UNDERNUTRITION IN MYANMAR

Part 1: A Critical Review of Literature

March 2016

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This report was prepared by 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: A woman in Yaynanchaung, Dry Zone, Myanmar, sifts rice for the family meal. Photo Credit: Elizabeth Whelan/ LEARN

Acronyms

ACF	Action Contre la Faim
ANC	Antenatal care
ARI	Acute respiratory infection
BMI	Body mass index
CoD	Cost of diet
CSI	Coping strategy index
EPI	Expanded Program on Immunization
FAO	Food and Agriculture Organization of the United Nations
FCS	Food consumption score
FSIN	Food Security Information Network
FSL	Food security and livelihoods
HAZ	Height-for-age z-score
HDDS	Household dietary diversity score
HDPE	High density polyethylene
HHS	Household hunger scale
HKI	Helen Keller International
IDDS	Individual dietary diversity score
IHLCA	Integrated Household Living Conditions Survey
IP	Implementing partner
IYCF	Infant and young child feeding
JMP	Joint monitoring program (WHO & UNICEF)
KSR	Kachin Special Region
LEARN	Leveraging Essential Actions to Reduce Malnutrition
LIFT	Livelihoods and Food Security Trust Fund
MAHFP	Months of adequate household food provisioning
MICS	Multiple indicator cluster survey
MDD	Minimum dietary diversity
MNPED	Ministry of National Planning and Economic Development
MR	Measles and rubella
MUAC	Mid-upper arm circumference
NNC	National Nutrition Center
ORS	Oral rehydration salts
PLW	Pregnant and lactating women
RHC	Rural health center
SCI	Save the Children International
SMART	Standardized Monitoring and Assessment of Relief and Transitions
SSR	Shan Special Region
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNSCN	United Nations Standing Committee on Nutrition
WASH	Water, sanitation and hygiene
WAZ	Weight-for-age z-score
WDDS	Women's dietary diversity
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight-for-height z-score

Contents

Photo Credit: Tim Mitzman/ Bridge

Abstract

Despite improvements in recent years, the prevalence of undernutrition among women and children in Myanmar remains unacceptably high. One in three children are stunted and about 8% are acutely malnourished. Micronutrient deficiencies are common among infants, young children and pregnant women. In fact, more than 80% of children 6 to 23 months of age and 70% of pregnant women are anemic. To better understand the determinants of undernutrition and the linkages between food security, livelihoods and nutrition in Myanmar as a whole as well as in specific geographic areas where programs supported by the Livelihoods, Food Security Trust Fund (LIFT) are being implemented, the LEARN project has reviewed food and nutrition security data from the past five years and synthesized relevant findings into this user-friendly report.

Guided by the conceptual framework of the determinants of undernutrition initially developed by UNICEF and adapted by the authors of the 2008 Lancet Series on Maternal and Child Undernutrition, this report presents what is known about the immediate determinants of undernutrition and how they are affected by underlying food security, caregiving, and environmental conditions, which are in turn shaped by income poverty, lack of access to capital and basic economic and social conditions. As the purpose of this report is as much to present what is known about food and nutrition security in Myanmar as it is to identify what is not known, the structure of the report is intended to highlight gaps in knowledge and areas for further research. Following the Introduction, Section 2 presents national level data on the food and nutrition security situation in Myanmar in the past five years. Sections 3, 4 and 5 present data on food and nutrition security from the various agro-ecological zones that are of interest to LIFT, namely the Coastal/Delta, Dry, and Uplands. Each section is organized in the same way, beginning with data on the prevalence of undernutrition in the geographic area, followed by findings on potential causes of undernutrition, organized according to immediate, underlying and basic determinants.

This report will contribute to the overall knowledge base of the food and nutrition security sector as well as inform decisions related to the selection of interventions aimed at improving the nutritional status of families and communities in Myanmar.

List of Figures

List of Tables

Women participate in a nutrition education session led by TDH Italia and WFP using an educational food pyramid in Kywe Boke, Dry Zone.
Photo Credit: Lynette Lim/ Save the Children

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 Leveraging Essential Actions for Reducing Malnutrition (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) programing throughout the country.

In 2014, the LIFT strategy was revised to include nutrition explicitly as one of its four strategic outcomes. LEARN provides ongoing technical support to LIFT, including advising on the programatic 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 have identified one challenge as the limited accessibility and usability of various data sources. Nevertheless, recent surveys by LIFT and SCI/WFP have generated a significant amount of data that can be analyzed further to generate some evidence on specific linkages between food security, livelihoods and nutrition in different regions of Myanmar.

