care practices, among others. The LIFT (2013) survey did not include many of these variables, and risk factors are therefore not strictly comparable. However, when viewed together, data from the two surveys can help to better understand the nutrition situation in the Dry Zone.

Stunting

Table 19 presents significant risk factors for stunting among children under five in the Dry Zone that were identified through simple logistic regression. Children in larger households with more children under five and with caregivers with low education are more likely to be stunted. In fact, for each additional child under five in the household, a child is nearly twice as likely to be stunted.

According to WFP et al. (2014), children who are born with low birth weight are more than 10.7 times more likely to be stunted than children with normal birth weight are. Children whose mothers had higher BMI were less likely to be stunted. This under-

Table 19: Risk factors for stunting among children under five in the Dry Zone (Results of simple logistic regression)

Survey	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
LIFT (2013)	Additional child under 5 in household	1.989	(1.508, 2.62)	0.000	1003
	Lower education level of caregiver	1.453	(1.011, 2.089)	0.043	1003
	Larger household size (>5)	1.382	(1.035, 1.848)	0.029	1003
WFP et al. (2014)	Low birth weight	10.66	(2.47, 45.98)	0.002	120
	Wasting	1.68	(1.16, 2.42)	0.006	2030
	Mother's BMI	0.93	(0.87, 0.98)	0.014	1690
	Did not meet minimum meal frequency[2]	1.73	(1.07, 2.8)	0.025	548
	Adequate HDDS	0.43	(0.18, 0.99)	0.047	572

[1] Significant association with stunting in both multiple and single logistic regression; [2] Breastfed children only

scores the intergenerational effects of undernutrition and the importance of improving maternal nutrition during the pregnancy and pre-pregnancy period. Wasting was also found to be associated with stunting in the WFP et al. (2014) survey, as well as dietary behaviors at the household level. Indeed, children living in households with inadequate HDDS were 2.33 times more likely to be stunted than children living in households with adequate HDDS. Children who did not receive the adequate number of meals in the day before the survey were also 1.73 times more likely to be stunted than children who did (WFP et al., 2014).

Table 20 presents risk factors for stunting identified through linear regression. Linear regression was conducted only for LIFT (2013) data from the Dry Zone to allow for comparison with the WFP et al. (2014) Dry Zone survey. The outcome variable for this analysis was height-for-age z-score (HAZ), which is a continuous variable. All of

Table 20: Risk factors for stunting- Results of linear regression (Outcome variable= Height-for-age z-score)

Survey	Explanatory variable	Coef-ficient	95% CI	Coefficient of determina-tion (R2 %)	p-value	(n)
LIFT (2013)	Additional child under 5 in household	-0.459	(-0.665, -0.253)	1.9	0.000	1003
	WHZ	0.173	(0.069, 0.277)	1.1	0.001	1003
	Education level of caregiver	0.28	(0.025, 0.535)	0.5	0.031	1003
	Larger household size	-0.224	(-0.432, -0.016)	0.4	0.035	1003
	Residence in Sagaing Region	-0.275	(-0.53, -0.02)	0.4	0.034	1003
WFP et al. (2014)	Birthweight	0.28	(0.14, 0.43)	13.06	< 0.001	120
	Adequate HDDS	0.6	(0.07, 1.13)	2.15	0.027	572
	Adequate FCS	0.39	(0.07, 0.71)	1.77	0.016	572
	WHZ	0.12	(0.06, 0.18)	0.95	< 0.001	2030
	Diarrhea	-0.38	(-0.62, -0.15	0.69	0.001	2030
	Sickness	-0.2	(-0.35, -0.04)	0.57	0.012	2029

the risk factors identified through logistic regression were also identified through linear regression for the LIFT survey. Additionally, residence in Sagaing Region was found to be significantly, negatively associated with HAZ. In both the LIFT (2013) and WFP et al. (2014) surveys, low weight-for-height z-score (WHZ) was found to be associated with low HAZ, suggesting that wasting is a risk factor for stunting in the Dry Zone.
In the WFP et al. (2014) survey, birthweight was found to explain about 13% of all stunting in the Dry Zone (see coefficient of determination). Food access at the household level, as measured by HDDS and food consumption score (FCS), was also found to be a significant determinant of stunting in the WFP et al. (2014) survey.

Wasting

Table 21 presents risk factors for wasting among children under five in the Dry Zone identified through logistic regression analysis performed on the LIFT (2013) and WFP et al. (2014) datasets. There were few significant explanatory variables for wasting in both surveys. In LIFT areas of the Dry Zone, children with younger caregivers were 1.3 times more likely to be wasted than children with older caregivers. In the WFP et al. (2014) survey, children with poor diets were 3.2 times more likely to be wasted, while children whose mothers had higher BMI were less likely to be wasted.

Table 22 presents significant risk factors for wasting identified through linear regression on the dependent variable, weight-for-height z-score (WHZ). In the LIFT (2013)

Table 21: Risk factors for wasting among children under-five in the Dry Zone (results of simple logistic regression)

Survey	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
LIFT (2013)	Younger caregiver[1]	1.289	(1.001, 1.66)	0.048	1064
WFP et al. (2014)	No minimum adequate diet	3.24	(1.06, 9.9)	0.039	546
	Mother's BMI	0.93	(0.87, 0.98)	0.014	1690

[1] Significant association with wasting in both multiple and simple logistic regression

Table 22: Risk factors for wasting- Results of linear regression (Outcome variable= weight-for-height z-score)

Survey	Explanatory variable	Coef-ficient	95% CI	Coefficient of determina-tion (R2 %)	p-value	(n)
LIFT (2013)	HAZ	0.062	(0.025, 0.099)	1	0.001	1002
	Diarrhea in the past two weeks	-0.232	(-0.403, -0.061)	0.7	0.007	1064
	Higher age of caregiver	0.075	(0.004, 0.146)	0.3	0.036	1064
WFP et al. (2014)	Birth weight	0.20	(0.06, 0.34)	7.79	0.005	120
	Maternal BMI	0.03	(0.01, 0.05)	1.35	0.001	1690
	HAZ	0.08	(0.04, 0.12)	0.95	< 0.001	2030
	Proper disposal of child feces	-0.18	(-0.29, -0.06)	0.82	0.002	1805
	Hand washing with soap after latrine	0.17	(0.04, 0.31)	0.76	0.012	1486

sample, HAZ and WHZ were found to be associated, along with diarrhea incidence and caregiver age. Children in the Dry Zone who suffered from diarrhea recently, have younger caregivers, and have low HAZ scores are more likely to have low WHZ. The effect sizes for all explanatory variables were small but significant.

In the WFP et al. (2014) survey, birth weight was again an important predictor of child nutritional status. Maternal BMI, HAZ, and key hygiene practices of proper disposal of child feces and hand washing were also found to have a small but significant effect on weight-for-height z-scores.

Underweight

Table 23 presents risk factors for underweight among children under five in the Dry Zone identified through simple logistic regression. Not surprisingly, children who are stunted or wasted are more likely to be underweight. Children in larger households with more children under five who suffered from diarrhea recently are also more likely to be underweight. Low education of caregiver and residence in a village without electricity were also found to be risk factors for underweight in LIFT program areas in the Dry Zone. No risk factors for underweight were identified in the WFP et al. (2014) survey.

Table 23: Risk factors for underweight among children under-five in the Dry Zone (results of simple logistic regression)

Survey	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
LIFT (2013)	Stunted[1]	15.152	(10.942, 20.976)	0.000	1003
	Wasted[1]	9.551	(5.899, 15.474)	0.000	1058
	Additional child under-5 in household[1]	2.379	(1.844, 3.07)	0.000	1081
	Diarrhea in the past two weeks[1]	1.841	(1.276, 2.655)	0.001	1081
	Larger household size (>5)	1.662	(1.241, 2.226)	0.001	1081
	Low education of caregiver (lower than middle)	1.522	(1.065, 2.174)	0.021	1081
	No electricity in village	1.370	(1.046, 1.796)	0.022	1081

[1] Significant association with underweight in both multiple and single logistic regression

Table 24 presents explanatory variables significantly associated with weight-for-age z-score (WAZ) in the LIFT (2013) survey through linear regression analysis. Besides HAZ and WHZ, the number of children under five in the household was found to have the largest effect on WAZ. That is, a child is more likely to be underweight as the number of children under five in the household increases. Small but significant associations were also found between WAZ and household size, caregiver education, diarrhea incidence, and distance to nearest town.

3.3.2. Risk factors for diarrhea in the Dry Zone

Table 25 presents risk factors for diarrhea among children under five in the Dry Zone that were identified through simple logistic regression analysis. In LIFT program areas, children in non-Buddhist households participating in LIFT projects are more likely to have had an episode of diarrhea in the past two weeks. Underweight children are also

A child at home in Kamma Village, Pakkoku Township.
Photo Credit: Elizabeth Whelan/ LEARN

Table 24: Risk factors for underweight- Results of linear regression (Outcome variable= Weight-for-age z-score)

Survey	Explanatory variable	Coef-ficient	95% CI	Coefficient of determina-tion (R2 %)	p-value	(n)
LIFT (2013)	HAZ	0.607	(0.582, 0.632)	68.4	0.000	1003
	WHZ	0.773	(0.693, 0.853)	25.1	0.000	1058
	Additional child under-5 in household	-0.598	(-0.77, -0.426)	4.1	0.000	1081
	More household members	-0.343	(-0.531, -0.155)	1.2	0.000	1081
	Higher education level of caregiver	0.343	(0.114, 0.572)	0.8	0.003	1081
	Diarrhea in the past two weeks	-0.422	(-0.683, -0.161)	0.8	0.002	1081
	Distance to the nearest town	0.11	(0.002, 0.218)	0.4	0.047	1081

more at risk for diarrhea than children with normal weight-for-age are. In the WFP et al. (2014) survey, vitamin A supplementation and hygiene behaviors were found to be significantly associated with diarrhea. In fact, children who did not receive vitamin A supplementation were twice as likely to have had diarrhea recently than those who did, which is expected given that vitamin A is preventive against diarrhea.

Table 25: Risk factors for diarrhea among children under-five in the Dry Zone (results of simple logistic regression)

Survey	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
LIFT (2013)	Religion other than Buddhist[1] [2]	22.727	(2.331, 218.258)	0.007	1137
	Underweight[1]	1.841	(1.276, 2.655)	0.001	1137
	LIFT beneficiary household[1]	1.460	(1.016, 2.097)	0.040	1137
WFP et al. (2014)	No vitamin A supplementation	2.01	(1.13, 3.55)	0.017	1662
	Proper disposal of child feces	0.56	(0.33, 0.95)	0.003	1805
	Hand washing before meal preparation	0.25	(0.11, 0.60)	0.002	1681

[1] Significant association with diarrhea in both multiple and simple logistic regression;
[2] The sample size for non-Buddhists in the Dry Zone is very small (4 households-See Summary Table 5, Annex 1)

3.3.3. Contributing factors to minimum dietary diversity in the Dry Zone

TThis section presents contributing factors for adequate dietary diversity identified through simple logistic regression (with minimum dietary diversity as the outcome variable) and linear regression (with child IDDS as the outcome variable). As can be seen in Table 26, children 6 to 23 months of age in Sagaing Region are more likely to have adequate dietary diversity than children in Magway and Mandalay. Additionally, children in households with more land for cultivation have better dietary diversity.

Table 26: Contributing factors to adequate dietary diversity among children 6 to 23 months of age in the Dry Zone (results of simple logistic regression)

Survey	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
LIFT (2013)	Residence in Sagaing Region[1]	15.152	(10.942, 20.976)	0.000	1003
	Residence outside Magway Region	9.551	(5.899, 15.474)	0.000	1058
	Larger plot size (>1 acre)[1]	2.379	(1.844, 3.07)	0.000	1081

[1] Significant association with dietary diversity in both multiple and single logistic regression

As Table 27 illustrates, linear regression performed on LIFT (2013) data revealed that children in Sagaing Region have higher IDDS than children have in other regions and especially Magway. Children living in households with higher income (over 75,000 MMK per month) have better dietary diversity than children living in households with lower income have. Similarly, children living in households reporting months of inadequate food supply have lower IDDS than those have in households with sufficient food year round.

Maternal IDDS and household diet (as measured by FCS) were found to be significantly associated with child IDDS in the WFP et al. (2014) survey. Together, these findings suggest that interventions to improve household livelihoods and food access will result in improved diets for young children.

Table 27: Significant associations with child dietary diversity- Results of linear regression (Outcome variable= Child IDDS)

Survey	Explanatory variable	Coef-ficient	95% CI	Coefficient of determina-tion (R2 %)	p-value	(n)
LIFT (2013)	Residence in Sagaing Re-gion	0.615	(0.252, 0.978)	3.2	0.001	340
	More months with inade-quate food provisioning	-0.292	(-0.48, -0.104)	2.6	0.003	340
	High monthly income	0.419	(0.117, 0.721)	2.1	0.007	340
	Residence in Magway Re-gion	-0.403	(-0.691, -0.115)	1.9	0.006	340
WFP et al. (2014)	Maternal IDDS	0.29	(0.19, 0.39)	7.80	< 0.001	618
	FCS	0.02	(0, 0.03)	4.12	0.025	183

3.4. Coastal/Delta Zone

This section presents data on the prevalence of undernutrition and contributing factors to nutritional status in the Coastal/Delta Zone along with significant risk factors for stunting, wasting, underweight, diarrhea, and dietary diversity. In the LIFT (2013) survey, the Coastal/Delta Zone is composed of Ayeyarwaddy Region and Rakhine State. While these areas may be similar in terms of environment, weather patterns, and exposure to natural disasters, they also have key differences that call into question the usefulness of aggregating data from Ayeyarwaddy and Rakhine into one zone. For instance, the Coastal/Delta Zone is the only zone composed of an ethnic minority state (Rakhine) and a Burmese majority region (Ayeyarwaddy). Additionally, the nutrition security of households in Rakhine State is known to be worse in terms of WASH, access to health services, and educational attainment (see Part I of this report).

Figure 17 presents the prevalence of undernutrition among children under five in Ayeyarwaddy Region and Rakhine State. The rate of stunting and wasting is slightly lower in Ayeyarwaddy than Rakhine State, though the nutrition situation is poor in both areas. Nearly 12% of children in LIFT program areas of Rakhine State are acutely malnourished, compared with about 10% of children in LIFT program areas of Ayeyarwaddy Region. The prevalence of wasting in the Coastal/Delta Zone is higher than in the Uplands and about the same as the Dry Zone. More than one-third of all children under five in Rakhine and Ayeyarwaddy are stunted, which is lower than the Uplands and about the same as the Dry Zone.

Figure 17: Prevalence of undernutrition among children under-five in the Coastal/Delta Zone: Ayeyarwaddy Region and Rakhine State

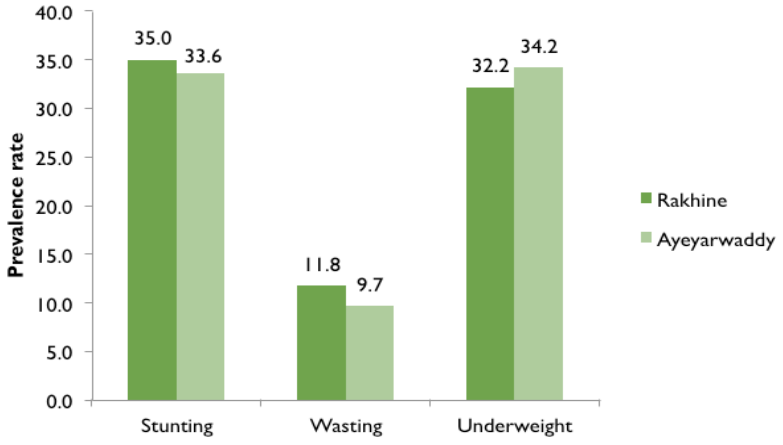


Figure 18 presents the prevalence of diarrhea among children under five in LIFT program areas of Ayeyarwaddy Region (14.7%) and Rakhine State (14.1%). The aggregate prevalence of diarrhea in the Coastal/Delta Zone is 14.6%, which is significantly higher than the Dry Zone

Figure 18: Prevalence of diarrhea among children under-five in the Coastal/Delta Zone: Ayeyarwaddy Region and Rakhine State

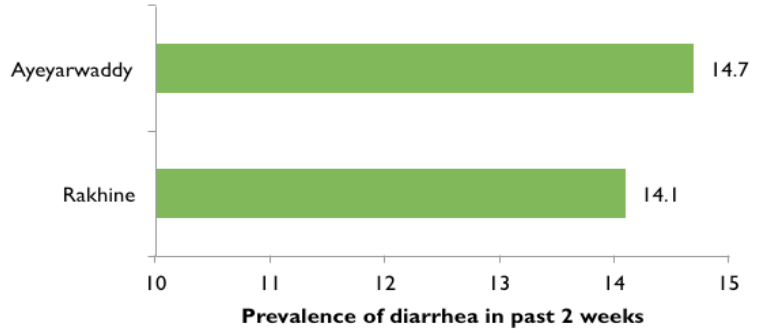
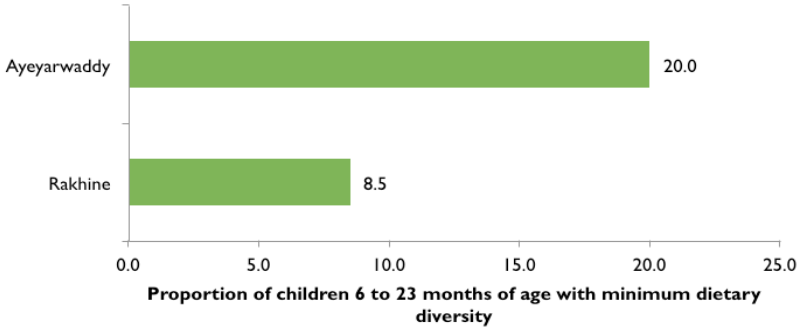


Figure 19: Proportion of children 6 to 23 months of age with minimum dietary diversity in the Coastal/Delta Zone: Ayeyarwaddy Region and Rakhine State



Tat Lan beneficiaries attend a nutrition education session in Lwan Oo Village, Pauk Taw Township, Rakhine State. Photo Credit: Elizabeth Whelan/ LEARN

(12.3%) and lower than the Uplands (18.6%).

Figure 19 presents data on the proportion of children 6 to 23 months of age in Rakhine and Ayeyarwaddy receiving an adequately diverse diet. While dietary quality is poor in both areas, the situation is far worse in Rakhine State, where less than 9% of children have adequate dietary diversity.

3.4.1. Risk factors for undernutrition in the Coastal/ Delta Zone

This section will present risk factors identified through simple logistic regression for undernutrition among children under five in the Coastal/Delta Zone.

Stunting

Table 28 presents significant risk factors for stunting in the Coastal/Delta Zone. Ethnic minority, and especially Kayin, chil-

dren are at increased risk of stunting compared with Burmese children. Households using ineffective or no water treatment of drinking water and low monthly income are also more likely to have a stunted child. Children living in LIFT beneficiary households are more likely to be stunted than children living in households not participating in LIFT projects, which could be due to selection bias. That is, worse-off households are more likely to be selected to participate in LIFT projects than better-off households.

Table 28: Risk factors for stunting among children under-five in the Coastal/Delta Zone (Results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Kayin ethnicity[1]	1.849	(1.133, 3.019)	0.014	1131
Additional child under-5 in household	1.507	(1.166, 1.948)	0.002	1131
Ethnicity other than Burmese	1.437	(1.04, 1.987)	0.028	1131
No effective water treatment	1.335	(1.039, 1.716)	0.024	1131
Lower monthly income (≤75,000 MMK)	1.302	(0.999, 1.697)	0.05	1131
LIFT beneficiary household	1.281	(0.999, 1.644)	0.05	1131

[1] Significant association with stunting in both multiple and single logistic regression

Wasting

Table 29 presents risk factors for wasting identified through simple logistic regression. Children in the Coastal/Delta Zone with diarrhea in the past two weeks were nearly twice as likely to be wasted as those that did not suffer from diarrhea. LIFT beneficiary households and residents in LIFT villages are less likely to be wasted than their peers living in non-beneficiary households and non-LIFT villages. Interestingly, the explanatory variable of "LIFT beneficiary" is directionally different for stunting and wasting. LIFT beneficiaries are more likely to be stunted, but less likely to be wasted.

Table 29: Risk factors for wasting among children under-five in the Coastal/Delta Zone (results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Diarrhea in the past two weeks	1.952	(1.203, 3.168)	0.007	1232
Not a LIFT beneficiary household	1.650	(1.101, 2.469)	0.015	1232
Residence in a comparison village[1]	1.616	(1.086, 2.406)	0.018	1232

[1] Significant association with wasting in both multiple and single logistic regression

Underweight

Table 30 presents risk factors for underweight among children under five in LIFT program areas of the Coastal/Delta Zone. Not surprisingly, stunted and wasted children are considerably more likely to be underweight than children with normal HAZ and WHZ. Children living in households with more children under five, ineffective or no method for treating drinking water, and low monthly income in larger villages are more likely to be underweight. Diarrhea was also found to be a significant risk factor for underweight in the Coastal/Delta Zone.

Table 30: Risk factors for underweight among children under five in the Coastal/Delta Zone (results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Stunted[1]	14.717	(10.671, 20.296)	0.000	1131
Wasted[1]	6.275	(4.168, 9.456)	0.000	1206
Additional child under 5 in household	1.839	(1.45, 2.331)	0.000	1226
Diarrhea in the past two weeks[1]	1.637	(1.146, 2.339)	0.007	1226
Ineffective/no treatment of drinking water	1.626	(1.268, 2.085)	0.000	1226
Low monthly income (≤75000 MMK)	1.410	(1.076, 1.849)	0.013	1226
Residence in a village with larger population	1.117	(1.021, 1.223)	0.016	1226

[1] Significant association with underweight in both multiple and single logistic regression

3.4.2. Risk factors for diarrhea in the Coastal/Delta Zone

Diarrhea and other illnesses are known contributing factors to undernutrition in young children. Table 31 presents risk factors for diarrhea among children in the Coastal/Delta Zone. Acutely malnourished, or wasted, children are nearly twice as likely to have suffered from diarrhea in the past two weeks. Male children are also at greater risk of diarrhea than female children are. Interestingly, children whose mothers have a higher level of education are actually more likely to have had diarrhea recently. This illustrates the bias of this indicator, whereby better-educated caregivers can be more likely to report that their child has diarrhea than less educated caregivers are. Another potential explanations for this relationship could be that less educated mothers breastfeed their children longer and are less likely to use breastmilk substitutes than better educated, wealthier mothers do.

Table 31: Risk factors for diarrhea among children under five in the Coastal/Delta Zone (results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Wasted	1.952	(1.203, 3.168)	0.007	1289
Male (child)[1]	1.680	(1.185, 2.384)	0.004	1289
Higher education of caregiver[1]	1.662	(1.093, 2.528)	0.018	1289
Underweight[1]	1.637	(1.146, 2.339)	0.007	1289

[1] Significant association with diarrhea in both multiple and single logistic regression

3.4.3. Contributing factors to minimum dietary diversity in the Coastal/Delta Zone

Dietary intake, like disease, is a known determinant of child nutritional status. Table 32 presents contributing factors to adequate dietary diversity among children 6 to 23 months of age in the Coastal/Delta Zone. A child with a caregiver who has a higher level of education living in a wealthier household with higher monthly income is more

Table 32: Contributing factors to adequate dietary diversity among children 6 to 23 months of age in the Coastal/Delta Zone (results of simple logistic regression)

Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Higher education level of caregiver[1]	2.492	(1.347, 4.611)	0.004	347
Higher monthly income (>75,000 MMK)	1.926	(1.139, 3.255)	0.014	347
Higher wealth quintile[1]	1.429	(1.15, 1.776)	0.001	347
Farther distance to nearest town[1]	1.309	(1.066, 1.609)	0.010	347

[1] Significant association with dietary diversity in both multiple and single logistic regression

likely to have an adequately diverse diet. Interestingly, households that are farther from the nearest town are actually more likely to have a child with an adequately diverse diet than those living closer to town. One possible explanation for this is that in the Coastal/Delta Zone, households located farther from town have more land for cultivation and thus better access to diverse foods.