1.1. Purpose of food and nutrition security review

The purpose of this report 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 that are of interest to LIFT. By analyzing and synthesizing recent primary and secondary data collected on food and nutrition security by different agencies at the national, state/regional, township, and community levels, this report seeks to present a coherent picture of the current situation in Myanmar. In the style of a critical review of literature, emphasis is placed on key findings that appear in multiple data sources or in particularly strong or relevant data sources.

The importance of focusing nutrition and food security interventions on the 1,000 days window, from conception to a child's second birthday, is widely accepted. During this critical period, good nutrition and healthy growth can have lasting benefits throughout life. As such, the most important outcome variables in this report are those that measure the food and nutrition security of pregnant women, infants, and young children. The nutritional status of children under five is also an important indicator that reflects the situation of the whole population, including their food security, livelihoods, public health and social environment. In children, nutritional status is measured using anthropometry, including stunting (low height for age), wasting (low weight for height or low mid-upper arm circumference (MUAC)) or edema, and underweight (low weight for age). Among women, body mass index (BMI), MUAC and stature are commonly used as indicators of nutritional status. Micronutrient deficiencies, such as anemia, are also im-

Fish is a common source of iron in Myanmar. Iron deficits lead to anemia, which is highly prevalent in Myanmar, particularly among adolescent women, pregnant women and young children.
Photo Credit: Elizabeth Whelan/ LEARN

portant indicators of maternal and child nutritional status. In addition to individual level indicators, household level indicators are important for understanding the underlying and basic determinants of maternal and child nutritional status.

In a Scoping Study on Food Security and Nutrition information in Myanmar, FAO (2011) noted that data or proxy data that could shed light on food security in Myanmar are scarce, of poor quality and sometimes contradictory. Although the situation has improved since then, with the 2014 census, several household surveys and numerous assessments having been added to the knowledge base, major issues with data quality and availability remain. This report includes food and nutrition security data from the past five years, wherever possible noting the quality of data sources and the usefulness of specific indicators for capturing current trends and for programmatic decision-making.

The types of resources included in this report fall into two major categories: primary and secondary research. Within primary research, surveys (of households and individuals), assessments in specific geographic areas that utilize a variety of qualitative and quantitative methods, and statistics gathered and calculated by WHO, UNICEF, FAO, and the World Bank are included. Secondary research includes desk reviews, situational analyses, and strategic planning documents from various governmental and non-governmental agencies. Secondary sources have been used to highlight recurring themes and to inform the structure of this report, while data from primary sources illustrate trends in food and nutrition security and point to likely determinants of poor nutrition and food insecurity. Secondary resources are also useful for obtaining citations from government surveys, which are often not widely disseminated and difficult to access. Little evidence is available on statistically significant associations between undernutrition and likely contributing factors in Myanmar. The immediate, underlying and basic determinants at the global level can point to likely determinants, but statistical evidence on the relative importance of these determinants in predicting undernutrition is scarce (except in the Dry Zone; see: Save the Children, WFP & the Ministry of Livestock, Fisheries and Rural Development. (2014).

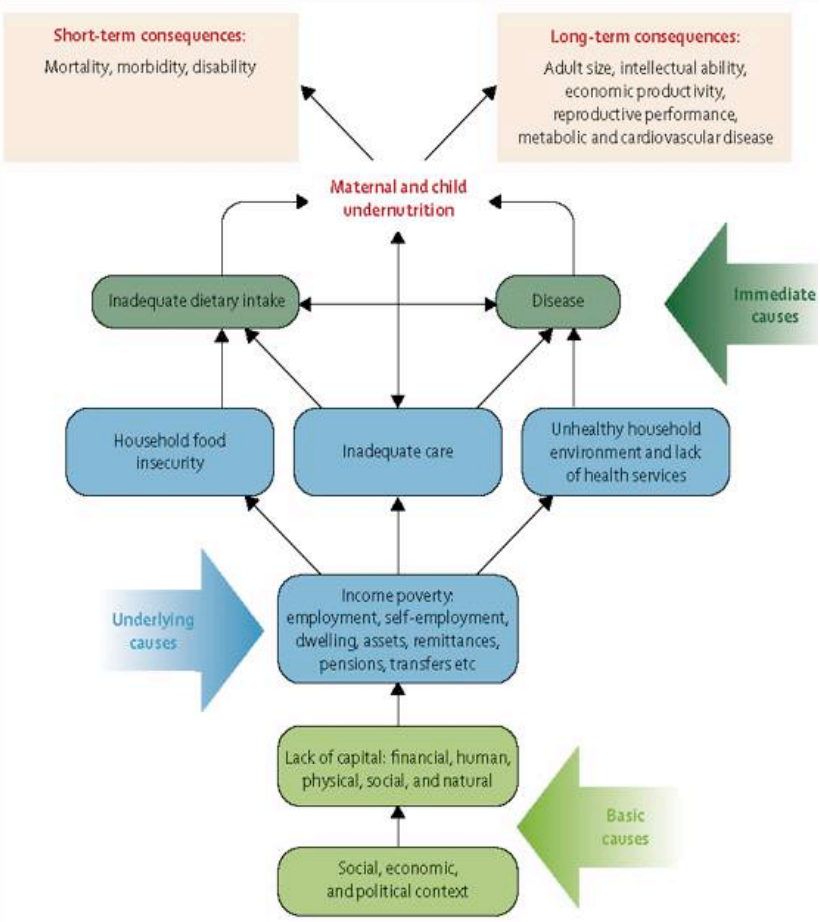
The purpose of this report is as much to present what is known about food and nu-