4. Discussion and Recommendations

The aim of this study was to better understand the contributing factors to undernutrition in LIFT program areas. Data from the 2013 LIFT Household Survey were disaggregated by age group and zone to provide insights into the different nutrition situations in each geographic area and to identify groups that are at particularly high risk of undernutrition. In addition, significant risk factors for undernutrition, diarrhea and dietary diversity were identified through logistic regression. For the Dry Zone, results from this study were also compared to the results of the WFP et al. (2014) Nutrition and Food Security Assessment in the Dry Zone of Myanmar. As a complement to logistic regression analysis, the summary prevalence tables in Annex 1 provide the reader with additional information about the differences in undernutrition prevalence by a variety of background characteristics including household size, income, land access, ethnicity and disease status, among others.

In this section, key findings from the secondary analysis of the 2013 LIFT Household Survey will be highlighted and briefly discussed. Following this discussion, priority areas for additional research as well as recommendations to LIFT for future surveys will be provided.

4.1. Undernutrition in LIFT program areas

Undernutrition affects a significant proportion of children under five in LIFT program areas. Nearly four out of every ten children is stunted, and about 8% of children are acutely malnourished. Evidence suggests that young children are routinely ill, with about 15% of children reportedly suffering from diarrhea in the past two weeks. At the same time, dietary quality of young children is very poor. Indeed only about one fifth of children 6 to 23 months of age in LIFT program areas receive an adequately diverse diet.

Figure 20 provides a summary of the prevalence rates of the dependent variables that were analyzed in this study. While the rate of undernutrition in all LIFT program areas is high, there are some key differences by zone. The Uplands is characterized by very high rates of stunting and low levels of wasting. Diarrhea is also more common in the Uplands than in the other two zones. Chin State, which is characterized by very high

Figure 20: Prevalence of stunting, wasting, underweight, diarrhea, and inadequate dietary diversity by zone

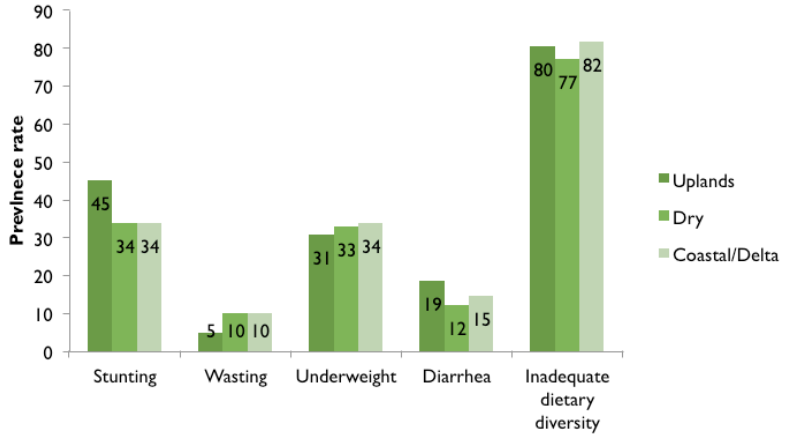
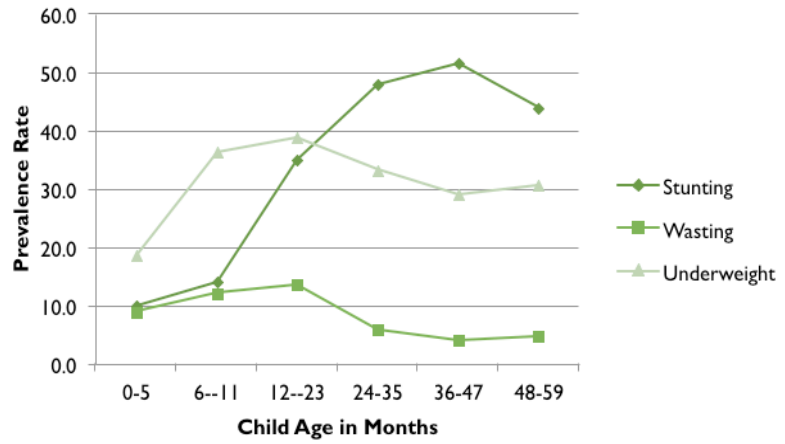


Figure 21: Prevalence of stunting, wasting and underweight among children under-five by age



rates of stunting and diarrhea as well as extremely poor dietary diversity, stands out as being far worse off than other states in the Uplands.

The Dry Zone is characterized by medium levels of stunting and high levels of wasting. Diarrhea is less prevalent in the Dry Zone than in the Uplands and the Coastal/Delta Zone, though the latter difference was not found to be statistically significant. While about 30% of children 12 to 23 months of age in the Dry Zone have adequate dietary diversity, only about 5% of infants 6 to 11 months had consumed four or more food groups in the previous day.

The Coastal/Delta Zone has roughly the same levels of undernutrition as the Dry Zone. About one-third of children under five are stunted and about 10% are wasted. Diarrhea is less common in the Coastal/Delta Zone than in the Uplands. The diets of infants 6 to 11 months of age in the Coastal/Delta Zone are extremely poor. In fact, almost no children in this age group have an adequately diverse diet.

Figure 21 presents the prevalence of undernutrition by age group in LIFT program areas. As would be expected, the prevalence of stunting is higher among older children while the prevalence of wasting is higher among younger children, particularly from 6 to 23 months of age. Growth faltering caused by repeated bouts of illness and acute malnutrition may be a risk factor for stunting later in childhood. This underscores the importance of ensuring good nutrition for children in the critical window from birth to two years, as well as for mothers during pregnancy.

4.1.1. Immediate causes: Inadequate dietary intake and disease

The risk factors for undernutrition that have been identified in this study are drawn from a limited set of variables available in the 2013 LIFT Household Survey datasets. Many of these risk factors are demographic indicators that may be more useful for targeting than for designing programs to reduce undernutrition.

Dietary intake and disease are immediate causes of undernutrition in mothers and children. Evidence from the 2013 LIFT Household Survey suggests that the diets of young children are severely lacking in diversity. In particular, infants 6 to 11 months seem to eat a restricted number of foods. Indeed the mean IDDS for infants 6 to 11 months of age was only 1.7, and only about 6% consumed foods from at least four food groups in the day preceding the survey. Actions to improve the diets of very young children and to address misconceptions about feeding young children a diverse diet should be

a priority for programs aiming to reduce undernutrition. Furthermore, the significant differences observed in the diets of children 6 to 11 months and 12 to 23 months of age underscores the importance of disaggregating nutrition data by age to better understand the situation.

In this study, poor dietary diversity was identified as a significant risk factor for underweight in the total sample. It was not found to significantly impact stunting, wasting or diarrhea prevalence in any zone. As would be expected, children in wealthier households with better educated caregivers and more land for cultivation have better dietary diversity than children in poor households with less land and less educated caregivers have. Children in Chin and Rakhine States appear to have particularly poor dietary diversity.

Diarrhea and other illnesses are known contributing factors to undernutrition. Diarrhea was found to be a risk factor for stunting in the total sample and in the Uplands, where diarrhea affects more than 18% of children under five. Diarrhea was also a risk factor for underweight in all three zones as well as a risk factor for wasting in the Coastal/Delta Zone.

In the Uplands, children from ethnic minorities and poor households are more likely to have had a recent episode of diarrhea, and children in Chin State are at particular risk. In the Coastal/Delta Zone, children with better-educated caregivers were actually more likely to have suffered from diarrhea in the past two weeks, highlighting the potential for bias in this self-reported indicator of disease status.

The prevalence of diarrhea also varies by age. In all LIFT program areas, the prevalence of diarrhea was highest among children 6 to 23 months of age, suggesting that young

Khun Thein Aung displays the ingredients for the family's evening meal, which includes rice, oil, tomatoes, unripe jackfruit and seasonings in Honar Village, Hopone Township, Shan State. Photo Credit: Elizabeth Whelan/ LEARN

A Tat Lan project beneficiary receives a cash transfer in Shauk Chon Village, Myaebon Township, Rakhine State. Maternity cash transfers support families during the 1,000 Days period to access food and health care. Photo Credit: Elizabeth Whelan/ LEARN

children are exposed to disease-causing bacteria in complementary foods as they begin eating and in the household environment as they become mobile. The highest estimated prevalence of diarrhea in any age group is among children 6 to 11 months of age in the Coastal/Delta Zone at about 34%. Interventions to improve the quality of complementary foods and improve household environments are essential for reducing the incidence of disease among young children in the critical window of birth to two years of age.

Evidence from the WFP et al. (2014) survey in the Dry Zone highlighted the significant effect of poor maternal nutrition on child nutritional status. Unfortunately, data on maternal nutrition and low birthweight were not available in the 2013 LIFT Household Survey datasets.

4.1.2. Underlying causes: Food, care, environment

Household food security and environment as well as practices relating to care for mothers and children are important underlying contributors to child nutritional status. Because the HDDS indicator could not be accessed for this analysis, it is not possible to draw conclusions about how and if household access to food contributes to child nutrition. However, access to land is understood as an important predictor of food security in Myanmar. In the LIFT (2013) sample, ownership of a larger plot of land is positively associated with better dietary diversity among children 6 to 23 months of age. In fact, children in households with one or more acres of land for cultivation were more likely to have consumed food from four or more food groups in the day preceding the survey in both the Uplands and Dry Zone. Ownership of a small plot of land (less than 1 acre) was identified as a risk factor for underweight in the Uplands and for diarrhea in the Uplands and Dry Zone.

In terms of household environment, the LIFT datasets included indicators of safe water source and effective treatment of drinking water. However, the relationship between access to clean water and child nutritional status was not straightforward, especially in the Uplands. In the total sample, access to a safe water source was actually associated with increased risk of stunting and diarrhea yet a decreased risk of wasting. Ineffective water treatment was also positively associated with wasting in the total sample.

In the Uplands, unsafe water source was a risk factor for wasting yet effective treatment of drinking water was a risk factor for stunting and underweight. In the Coastal/Delta Zone, ineffective or no treatment of drinking water was a risk factor for both stunting and underweight. In the Dry Zone, indicators of water safety and treatment were not found to be significantly associated with child nutritional status or diarrhea.

4.1.3. Basic causes

Poverty, as measured by household income and wealth quintile, was found to be an important risk factor for undernutrition, diarrhea, and poor dietary diversity. Low household monthly income (less than 75,000 MMK) was found to be a risk factor for stunting and underweight in the Uplands and Coastal/Delta Zone and in the total sample. Low income was also positively associated with diarrhea in the Uplands and the total sample. Higher household income was found to be a contributing factor to adequate child dietary diversity in the Uplands and Coastal/Delta Zone as well as the total sample.

Lower wealth quintile was a significant risk factor for stunting and diarrhea in the Uplands as well as underweight in the Coastal/Delta Zone and total sample. Higher wealth quintile was positively associated with better dietary diversity in the Coastal/Delta Zone and in the total sample. Interestingly, household income and wealth quintile was not associated with child nutritional status, diarrhea, or dietary diversity in the Dry Zone.

Poverty is a function of lack of access to capital. Education is an indispensible form of human capital that impacts nutritional status in a variety of important ways. Lack of education is a contributing factor for income poverty: less educated households are poorer and more vulnerable to economic and environmental shocks. Lack of education also directly impacts maternal and child health and nutrition behaviors such as appropriate treatment for illness and utilization of preventive health services. Low caregiver education was found to be a risk factor for stunting and underweight in the Dry Zone. Better caregiver education was positively associated with adequate dietary diversity in the Coastal/Delta Zone and the total sample. Interestingly, higher education was found to be a risk factor for diarrhea in the Coastal/Delta Zone, again suggesting the bias associated with this indicator.

Demographic characteristics of households in LIFT program areas were found to be important contributing factors to child nutritional status. In particular, households with more than one child under the age of five are at increased risk of having a malnourished child. The risk of stunting and underweight increases with each additional child under five in the Uplands and Dry and Coastal/Delta Zones. Households with fewer children under five are also more likely to have a child with adequate dietary diversity as well as, interestingly, a child with wasting (in the total sample).

In some contexts, larger household size is associated with better socioeconomic status because there are more income earners. However, larger household size in LIFT program areas seems to be associated with poor nutrition outcomes. In the Uplands and the Dry Zone as well as in the total sample, larger households are more likely to have

a child that is stunted and underweight. Children with younger caregivers in the Dry Zone are more likely to be wasted and more likely to have diarrhea in the Uplands.

Typically, households in small, remote villages are at increased risk of undernutrition due to poor access to health services, markets, and other services. Children in small villages that are farther away from towns and RHCs in the Uplands are more likely to be stunted and to have diarrhea. In the Coastal/Delta Zone, residence in a small village is a risk factor for underweight, yet children living in villages farther from town are more likely to have adequate dietary diversity.

Ethnic minority children are at increased risk of stunting in the Uplands and Coastal/Delta Zone as well as underweight and diarrhea in the Uplands., However, Burmese children are more likely to be wasted (perhaps due to the high level of wasting in the mostly-Burmese Dry Zone).

The relationship between child nutritional status and participation in LIFT projects or residence in a LIFT village was not straightforward, perhaps due to selection bias. Children living in LIFT villages and in households benefiting from LIFT projects are less likely to be wasted in the Uplands and Coastal/Delta Zone as well as in the total sample. LIFT beneficiaries in the Dry Zone are more likely to have diarrhea while beneficiaries in the Coastal/Delta Zone are more likely to be stunted. Children living in LIFT villages are also less likely to have adequate dietary diversity in the Uplands.

4.2. Areas for additional research

Additional research is needed to better understand the feeding practices of infants and young children. Dietary diversity is extremely poor in LIFT program areas, particularly for young children. Additional data are needed to understand whether this is due to household food insecurity or dietary restrictions being placed on young children due to a lack of understanding about the importance of a varied diet.

Despite the logical links between disease and WASH, lack of access to safe water and ineffective or no treatment of drinking water was not found to have the expected relationship with child nutritional status in some areas. More research is needed to identify which household WASH characteristics and behaviors are most important for preventing undernutrition. In particular, data on hand washing and access to safe sanitation facilities are needed.

4.3. Recommendations for future surveys

The 2013 LIFT Household Survey generated important data for understanding the nutrition situation in areas where LIFT programs are operating. A few relatively minor additions and adjustments to the next household survey could greatly increase its utility for program planning and implementation. The following are key recommendations for future LIFT surveys:

- Include questions on IYCF practices (including exclusive breastfeeding, continued breastfeeding to two years, timely introduction of adequate complementary foods, etc.) based on the standard WHO/UNICEF (2008) indicators;
- Include measurements of maternal nutritional status (BMI and/or MUAC) and dietary intake (WDDS) as well as a question about low birth weight;
- Include additional questions on hygiene practices, such as hand washing and

disposal of child feces, potential sources of drinking water contamination, and sanitation facilities;
- Sample Ayeyarwaddy Region and Rakhine State separately;
- Include a key variable to match datasets to allow for analysis of the impact of household food security on child nutritional status.

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ANNEX 1: Summary Prevalence Tables

Summary Table 1: Determinants of Undernutrition (Total Sample)

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Zone												
Uplands*,**,***	45.1%	-1.8407	(-1.843, -1.839)	1331	5.0%	-0.3012	(-0.303, -0.3)	1520	30.8%	-1.5083	(-1.51, -1.506)	1521
Dry*,***	33.9%	-1.4445	(-1.446, -1.443)	1003	10.1%	-0.8610	(-0.862, -0.86)	1064	32.9%	-1.5473	(-1.549, -1.546)	1081
Coastal/Delta*,**,***	33.9%	-1.4414	(-1.446, -1.437)	1131	10.0%	-0.8217	(-0.825, -0.819)	1232	33.9%	-1.5112	(-1.515, -1.507)	1226
State/Region												
Kachin	42.7%	-1.9099	(-1.92, -1.9)	179	6.8%	-.4466	(-0.452, -0.441)	206	29.6%	-1.6539	(-1.662, -1.646)	202
Chin*,**,***	56.5%	-2.4228	(-2.427, -2.419)	503	2.2%	-.2502	(-0.252, -0.248)	616	45.6%	-2.1568	(-2.16, -2.154)	626
Sagaing***	39.3%	-1.6357	(-1.639, -1.632)	168	12.6%	-.9402	(-0.942, -0.938)	175	36.2%	-1.6417	(-1.645, -1.639)	179
Magway*	32.1%	-1.3880	(-1.39, -1.386)	549	8.7%	-.8203	(-0.822, -0.819)	581	31.5%	-1.5220	(-1.524, -1.52)	588
Mandalay***	33.5%	-1.3525	(-1.359, -1.346)	286	15.0%	-.9583	(-0.962, -0.954)	308	34.5%	-1.4814	(-1.487, -1.476)	314
Rakhine	35.0%	-1.3024	(-1.315, -1.29)	116	11.8%	-1.0000	(-1.007, -0.993)	121	32.2%	-1.5751	(-1.584, -1.566)	121
Shan (south)*,***	47.9%	-1.9352	(-1.939, -1.931)	356	6.5%	-.2854	(-0.288, -0.283)	384	29.4%	-1.5275	(-1.531, -1.524)	389
Shan (North)**	34.4%	-1.3003	(-1.304, -1.297)	293	6.6%	-.3380	(-0.34, -0.336)	314	17.5%	-.8556	(-0.859, -0.853)	304
Ayeyarwaddy	33.6%	-1.4703	(-1.475, -1.465)	1015	9.7%	-.7843	(-0.787, -0.781)	1111	34.2%	-1.4981	(-1.502, -1.494)	1105
LIFT vs. Comparison* **												
Comparison village	41.5%	-1.6327	(-1.635, -1.63)	873	8.3%	-.5750	(-0.577, -0.573)	963	29.5%	-1.4275	(-1.43, -1.425)	963

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
LIFT village	38.0%	-1.6156	(-1.617, -1.614)	2592	7.6%	-.6081	(-0.609, -0.607)	2853	32.9%	-1.5597	(-1.561, -1.558)	2865
Total number months with inadequate food provisioning* **												
0	38.5%	-1.6027	(-1.604, -1.601)	3087	7.4%	-.5985	(-0.599, -0.598)	3412	31.3%	-1.5029	(-1.504, -1.502)	3401
1	58.2%	-2.0895	(-2.103, -2.076)	36	12.2%	-.3463	(-0.356, -0.336)	37	34.5%	-1.5722	(-1.583, -1.561)	37
2	33.1%	-1.5020	(-1.512, -1.492)	149	11.7%	-.6565	(-0.663, -0.65)	161	30.6%	-1.4959	(-1.504, -1.488)	163
3	37.4%	-1.8430	(-1.85, -1.836)	98	2.7%	-.6961	(-0.7, -0.692)	110	45.1%	-2.0917	(-2.1, -2.084)	110
4	36.5%	-1.7361	(-1.746, -1.726)	61	3.3%	-.2006	(-0.207, -0.194)	69	29.1%	-1.4522	(-1.46, -1.444)	66
5	90.0%	-2.8252	(-2.85, -2.801)	25	59.1%	-1.6726	(-1.687, -1.658)	28	85.0%	-2.9291	(-2.943, -2.916)	28
6	17.2%	-.1934	(-0.239, -0.148)	5	0.0%	-.0036	(-0.017, 0.009)	5	0.0%	-.1846	(-0.203, -0.166)	5
7	100.0%	-2.6314	(-2.637, -2.626)	2	0.0%	-.4721	(-0.485, -0.46)	2	60.7%	-1.9175	(-1.925, -1.91)	2
8	100.0%	-3.2900	(-3.29, -3.29)	1	0.0%	-.2600	(-0.26, -0.26)	1	100.0%	-2.2300	(-2.23, -2.23)	1
9	100.0%	-3.4500	(-3.45, -3.45)	1	0.0%	-.3533	(-0.375, -0.332)	3	100.0%	-4.1333	(-4.164, -4.103)	3
Beneficiary Household of LIFT,*** **												
No	40.0%	-1.6300	(-1.632, -1.628)	2038	8.4%	-.6025	(-0.604, -0.601)	2222	30.6%	-1.4920	(-1.494, -1.49)	2230
Yes	37.3%	-1.6057	(-1.608, -1.604)	1427	6.9%	-.5963	(-0.598, -0.595)	1594	33.9%	-1.5741	(-1.576, -1.572)	1598
Buddhist*,,*** **												
No	54.5%	-2.3426	(-2.346, -2.339)	725	2.9%	-.2627	(-0.265, -0.261)	876	43.2%	-2.0830	(-2.086, -2.08)	878

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Yes	35.7%	-1.4740	(-1.475, -1.473)	2740	8.9%	-.6767	(-0.678, -0.676)	2940	29.5%	-1.4002	(-1.402, -1.399)	2950
Burmese Ethnicity,***												
No	46.4%	-1.8826	(-1.885, -1.88)	1464	4.9%	-1.8826	(-1.884, -1.881)	1674	31.8%	-1.5528	(-1.555, -1.551)	1674
Yes	33.0%	-1.4151	(-1.417, -1.413)	2001	10.3%	-1.4151	(-1.416, -1.414)	2142	32.2%	-1.5052	(-1.507, -1.504)	2154
Number of children under-five in household*,,*****												
1	33.9%	-1.4500	(-1.451, -1.449)	2518	9.1%	-.6590	(-0.66, -0.658)	2524	24.8%	-1.2934	(-1.294, -1.292)	2555
2	51.9%	-2.0421	(-2.046, -2.038)	794	5.1%	-.4726	(-0.474, -0.471)	1072	47.8%	-2.0521	(-2.056, -2.049)	1054
3	65.1%	-2.6433	(-2.652, -2.635)	146	2.6%	-.4247	(-0.428, -0.421)	206	55.4%	-2.1727	(-2.181, -2.164)	205
4	74.4%	-3.0511	(-3.079, -3.023)	7	0.0%	-.1222	(-0.133, -0.112)	14	66.1%	-3.5482	(-3.579, -3.518)	14
Household Size,*****												
<5	35.2%	-1.5254	(-1.528, -1.523)	1223	6.2%	-.5737	(-0.575, -0.572)	1294	25.2%	-1.3191	(-1.321, -1.317)	1299
>=5	40.5%	-1.6624	(-1.664, -1.661)	2242	8.5%	-.6110	(-0.612, -0.61)	2522	34.9%	-1.6151	(-1.617, -1.614)	2529
Dietary diversity**												
IDDS < 4	28.6%	-1.3617	(-1.365, -1.359)	722	13.8%	-.9061	(-0.908, -0.904)	906	39.7%	-1.9090	(-1.912, -1.906)	913
IDDS >=4	27.3%	-1.2530	(-1.258, -1.248)	221	10.3%	-.8061	(-0.809, -0.803)	251	31.0%	-1.4338	(-1.439, -1.429)	249
Monthly income*,**												
<= 75,000	41.6%	-1.6853	(-1.687, -1.684)	2224	7.5%	-.5867	(-0.588, -0.586)	2467	33.6%	-1.5989	(-1.6, -1.597)	2478
>75,000	34.4%	-1.5117	(-1.514, -1.509)	1241	8.2%	-.6218	(-0.623, -0.62)	1349	29.3%	-1.4047	(-1.407, -1.403)	1350