trition security in Myanmar as it is to identify what is not known. The structure of the report is intended to highlight gaps in knowledge to identify areas for additional research. Following the Introduction, Section 2 presents national level data on the food and nutrition security situation in Myanmar in the past five years. Sections 3, 4 and 5 present data on food and nutrition security from the various agro-ecological zones that are of interest to LIFT, namely the Coastal/Delta, Dry, and Uplands. Each section is organized in the same way, beginning with data on the prevalence of undernutrition in the geographic area, followed by findings on potential causes of undernutrition, organized according to immediate, underlying and basic determinants.

1.2. Conceptual framework

The conceptual framework below (Figure 1) was adapted from the 1991 UNICEF Conceptual Framework of Malnutrition and presented in the 2008 Lancet Series on Maternal and Child Undernutrition. This framework illustrates the immediate determinants of undernutrition and how they are affected by underlying food security, caregiving, and environmental conditions, which are in turn shaped by income poverty, lack of access to capital and basic economic and social conditions. This report presents what is known about the immediate, underlying and basic determinants of undernutrition in Myanmar. Using this information, decisions can be made about which interventions are likely to have a positive impact on specific contributing factors to improve the nutritional status of women and children in Myanmar.

Figure 1: Framework of the relationships between poverty, food insecurity, and other underlying and immediate causes of maternal and child undernutrition and their short- and long-term consequences (Bhutta et al., 2008)

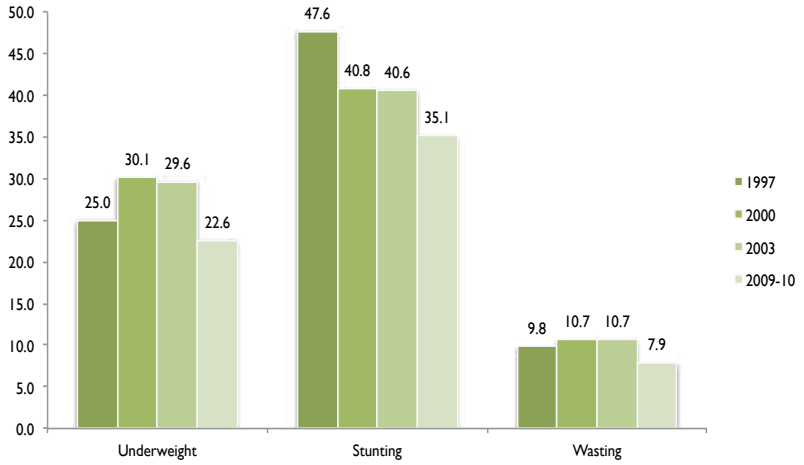


The conceptual framework in Figure 1 is useful for understanding the determinants of nutritional status, particularly in young children. However, where this and other frameworks that reference the original UNICEF conceptual framework fall short is in capturing the importance of the maternal dimensions of the intergenerational cycle of growth. Indeed there is a general lack of understanding of the enormous impact that changes during the period in utero can have later in the life course (UNSCN, 2011). To underscore the importance of interventions during the pregnancy (as well as pre-pregnancy) period, maternal health and nutritional status will be included as some of the immediate determinants of child nutritional status throughout this report.

2. Food and Nutrition Security Situation in Myanmar

The following section presents current evidence on the food and nutrition security situation in Myanmar at the national level, wherever relevant disaggregated by demographic characteristics including age,

Figure 2: Trends in nutritional status of children under-five years according to 2006 WHO Growth Standards (MICS 1997-2010)



wealth quintile, and mother's education. Later sections will present data on regional trends.