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Wealth quintile**												
First	39.8%	-1.6740	(-1.678, -1.67)	749	8.8%	-.7727	(-0.775, -0.771)	826	39.9%	-1.7462	(-1.749, -1.743)	831
Second	41.7%	-1.7098	(-1.714, -1.706)	658	8.2%	-.6757	(-0.678, -0.674)	727	36.7%	-1.7023	(-1.706, -1.699)	732
Third	38.7%	-1.5875	(-1.591, -1.584)	471	7.6%	-.7043	(-0.706, -0.702)	519	31.6%	-1.5433	(-1.546, -1.54)	524
Fourth	39.6%	-1.5724	(-1.575, -1.57)	1128	8.7%	-.5655	(-0.567, -0.564)	1242	31.3%	-1.4573	(-1.459, -1.455)	1243
Fifth	33.9%	-1.6393	(-1.642, -1.636)	459	4.4%	-.3608	(-0.363, -0.359)	502	22.5%	-1.3170	(-1.32, -1.314)	498
Shan Ethnicity**												
No	41.3%	-1.7087	(-1.71, -1.707)	3247	8.2%	-.6085	(-0.61, -0.607)	3583	33.9%	-1.5726	(-1.574, -1.571)	3598
Yes	35.6%	-1.5018	(-1.504, -1.5)	218	7.2%	-.5886	(-0.59, -0.587)	233	29.5%	-1.4660	(-1.468, -1.464)	230
Village population**												
0-200	55.5%	-2.3218	(-2.33, -2.314)	188	0.4%	-.2297	(-0.234, -0.226)	218	35.6%	-1.8663	(-1.873, -1.86)	217
200-400	41.7%	-1.7719	(-1.775, -1.769)	694	6.1%	-.4781	(-0.48, -0.476)	757	30.9%	-1.5880	(-1.591, -1.585)	762
400-600	35.9%	-1.4849	(-1.488, -1.482)	774	9.2%	-.6133	(-0.615, -0.611)	851	29.7%	-1.4888	(-1.491, -1.486)	863
600-800	40.4%	-1.6302	(-1.634, -1.626)	550	4.7%	-.6219	(-0.624, -0.619)	607	35.2%	-1.5705	(-1.574, -1.567)	604
800+	37.6%	-1.5666	(-1.569, -1.565)	1259	9.1%	-.6688	(-0.67, -0.668)	1383	32.6%	-1.4845	(-1.486, -1.483)	1382
Water treatment***												
Ineffective/no treatment	37.8%	-1.5224	(-1.525, -1.52)	1311	8.6%	-.6141	(-0.616, -0.613)	1433	29.0%	-1.4433	(-1.445, -1.441)	1433
Effective treatment	39.4%	-1.6713	(-1.673, -1.67)	2154	7.4%	-.5924	(-0.593, -0.591)	2383	33.6%	-1.5702	(-1.572, -1.569)	2395

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Drinking water source*,* **												
Unsafe	41.2%	-1.6549	(-1.658, -1.652)	1467	9.3%	-.7060	(-0.708, -0.704)	1619	33.8%	-1.5492	(-1.552, -1.547)	1611
Safe	38.1%	-1.6091	(-1.611, -1.608)	1998	7.3%	-.5674	(-0.568, -0.566)	2197	31.5%	-1.5198	(-1.521, -1.518)	2217
Diarrhea in the past two weeks*,**												
No diarrhea	37.3%	-1.5396	(-1.541, -1.538)	2956	7.4%	-.5805	(-0.581, -0.58)	3237	29.5%	-1.4412	(-1.443, -1.44)	3241
Diarrhea in the past two weeks	48.3%	-2.0924	(-2.096, -2.089)	509	10.0%	-.7082	(-0.711, -0.706)	579	45.8%	-1.9929	(-1.996, -1.99)	587
Total	**38.9%**	**-1.6198**	**(-1.621, -1.618)**	**3465**	**7.8%**	**-.5999**	**(-0.601, -0.599)**	**3816**	**32.0%**	**-1.5267**	**(-1.528, -1.525)**	**3828**

* = Significant risk factor for Stunting; **=Significant risk factor for Wasting ; ***= Significant risk factor for Underweight

Summary Table 2: Determinants of undernutrition (UPLANDS)

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
State/Region												
Kachin	42.7%	-1.9099	(-1.92, -1.9)	179	6.8%	-.4466	(-0.452, -0.441)	206	29.6%	-1.6539	(-1.662, -1.646)	202
Chin**,***	56.5%	-2.4228	(-2.427, -2.419)	503	2.2%	-.2502	(-0.252, -0.248)	616	45.6%	-2.1568	(-2.16, -2.154)	626
Shan (south)*, ***	47.9%	-1.9352	(-1.939, -1.931)	356	6.5%	-.2854	(-0.288, -0.283)	384	29.4%	-1.5275	(-1.531, -1.524)	389
Shan (North)*, ***	34.4%	-1.3003	(-1.304, -1.297)	293	6.6%	-.3380	(-0.34, -0.336)	314	17.5%	-.8556	(-0.859, -0.853)	304
LIFT vs. Comparison**												
Comparison village	44.3%	-1.7320	(-1.736, -1.728)	334	6.5%	-.3907	(-0.393, -0.388)	382	29.9%	-1.3414	(-1.346, -1.337)	380
LIFT village	45.3%	-1.8806	(-1.883, -1.878)	997	4.5%	-.2683	(-0.27, -0.267)	1138	31.1%	-1.5692	(-1.571, -1.567)	1141
Number of children under-five*, ***												
1	39.2%	-1.6102	(-1.612, -1.608)	830	5.7%	-.3060	(-0.308, -0.304)	831	19.3%	-1.1440	(-1.146, -1.142)	835
2	55.1%	-2.2217	(-2.227, -2.216)	389	4.3%	-.2794	(-0.282, -0.277)	524	46.6%	-2.0443	(-2.049, -2.04)	518
3	63.3%	-2.6097	(-2.62, -2.6)	105	3.4%	-.3599	(-0.364, -0.356)	151	53.8%	-2.0499	(-2.06, -2.04)	154
4	74.4%	-3.0511	(-3.079, -3.023)	7	0.0%	-.1222	(-0.133, -0.112)	14	66.1%	-3.5482	(-3.579, -3.518)	14
Gender of caregiver**												
Male	44.5%	-1.9694	(-1.973, -1.966)	434	2.3%	-.1885	(-0.191, -0.186)	489	28.7%	-1.4452	(-1.449, -1.442)	492
Female	45.3%	-1.7801	(-1.783, -1.777)	897	6.3%	-.3532	(-0.355, -0.352)	1031	31.8%	-1.5373	(-1.54, -1.535)	1029

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Household Size*, * **												
<=5	42.6%	-1.7520	(-1.756, -1.748)	385	4.7%	-.2524	(-0.255, -0.25)	412	22.0%	-1.2388	(-1.242, -1.236)	411
>5	46.1%	-1.8766	(-1.879, -1.874)	946	5.1%	-.3193	(-0.321, -0.318)	1108	34.1%	-1.6083	(-1.611, -1.606)	1110
Dietary diversity* **												
IDDS < 4	34.9%	-1.6218	(-1.627, -1.617)	277	8.7%	-.6104	(-0.613, -0.608)	390	43.2%	-1.9909	(-1.996, -1.986)	392
IDDS >=4	30.1%	-1.4129	(-1.42, -1.406)	79	7.3%	-.5214	(-0.526, -0.517)	97	27.5%	-1.2766	(-1.285, -1.268)	97
Monthly income*, * **												
<= 75,000	48.5%	-1.9626	(-1.965, -1.96)	837	6.0%	-.3087	(-0.31, -0.307)	959	34.5%	-1.6559	(-1.659, -1.653)	966
> 75,000	39.5%	-1.6434	(-1.647, -1.64)	494	3.5%	-.2890	(-0.291, -0.287)	561	24.6%	-1.2631	(-1.266, -1.26)	555
Wealth quintile*, * **												
First	51.1%	-2.1448	(-2.154, -2.136)	121	2.0%	-.3647	(-0.369, -0.36)	139	40.8%	-1.8818	(-1.889, -1.875)	141
Second	56.9%	-2.2863	(-2.295, -2.277)	132	5.5%	-.3485	(-0.352, -0.345)	158	44.9%	-2.0272	(-2.034, -2.021)	160
Third	51.5%	-1.9892	(-1.996, -1.982)	143	6.5%	-.5364	(-0.541, -0.532)	171	40.7%	-1.9198	(-1.926, -1.913)	174
Fourth	46.4%	-1.7782	(-1.782, -1.775)	584	6.5%	-.2765	(-0.279, -0.275)	662	30.8%	-1.4195	(-1.423, -1.416)	662
Fifth	35.8%	-1.6836	(-1.687, -1.68)	351	2.8%	-.2324	(-0.235, -0.23)	390	20.1%	-1.2469	(-1.25, -1.244)	384
Buddhist*,, *** **												
No	54.6%	-2.3478	(-2.351, -2.344)	658	2.8%	-.2558	(-0.258, -0.254)	797	43.4%	-2.0855	(-2.089, -2.082)	802
Yes	39.4%	-1.5360	(-1.539, -1.533)	673	6.5%	-.3315	(-0.333, -0.33)	723	22.2%	-1.1153	(-1.118, -1.113)	719

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Village population*												
0-200	55.5%	-2.3228	(-2.331, -2.315)	59	0.4%	-.2292	(-0.233, -0.225)	74	35.6%	-1.8667	(-1.874, -1.86)	73
200-400	45.6%	-1.9251	(-1.929, -1.921)	251	4.7%	-.3090	(-0.311, -0.307)	279	30.2%	-1.6167	(-1.62, -1.613)	278
400-600	47.6%	-1.7429	(-1.748, -1.738)	371	5.4%	-.2882	(-0.291, -0.285)	420	30.4%	-1.4751	(-1.479, -1.471)	430
600-800	50.3%	-2.0398	(-2.046, -2.033)	241	1.4%	-.1603	(-0.164, -0.157)	275	35.1%	-1.6368	(-1.643, -1.631)	276
800+	40.4%	-1.7041	(-1.708, -1.7)	409	6.8%	-.3508	(-0.353, -0.349)	472	29.5%	-1.3586	(-1.362, -1.355)	464
Water treatment*, **,*												
Ineffective/no treatment	44.5%	-1.7187	(-1.723, -1.715)	477	7.5%	-.3491	(-0.351, -0.347)	531	26.7%	-1.4161	(-1.419, -1.413)	527
Effective treatment	45.4%	-1.8964	(-1.899, -1.894)	854	3.9%	-.2801	(-0.282, -0.279)	989	32.6%	-1.5483	(-1.551, -1.546)	994
Drinking water source*, **												
Unsafe	51.8%	-2.0252	(-2.03, -2.02)	226	7.4%	-.4283	(-0.431, -0.425)	267	32.4%	-1.6376	(-1.642, -1.633)	264
Safe	43.5%	-1.7988	(-1.801, -1.796)	1105	4.5%	-.2723	(-0.274, -0.271)	1253	30.4%	-1.4788	(-1.481, -1.477)	1257
Beneficiary of LIFT project**												
No	45.4%	-1.8037	(-1.807, -1.801)	856	6.2%	-.3703	(-0.372, -0.369)	960	30.0%	-1.4493	(-1.452, -1.447)	958
Yes	44.5%	-1.9095	(-1.913, -1.906)	475	2.9%	-.1774	(-0.179, -0.175)	560	32.2%	-1.6139	(-1.617, -1.611)	563
Land owned for cultivation***												
No	46.9%	-1.9940	(-1.997, -1.991)	686	5.5%	-.3305	(-0.332, -0.329)	787	35.1%	-1.6800	(-1.683, -1.677)	793
Yes	43.3%	-1.6921	(-1.695, -1.689)	645	4.6%	-.2729	(-0.275, -0.271)	733	26.5%	-1.3397	(-1.342, -1.337)	728

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Burmese Ethnicity*, ***												
No	46.7%	-1.9025	(-1.905, -1.9)	1266	4.6%	-.2874	(-0.289, -0.286)	1455	31.6%	-1.5461	(-1.548, -1.544)	1456
Yes	18.3%	-.8236	(-0.834, -0.813)	65	12.4%	-.5614	(-0.568, -0.555)	65	16.2%	-.8125	(-0.82, -0.805)	65
Shan Ethnicity***												
No	49.2%	-2.0281	(-2.031, -2.026)	1113	4.8%	-.3090	(-0.31, -0.308)	1287	36.0%	-1.7271	(-1.729, -1.725)	1291
Yes	33.6%	-1.3135	(-1.318, -1.309)	218	5.6%	-.2783	(-0.281, -0.276)	233	14.9%	-.8461	(-0.85, -0.843)	230
Diarrhea in the past two weeks*,***												
No diarrhea	43.4%	-1.7356	(-1.738, -1.733)	1075	4.8%	-.2762	(-0.278, -0.275)	1217	27.8%	-1.4114	(-1.414, -1.409)	1214
Diarrhea in the past two weeks	53.0%	-2.3269	(-2.332, -2.322)	256	6.2%	-.4114	(-0.414, -0.408)	303	43.6%	-1.9253	(-1.93, -1.921)	307
Total	**45.1%**	**-1.8407**	**(-1.843, -1.839)**	**1331**	**5.0%**	**-.3012**	**(-0.303, -0.3)**	**1520**	**30.8%**	**-1.5083**	**(-1.51, -1.506)**	**1521**

* = Significant risk factor for Stunting; **=Significant risk factor for Wasting ; ***= Significant risk factor for Underweight

Summary Table 3: Determinants of undernutrition (DRY ZONE)

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
State/Region												
Sagaing	39.3%	-1.6357	(-1.639, -1.632)	168	12.6%	-.9402	(-0.942, -0.938)	175	36.2%	-1.6417	(-1.645, -1.639)	179
Magway	32.1%	-1.3880	(-1.39, -1.386)	549	8.7%	-.8203	(-0.822, -0.819)	581	31.5%	-1.5220	(-1.524, -1.52)	588
Mandalay	33.5%	-1.3525	(-1.359, -1.346)	286	15.0%	-.9583	(-0.962, -0.954)	308	34.5%	-1.4814	(-1.487, -1.476)	314
LIFT vs. Comparison												
Comparison village	38.6%	-1.5623	(-1.566, -1.559)	251	8.7%	-.7311	(-0.733, -0.729)	264	29.1%	-1.5211	(-1.525, -1.518)	273
LIFT village	32.3%	-1.4048	(-1.407, -1.403)	752	10.6%	-.9044	(-0.906, -0.903)	800	34.2%	-1.5563	(-1.558, -1.554)	808
Number of children under-five*, **, * **												
1	30.5%	-1.3292	(-1.331, -1.327)	806	11.2%	-.8770	(-0.878, -0.876)	808	27.8%	-1.3718	(-1.373, -1.37)	822
2	47.6%	-1.8846	(-1.891, -1.878)	176	6.7%	-.8156	(-0.818, -0.813)	230	51.0%	-2.1624	(-2.168, -2.156)	234
3	71.5%	-2.7739	(-2.79, -2.758)	21	0.0%	-.6785	(-0.684, -0.673)	26	60.5%	-2.5710	(-2.583, -2.559)	25
Education level of caregiver*, **												
Primary school or lower	35.6%	-1.5034	(-1.505, -1.501)	835	9.5%	-.8663	(-0.867, -0.865)	886	34.3%	-1.6031	(-1.605, -1.601)	900
Middle and higher	25.9%	-1.1561	(-1.16, -1.152)	168	13.3%	-.8346	(-0.837, -0.832)	178	26.0%	-1.2694	(-1.273, -1.266)	181
Household Size*, **, * **												
<5	27.0%	-1.2843	(-1.287, -1.282)	297	7.0%	-.7999	(-0.802, -0.798)	306	24.7%	-1.2818	(-1.284, -1.279)	313
>=5	37.0%	-1.5163	(-1.519, -1.514)	706	11.5%	-.8874	(-0.889, -0.886)	758	36.4%	-1.6610	(-1.663, -1.659)	768

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Land owned for cultivation*												
<=1 acre	34.8%	-1.4545	(-1.457, -1.452)	558	10.3%	-.8517	(-0.853, -0.85)	595	33.4%	-1.5708	(-1.573, -1.569)	603
> 1 acre	32.7%	-1.4300	(-1.433, -1.427)	445	9.9%	-.8748	(-0.876, -0.873)	469	32.1%	-1.5118	(-1.514, -1.51)	478
Electricity access**												
No Electricity in village	38.0%	-1.5708	(-1.573, -1.568)	651	10.1%	-.8360	(-0.837, -0.835)	694	36.2%	-1.6278	(-1.63, -1.626)	707
Electricity in village	26.6%	-1.2184	(-1.221, -1.216)	352	10.2%	-.9065	(-0.908, -0.905)	370	26.8%	-1.3998	(-1.402, -1.397)	374
Dietary Diversity*												
<=3	23.5%	-1.1684	(-1.168, -1.168)	228	19.1%	-1.1753	(-1.175, -1.175)	254	36.0%	-1.8338	(-1.838, -1.829)	258
>3	27.3%	-1.0406	(-1.041, -1.041)	69	11.9%	-1.0148	(-1.015, -1.015)	76	32.4%	-1.5124	(-1.52, -1.505)	74
Age of caregiver*, ***												
18-30	29.9%	-1.3258	(-1.329, -1.323)	276	12.2%	-.8880	(-0.89, -0.886)	297	32.1%	-1.4708	(-1.474, -1.468)	299
31-40	35.7%	-1.5465	(-1.55, -1.543)	385	11.9%	-.9690	(-0.971, -0.967)	408	36.5%	-1.7389	(-1.742, -1.736)	417
40+	35.3%	-1.4276	(-1.431, -1.424)	342	6.3%	-.7098	(-0.712, -0.708)	359	29.2%	-1.3825	(-1.385, -1.38)	365
Gender of caregiver, *****												
Male	38.7%	-1.4842	(-1.488, -1.48)	271	10.5%	-.8154	(-0.818, -0.813)	287	31.8%	-1.4914	(-1.494, -1.488)	291
Female	32.3%	-1.4311	(-1.433, -1.429)	732	10.0%	-.8763	(-0.878, -0.875)	777	33.3%	-1.5658	(-1.568, -1.564)	790

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Diarrhea in the past two weeks**												
No diarrhea	32.3%	-1.3863	(-1.388, -1.384)	885	9.4%	-.8255	(-0.827, -0.824)	937	30.2%	-1.4596	(-1.461, -1.458)	948
Diarrhea in the past two weeks	46.7%	-1.8944	(-1.9, -1.889)	118	15.7%	-1.1242	(-1.128, -1.121)	127	51.5%	-2.1650	(-2.17, -2.16)	133
Total	**33.9%**	**-1.4445**	**(-1.446, -1.443)**	**1003**	**10.1%**	**-.8610**	**(-0.862, -0.86)**	**1064**	**32.9%**	**-1.5473**	**(-1.549, -1.546)**	**1081**

* = Significant risk factor for Stunting; **=Significant risk factor for Wasting ; ***= Significant risk factor for Underweight

Summary Table 3: Determinants of undernutrition (DRY ZONE)

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
State/Region												
Rakhine	35.0%	-1.3024	(-1.315, -1.29)	116	11.8%	-1.0000	(-1.007, -0.993)	121	32.2%	-1.5751	(-1.584, -1.566)	121
Ayeyarwaddy	33.6%	-1.4703	(-1.475, -1.465)	1015	9.7%	-.7843	(-0.787, -0.781)	1111	34.2%	-1.4981	(-1.502, -1.494)	1105
LIFT vs. Comparison* **												
Comparison village	42.1%	-1.2728	(-1.29, -1.256)	288	26.6%	-1.1036	(-1.114, -1.093)	317	30.2%	-1.3459	(-1.359, -1.332)	310
LIFT village	32.8%	-1.4628	(-1.468, -1.458)	843	7.9%	-.7847	(-0.788, -0.782)	915	34.3%	-1.5318	(-1.536, -1.528)	916
Number of children under-five*,**												
1	30.6%	-1.4514	(-1.456, -1.447)	882	11.9%	-.9389	(-0.942, -0.936)	885	31.5%	-1.4840	(-1.487, -1.481)	898
2	48.1%	-1.3568	(-1.373, -1.341)	229	3.6%	-.4231	(-0.429, -0.417)	318	40.9%	-1.5418	(-1.555, -1.528)	302
3	50.0%	-2.1820	(-2.243, -2.121)	20	0.0%	-.0967	(-0.118, -0.076)	29	66.6%	-2.6656	(-2.714, -2.617)	26
Distance to nearest RHC* **												
<=1 mile	29.2%	-1.3191	(-1.325, -1.313)	450	12.5%	-0.8723	(-0.876, -0.868)	487	34.2%	-1.4369	(-1.442, -1.432)	486
> 1mile	38.5%	-1.5635	(-1.57, -1.557)	681	7.7%	-0.7727	(-0.777, -0.769)	745	33.6%	-1.5825	(-1.588, -1.577)	518
Gender of child*,**												
Female	28.0%	-1.4488	(-1.455, -1.443)	531	8.2%	-.8243	(-0.828, -0.82)	574	35.4%	-1.5258	(-1.531, -1.521)	572
Male	39.5%	-1.4342	(-1.441, -1.428)	600	11.8%	-.8194	(-0.824, -0.815)	658	32.5%	-1.4981	(-1.504, -1.492)	654

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Diarrhea in the past two weeks,***												
No diarrhea	35.4%	-1.4410	(-1.446, -1.436)	996	9.7%	-0.8027	(-0.806, -0.8)	1083	34.0%	-1.4921	(-1.496, -1.488)	1079
Diarrhea in the past two weeks	24.5%	-1.4435	(-1.452, -1.435)	135	12.1%	-0.9301	(-0.939, -0.922)	149	33.1%	-1.6274	(-1.637, -1.618)	147
Ethnicity												
Kayin*	66.6%	-1.6149	(-1.632, -1.598)	69	14.2%	-.8686	(-0.887, -0.85)	84	57.0%	-1.9313	(-1.956, -1.906)	81
Burmese*	32.0%	-1.4513	(-1.456, -1.446)	946	9.6%	-.7901	(-0.793, -0.787)	1027	33.2%	-1.4798	(-1.484, -1.475)	1024
Beneficiary HH of LIFT project*,**												
No	37.1%	-1.4236	(-1.431, -1.416)	662	14.7%	-.9827	(-0.987, -0.979)	716	34.8%	-1.5795	(-1.585, -1.574)	714
Yes	30.6%	-1.4589	(-1.465, -1.453)	469	5.7%	-.6705	(-0.674, -0.667)	516	33.0%	-1.4447	(-1.45, -1.439)	512
Distance to nearest town**												
0-10	35.3%	-1.5301	(-1.538, -1.522)	615	1.9%	-.7689	(-0.773, -0.765)	661	30.5%	-1.5061	(-1.511, -1.501)	662
10-20	33.4%	-1.4172	(-1.424, -1.411)	285	13.0%	-.8096	(-0.814, -0.805)	311	35.2%	-1.4903	(-1.496, -1.485)	310
20-30	30.5%	-1.0519	(-1.395, -0.708)	105	8.9%	-.7882	(-0.954, -0.622)	124	25.4%	-.9246	(-1.242, -0.608)	118
30-40	17.0%	-.6245	(-0.668, -0.581)	95	0.3%	-.8637	(-0.883, -0.844)	102	16.7%	-.9998	(-1.032, -0.967)	101
41+	32.4%	-1.3113	(-1.324, -1.298)	31	23.5%	-1.0757	(-1.086, -1.065)	34	40.1%	-1.6838	(-1.7, -1.668)	35
Monthly household income*,**												
<=75000	35.6%	-1.3794	(-1.385, -1.373)	753	7.3%	-0.8117	(-0.815, -0.808)	829	33.7%	-1.5179	(-1.523, -1.513)	823
>75000	31.0%	-1.5455	(-1.553, -1.539)	378	14.9%	-0.8391	(-0.844, -0.834)	403	34.3%	-1.4994	(-1.506, -1.493)	403

Independent variable (selected b/c of statistically significant association with at least one dependent variable)	Stunting prevalence	HAZ			Wasting prevalence	WHZ			Underweight prevalence	WAZ		
		Mean	95% CI	n		Mean	95% CI	n		Mean	95% CI	n
Availability of electricity in the village**												
No	31.8%	-1.3982	(-1.404, -1.392)	729	8.9%	-.7861	(-0.79, -0.782)	796	31.2%	-1.4148	(-1.42, -1.41)	793
Yes	36.3%	-1.4917	(-1.499, -1.484)	402	11.3%	-.8628	(-0.867, -0.859)	436	36.9%	-1.6237	(-1.629, -1.618)	433
Used proper water treatment*,**												
No	39.2%	-1.5773	(-1.584, -1.57)	439	10.5%	-.8122	(-0.817, -0.808)	487	39.9%	-1.7671	(-1.774, -1.76)	477
Yes	31.0%	-1.3682	(-1.374, -1.362)	692	9.8%	-.8271	(-0.831, -0.823)	754	30.5%	-1.3676	(-1.372, -1.363)	749
Population in village**												
0-200	33.3%	-1.3411	(-1.632, -1.05)	129	10.4%	-0.7154	(-0.859, -0.572)	144	25.0%	-1.4032	(-1.664, -1.143)	144
200-400	29.1%	-1.3439	(-1.351, -1.337)	280	10.4%	-0.7856	(-0.791, -0.781)	301	27.6%	-1.2621	(-1.268, -1.256)	302
400-600	20.2%	-1.1578	(-1.18, -1.135)	223	29.6%	-1.1242	(-1.149, -1.099)	244	30.0%	-1.4873	(-1.509, -1.466)	237
600-800	40.2%	-1.3116	(-1.33, -1.293)	205	7.1%	-0.9293	(-0.938, -0.92)	221	30.1%	-1.5414	(-1.554, -1.529)	219
800+	36.9%	-1.5550	(-1.561, -1.549)	294	9.3%	-0.8091	(-0.813, -0.805)	322	39.3%	-1.6846	(-1.69, -1.679)	324
Total	**33.9%**	**-1.4414**	**(-1.446, -1.437)**	**1131**	**10.0%**	**-.8217**	**(-0.825, -0.819)**	**1232**	**10.0%**	**-1.5112**	**(-1.515, -1.507)**	**1226**

* = Significant risk factor for Stunting; **=Significant risk factor for Wasting ; ***= Significant risk factor for Underweight

Summary Table 5: Prevalence of diarrhea by significant independent variables (All zones)

Independent variable (selected b/c of statistically significant association with diarrhea in one or more zones)	TOTAL		Uplands		Dry Zone		Coastal/Delta Zone	
	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n
Zone								
Uplands*	18.6	1641	18.6	1641				
Dry*	12.3	1137			12.3	1137		
Coastal/delta*	14.6	1289					14.6	1289
State/Region								
Kachin**	6.8	215	6.8	215				
Chin*, **	28.8	665	28.8	665				
Sagaing*	10.4	188			10.4	188		
Magway*	12.8	615			12.8	615		
Mandalay	13.8	334			13.8	334		
Rakhine	14.1	127					14.1	127
Shan (South)*	19.2	439	19.2	439				
Shan (North)**	10	322	10.0	322				
Ayeyarwaddy	14.7	1162					14.7	1162

Independent variable (selected b/c of statistically significant association with diarrhea in one or more zones)	TOTAL		Uplands		Dry Zone		Coastal/Delta Zone	
	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n
Distance to nearest town*,**								
0-10 mile	14.9	1678	20.2	569	9.9	418	14.0	691
10-20 mile	12.0	1479	12.8	688	10.6	463	15.3	328
20-30 mile	22.2	494	24.1	129	21.1	237	6.3	128
30-40 mile	23.1	305	25.0	181	10.2	19	16.4	105
40+ mile	17.8	111	18.6	74	-	0	13.5	37
Accessibility of electricity*								
No	14.7	2398	19.3	86	11.2	745	13.5	837
Yes	16.4	1669	17.9	825	14.3	392	15.9	452
Drinking water source*								
Not safe	14.0	1699	17.9	284	9.8	220	13.6	1195
Safe	15.8	2368	18.8	1357	12.8	917	23.9	94
HH with land owned for cultivation*,**								
<=1 acre	16.4	2488	21.8	846	12.2	634	15.8	1008
> 1 acre	14.0	1579	15.5	795	12.5	503	10	281
Monthly HH income*, **								
<=75000	16.2	2643	21.1	1044	11.3	728	16.7	871
>75000	14.0	1424	14.5	597	14.1	409	10.9	418

Independent variable (selected b/c of statistically significant association with diarrhea in one or more zones)	TOTAL		Uplands		Dry Zone		Coastal/Delta Zone	
	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n
Wealth quintile**								
First	15.5	875	26.5	149	10.9	195	15	531
Second	17.9	775	27.3	172	14.7	224	11.5	379
Third	19.3	544	23.9	180	17.4	202	19	162
Fourth	13.2	1329	16.2	719	9.5	418	14.6	192
Fifth	14.8	544	16.1	421	9.5	98	10.3	25
Number of Under 5 children*								
1	13.7	2614	16	865	11.7	842	15.2	907
2	18.9	1186	22.6	575	13.9	262	13.7	349
3	20	251	21.8	185	16.1	33	0	33
4	3.8	16	3.8	16	-	-	-	-
Sex of child*,****								
Female	15.1	1954	19.2	798	11.8	553	10.6	603
Male	15.7	2113	18.1	843	12.7	584	18.2	686
Education of caregiver******								
Primary school or lower	15.0	3311	18.0	1268	13	947	9.3	1096
31- 41	13.4	1507	15.4	593	10.5	439	20.1	475
41+	14.1	1114	14.5	474	14.6	379	7.5	261

Independent variable (selected b/c of statistically significant association with diarrhea in one or more zones)	TOTAL		Uplands		Dry Zone		Coastal/Delta Zone	
	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n
LIFT vs. Comparison								
Comparison village	18.2	1014	25.4	408	11.1	280	8	326
LIFT village	14.5	3053	16.1	1233	12.7	857	15.5	963
Village population*, **								
0-200	18.4	227	18.4	75	-	0	11.2	152
200-400	18.8	800	22.3	300	15.1	188	11.8	312
400-600	16.8	924	18.9	462	15.1	208	16.5	254
600-800	16.0	646	22.1	298	10.4	118	11.8	230
800+	12.9	1470	14.9	506	10.6	623	17	341
Ethnicity								
Burmese*,**	11.9	2260	0.8	67	12.2	1121	14.1	1072
Shan*,**	7.9	242	7.9	242	-	0	-	0
Total number months with inadequate food provisioning**								
0	15.5	3625	19.2	1488	12.4	1065	13.0	1072
1	31.6	38	31.3	22	-	2	35.9	14
2	9.2	172	3.6	49	13.4	32	22.8	91
3	13.7	116	10.6	28	16.3	19	23.4	69
4	23.6	75	32.7	31	2.8	13	17.9	31

Independent variable (selected b/c of statistically significant association with diarrhea in one or more zones)	TOTAL		Uplands		Dry Zone		Coastal/Delta Zone	
	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n
5	5.9	29	9.1	13	0	4	25	12
6	0	5	0.0	4	0	1	-	0
7	0	3	0.0	3	-	0	-	0
8	0	1	0.0	0	0	1	-	0
9	0	3	0.0	3	-	0	-	0
Distance to nearest RHC*								
<=1 mile	15.4	1990	16.7	829	14.1	650	18.6	511
> 1 mile	15.4	2077	20.5	812	8.5	487	11	778
Religion*,,*** ** **								
Buddhist	12.9	3129	13.5	787	12.2	1133	14.7	1209
Not Buddhist	26.5	938	26.3	854	73.3	4	0.4	7
Stunting*,**								
No	12.3	2057	15.2	663	9.2	648	16.4	746
Yes	18	1408	20.9	668	15.8	355	0.4	385
Underweight*, **, *, ***** ** ** **								
No	12.3	2552	15.3	970	9	714	14.3	868
Yes	22.2	1276	26.7	551	19.5	367	14.9	358

Independent variable (selected b/c of statistically significant association with diarrhea in one or more zones)	TOTAL		Uplands		Dry Zone		Coastal/Delta Zone	
	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n	Prevalence (%)	n
Wasting****								
No	14.8	3517	18.3	1453	11.2	953	14.6	1111
Yes	19.6	299	22.7	67	18.4	111	18	121
Beneficiary HH of LIFT project***								
No	14.6	2365	19.0	1036	10.2	579	8.1	750
Yes	16.5	1702	17.9	605	14.7	558	21	539
Total	**15.4**	**4067**	**18.6**	**1641**	**12.3**	**1137**	**14.6**	**1289**

* =Significant determinant in Total Sample; **=Significant determinant in the Uplands; ***=Significant determinant in Dry Zone;
****=Significant determinant in Coastal/Delta zone

Summary Table 6: Determinants of child dietary diversity (All zones)

Independent variable (selected b/c of statistically significant association with at least one dependent variable in one or more zones)	Prevalence of minimum adequate dietary diversity (%)				Mean IDDS			
	TOTAL	Uplands	Dry	Coastal/	TOTAL	Uplands	Dry	Coastal/
Zone								
Uplands	19.60	19.60	22.70	18.30	2.40	2.38		
Dry*	22.70				2.50		2.48	
Coastal/Delta	18.30				2.50			2.50
State/Region								
Kachin*,**	34.80	34.80			2.98	2.98		
Chin*,**	4.10	4.10			1.74	1.74		
Sagaing*,***	37.40		37.40		3.06		3.06	
Magway***	17.20		17.20		2.28		2.28	
Mandalay	23.00		23.00		2.36		2.36	
Rakhine****	8.50			8.50	2.13			2.10
Shan (South)	17.00	17.00			2.26	2.26		
Shan (North)*,**	31.90	31.90			2.91	2.91		
Ayeyarwaddy	20.00			20.00	2.54			2.50

Independent variable (selected b/c of statistically significant association with at least one dependent variable in one or more zones)	Prevalence of minimum adequate dietary diversity (%)				Mean IDDS			
	TOTAL	Uplands	Dry	Coastal/	TOTAL	Uplands	Dry	Coastal/
LIFT vs. Comparison*,**								
Comparison village	29.90	28.40	34.70	3.40	2.70	2.66	2.80	2.40
LIFT village	18.10	16.00	19.80	20.10	2.40	2.27	2.40	2.50
Monthly income*,,*****								
<= 75000	17.50	16.00	20.00	12.00	2.30	2.23	2.30	2.20
> 75000	26.30	25.30	26.80	28.90	2.70	2.63	2.80	3.00
Wealth quintile*,***								
First	15.50	3.30	23.90	7.30	2.22	1.90	2.40	2.07
Second	10.30	11.40	9.90	10.60	2.07	1.79	2.10	2.29
Third	17.00	12.30	14.90	57.20	2.31	1.99	2.30	3.58
Fourth	26.00	21.60	32.20	28.90	2.65	2.54	2.80	3.04
Fifth	25.60	24.30	31.20	66.10	2.50	2.49	2.50	3.66
Land owned *,,****								
<= 1 acre	16.90	15.20	18.00	18.80	2.30	2.27	2.30	2.46
> 1 acre	26.20	23.70	30.80	16.00	2.60	2.49	2.70	2.54

Independent variable (selected b/c of statistically significant association with at least one dependent variable in one or more zones)	Prevalence of minimum adequate dietary diversity (%)				Mean IDDS			
	TOTAL	Uplands	Dry	Coastal/	TOTAL	Uplands	Dry	Coastal/
Distance to nearest town *,**								
0-10 mile	24.30	23.70	25.20	22.70	2.45	2.52	2.30	2.79
10-20 mile	17.50	13.80	21.50	11.00	2.42	2.30	2.60	2.08
20-30 mile	21.00	24.30	18.40	27.50	2.56	2.59	2.50	2.58
30-40 mile	8.90	5.40	45.60	0.80	1.86	1.66	3.80	2.02
40+ mile	27.40	25.80	-	36.70	2.51	2.41	-	3.10
Education of caregiver *,**								
Primary and lower	20.00	18.80	21.50	17.80	2.40	2.37	2.40	2.40
Middle and higher	24.00	22.00	27.00	20.00	2.50	2.44	2.60	2.80
Underweight*,**								
No	23.50	24.40	23.60	17.90	2.50	2.54	2.54	2.58
Yes	17.30	13.90	20.80	20.30	2.30	2.20	2.37	2.38
Buddhist*,**								
No	8.00	7.00	80.50	0.40	1.90	1.86	3.66	2.00
Yes	23.60	26.50	22.40	18.40	2.50	2.67	2.47	2.48

Independent variable (selected b/c of statistically significant association with at least one dependent variable in one or more zones)	Prevalence of minimum adequate dietary diversity (%)				Mean IDDS			
	TOTAL	Uplands	Dry	Coastal/	TOTAL	Uplands	Dry	Coastal/
Number of children under-5 in household*								
1	22.20	20.80	23.60	20.90	2.51	2.46	2.53	2.59
2	17.30	16.40	19.90	10.50	2.25	2.22	2.29	2.25
3	21.30	23.90	-	0.10	2.35	2.42	2.48	0.01
4	-	-	-	-	1.86	1.86	-	-
Stunting*,****								
No	22.60	22.80	22.50	22.40	2.50	2.46	2.46	2.59
Yes	21.60	19.20	26.30	10.40	2.54	2.69	2.69	2.58
Wasting*								
No	18.90	20.40	24.90	18.60	2.46	2.52	2.52	2.57
Yes	34.10	17.60	15.90	21.20	2.34	2.30	2.30	2.29
Shan ethnicity**								
No	18.90	14.30	22.70	18.30	2.37	2.21	2.48	2.48
Yes	34.10	34.10	-	-	2.85	2.85	-	-
Total	**20.90**	**20.00**	**22.90**	**18.40**	**2.40**	**2.39**	**2.50**	**2.50**

* =Significant determinant in Total Sample; **=Significant determinant in the Uplands; ***=Significant determinant in Dry Zone;
****=Significant determinant in Coastal/Delta zone

ANNEX 2: Results of multiple logistic regression

Table A: Risk factors for stunting, wasting, underweight, diarrhea and dietary diversity among children under-five in LIFT program areas -results of multiple logistic regression

Outcome variable	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Stunting	Underweight[1]	23.702	(18.633, 30.177)	0.000	3459
	No wasting[1]	4.695	(3.324, 6.626)	0.000	3459
	Ethnicity other than Burmese[1]	1.980	(1.632, 2.397)	0.000	3459
	Number of children under-5 in the household (1, 2,3, 4)[1]	1.594	(1.362, 1.864)	0.000	3459
	Residence in Chin State[1]	1.410	(1.078, 1.845)	0.012	3459
	Lower monthly income (<=75,000)[1]	1.259	(1.056, 1.503)	0.011	3459
Wasting	Underweight	24.783	(17.209, 35.679)	0.000	3459
	Residence outside Chin state	4.808	(2.106, 11.013)	0.000	3459
	Not stunted	4.717	(3.317, 6.692)	0.000	3459
	Fewer children under-5 in household (4,3,2,1)	1.667	(1.218, 2.281)	0.001	3459
	Not a LIFT beneficiary household	1.553	(1.159, 2.079)	0.003	3459
	Larger household size (>5)	1.442	(1.066, 1.95)	0.018	3459
	Residence outside the Uplands	1.441	(1.008, 2.058)	0.044	3459
	Number of months with inadequate food provisioning	1.148	(1.017, 1.296)	0.025	3459
Underweight	Stunted	24.251	(19.047, 30.848)	0.000	3459
	Residence outside the Uplands	1.812	(1.474, 2.225)	0.000	3459
	Diarrhea in the past two weeks	1.773	(1.368, 2.295)	0.000	3459
	Larger household size (>5)	1.561	(1.329, 1.833)	0.000	3459
	Wasted	1.096	(16.418, 33.772)	0.000	3459
	Residence in village with larger population (0-200=1, 200-400=2, … , 800+=5)	1.096	(1.02, 1.179)	0.013	3459
Diarrhea	Residence in Chin state	2.720	(2.177, 3.398)	.000	3828
	Residence outside Sagaing region	1.809	(1.013, 3.23)	.045	3828
	Underweight	1.701	(1.406, 2.059)	.000	3828
	Male (child)	1.261	(1.052, 1.512)	.012	3828
	Fewer children under-5 in household (4, 3, 2, 1)	1.182	(1.009, 1.385)	.038	3828
	Younger caregiver (>40=3, 31-40=2, 18-30=1)	1.128	(1.005, 1.266)	.041	3828
	Residence in smaller village (>800=5, 600-800=4, 400-600=3, 200-400=2, 0-200=1)	1.087	(1.014, 1.165)	.018	3828
Minimum dietary diversity	Residence outside Chin state	13.333	(4.675, 37.802)	0.000	940
	Residence in Sagaing region	3.482	(1.828, 6.634)	0.000	940
	Middle and higher education of caregiver	1.843	(1.259, 2.698)	.002	940
	Middle and higher education of caregiver	1.843	(1.259, 2.698)	.002	940
	Not wasted	1.754	(1.039, 2.966)	.035	940
	Higher monthly income (>75000)	1.635	(1.177, 2.271)	.003	940
	Residence outside Dry Zone	1.605	(1.092, 2.36)	.016	940
	Stunted	1.591	(1.107, 2.285)	.012	940
	Farther distance to nearest town (0-10=1, 10-20=2, 20-30=3, 30-40=4, >40=5)	1.192	(1.024, 1.388)	.024	940
	Higher wealth quintile	1.143	(1.018, 1.283)	.024	940

Uplands

Table: Risk factors for stunting, wasting, underweight, diarrhea and minimum dietary diversity among children under-five in the Uplands (Results of multiple logistic regression)

Outcome variable	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Stunting	Underweight[1]	26.696	(16.566, 43.023)	.000	1327
	Not wasting	6.946	(3.254, 14.829)	.000	1327
	Ethnicity other than Burmese[1]	2.989	(1.446, 6.182)	.003	1327
	Number of children under-5 in household (1,2,3,4)[1]	1.854	(1.503, 2.288)	.000	1327
	Lower monthly income (<=75000)[1]	1.376	(1.047, 1.807)	.022	1327
Wasting	Underweight	32.691	(14.351, 74.455)	.000	1327
	Not stunted	6.024	(2.759, 13.08)	.000	1327
	Residence outside Chin state	5.706	(2.46, 13.221)	.000	1327
	Female caregiver	2.084	(1.017, 4.269)	.045	1327
	Not in a LIFT beneficiary household	2.083	(1.011, 4.294)	.047	1327
Underweight	Wasted	37.994	(16.897, 85.43)	.000	1327
	Stunted	25.665	(15.964, 41.261)	.000	1327
	Diarrhea in the past two weeks	1.613	(1.127, 2.31)	.009	1327
	Residence in Chin State	1.551	(1.132, 2.125)	.006	1327
	Additional child under-5 in household (1,2,3,4)	1.538	(1.231, 1.92)	.000	1327
Diarrhea	Ethnicity other than Burmese	6.803	(1.607, 28.663)	.009	1521
	Ethnicity other than Shan	2.747	(1.603, 4.711)	.000	1521
	Residence in Chin State	2.534	(1.565, 4.105)	.000	1521
	Buddhist	1.835	(1.087, 3.097)	.023	1521
	Underweight	1.446	(1.104, 1.895)	.007	1521
	Younger caregiver (18-30=1, 31-40=2, 40+=3)	1.279	(1.082, 1.509)	.004	1521
	Fewer months with inadequate food provisioning (0 to 9)	1.220	(1.045, 1.425)	.012	1521
	Farther distance to nearest town (0-10=1, 10-20=2, 20-30=3, 30-40=4, 40+=5)	1.187	(1.052, 1.341)	.005	1521
	Less population in village (0-200=1, 200-400=2, 400-600=3, 600-800=4, 800+=5)	1.171	(1.05, 1.303)	.004	1521
Minimum dietary diversity	Residence outside Chin state	3.586	(2.357, 7.917)	.000	510
	Higher monthly income (>75000)	1.999	(1.26, 3.172)	.003	510

Dry Zone

Table: Risk factors for stunting, wasting, underweight, diarrhea and minimum dietary diversity among children under-five in the Dry Zone (Results of multiple logistic regression)

Outcome variable	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Stunting	Underweight[1]	58.908	(23.385, 148.392)	.000	296
	Wasting	2.862	(1.145, 7.152)	.024	296
	No land for cultivation	2.615	(1.203, 5.686)	.015	296
	Minimum dietary diversity (>3)	2.552	(1.089, 5.98)	.031	296
Wasting	Underweight	32.583	(17.434, 60.898)	.000	1002
	Not Stunted	4.650	(2.647, 8.169)	.000	1002
	Larger household size (>=5)	2.194	(1.22, 3.944)	.009	1002
	Fewer children under-5 in household (4,3,2,1)	2.049	(1.177, 3.565)	.011	1002
	Male caregiver	2.021	(1.191, 3.43)	.009	1002
	Younger caregiver (18-30=1, 31-40=2, 40+=3)	1.566	(1.132, 2.166)	.007	1002
Underweight	Stunted	24.929	(16.539, 37.574)	.000	1002
	Wasted	31.802	(17.184, 58.856)	.000	1002
	Female caregiver	1.650	(1.093, 2.491)	.017	1002
	Additional child under-5 in household (1,2,3,4)	1.587	(1.099, 2.292)	.014	1002
	Diarrhea in the past 2 weeks	1.974	(1.144, 3.405)	.014	1002
Diarrhea	Religion other than Buddhist	7.634	(3.269, 317.435)	0.003	1081
	Underweight	1.894	(1.307, 2.746)	0.001	1081
	LIFT beneficiary household	1.563	(1.077, 2.27)	0.019	1081
Minimum dietary diversity	Residence in Sagaing Region	2.661	(1.476, 4.802)	0.001	340
	Larger plot size (>1 acre)	1.909	(1.133, 3.213)	0.015	340

Coastal/Delta Zone

Table: Risk factors for stunting among children under-five in the Delta/Coastal Zone (Results of multiple logistic regression)

Outcome variable	Explanatory variable	Odds-ratio	95% CI	p-value	(n)
Stunting	Underweight	23.940	(16.165, 35.457)	.000	1130
	Not Wasted	4.785	(2.752, 8.32)	.000	1130
	Kayin ethnicity	1.853	(1.024, 3.354)	.041	1130
	Gender of child (male)	1.452	(1.07, 1.969)	.017	1130
Wasting	Underweight	19.821	(11.195, 35.095)	.000	1130
	Not stunted	4.865	(2.751, 8.603)	.000	1130
	Residence in a Comparison Village	2.256	(1.402, 3.631)	.001	1130
	No electricity in the village	1.887	(1.069, 3.332)	.029	1130
	Shorter distance to nearest RHC (<=1 mile, > 1 mile)	1.657	(1.053, 2.609)	.029	1130
	Distance to nearest town (0-10=1, 10-20=2, 20-30=3, 30-40=4, >40=5)	1.277	(1.016, 1.604)	.036	1130
Underweight	Stunted	23.955	(16.169, 35.49)	.000	1130
	Wasted	18.115	(10.401, 31.55)	.000	1130
	Diarrhea in the past weeks	1.665	(1.005, 2.758)	.048	1130
	Female (child)	1.551	(1.101, 2.183)	.012	1130
Diarrhea	Higher education of caregiver (middle and higher)	1.745	(1.133, 2.688)	.012	1226
	Male (child)	1.741	(1.213, 2.498)	.003	1226
	Underweight	1.716	(1.196, 2.463)	.003	1226
Minimum dietary diversity	Residence outside Rakhine State	3.049	(1.008, 9.229)	0.048	290
	Higher education level of caregiver	2.642	(1.277, 5.469)	0.009	290
	Stunted	2.218	(1.113, 4.423)	0.024	290
	Higher wealth quintile (1 to 5)	1.447	(1.133, 1.85)	0.003	290
	Distance to nearest town (0-10=1, 11-20=2, 21-30=3, 31-40=4, 40+=5)	1.314	(1.043, 1.656)	0.02	290

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