2.1. Prevalence of undernutrition

Despite improvements in recent years, the prevalence of undernutrition among children in Myanmar remains high. Figure 2 presents trends in child nutritional status from Multiple Indicator Cluster Surveys (MICS) from 1997 to 2010 (with prevalence rates from 1997, 2000 and 2003 recalculated using the 2006 WHO Growth Standards). The 2009-2010 MICS was a nationally representative survey and is the most-often cited source for malnutrition prevalence rates. However, there were methodological issues with the MICS that may have affected national and regional estimates of undernutrition (MNPED & MOH, 2011).[1] Despite these issues, MICS data are useful for observing trends in child nutrition over time.

According to the MICS 2009-10, 22.6% of children under-five years of age are underweight, which represents an improvement from about 30% in 2000 (MNPED & MOH, 2011). Despite a reduction of more than five percentage points since 2000, still more than one-third of all children under five in Myanmar are stunted. Wasting affects nearly 8% of children under five.

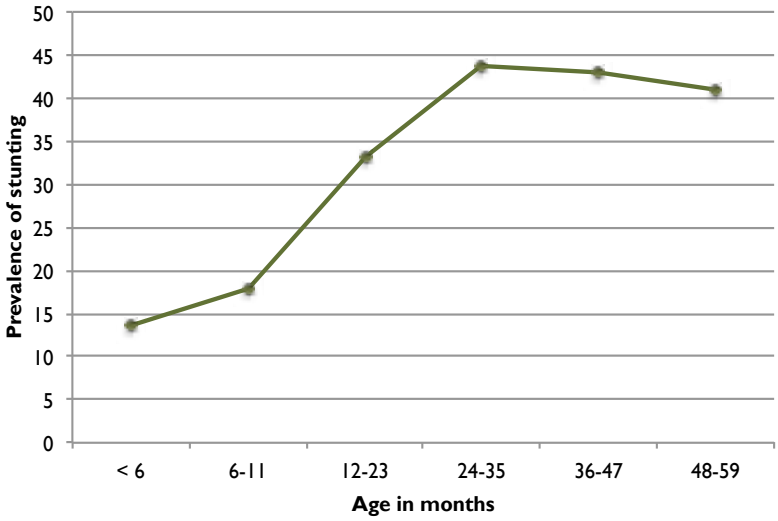
2.1.1. Stunting

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. More than one-third of all children in Myanmar are stunted according to the MICS 2009-10. As can be seen in Figure 3, the prevalence of stunting is highest among children 24 to 35 months of age. However, nearly 15% of children under-six months of age are already stunted (MNPED & MOH, 2011), indicating poor growth and development beginning in utero. This evidence underscores the fact that robust maternal nutrition actions are needed to improve child nutritional status in Myanmar. At the same time, actions to improve the nutritional status of women for their own sake, regardless of whether they are pregnant or lactating, should be a priority. Improvements to women's health and nutrition will result in a myriad of benefits for families, communities and the nation.

Stunting disproportionately affects children living in poor households. According to MICS 2009-10 data, children under-five years of age living in the poorest households are more than twice as likely to be stunted (46.6%) than those living in the wealthiest households (20.7%). However, it is significant that one in five children in the wealthiest

1 19 townships in Ayeyarwaddy, Yangon, and Shan (North) were removed from the sampling frame. 40 enumeration areas (EAs) in Kachin, Kayin, Rakhine, Sagaing, Shan, and Tanintharyi were not visited during field work due to security concerns and were replaced with substitute EAs, which is not a recommended procedure for MICS.

Figure 3: Prevalence of stunting by child age (MICS 2009-10)



households are stunted. Though mothers with no education are significantly more likely to have children who are stunted, more than a quarter of children whose mothers have a secondary education or higher are stunted (MNPED & MOH, 2011). These findings suggest that some key determinants of stunting, such as poor child feeding practices, exist in households at all levels of socioeconomic status. Furthermore, raising incomes without achieving changes in nutrition-related behaviors is not likely to fix the problem of stunting in Myanmar.

The prevalence of stunting in rural areas (38.4%) is higher than in urban areas (27.2%), and there are substantial differences by region. The highest rates of stunting, according to the MICS 2009-10, are found in Chin State (58.0%) and Rakhine State (49.9%). The 2013 Household Survey conducted by LIFT found a stunting prevalence of 31.9% in LIFT working areas.[2] The rate of stunting was found to be highest in the Uplands (Chin, Kachin, Shan states) at 38.9% and lower in the Dry Zone (27.5%) and Coastal/Delta Zone (27.0%).

2.1.2. Wasting

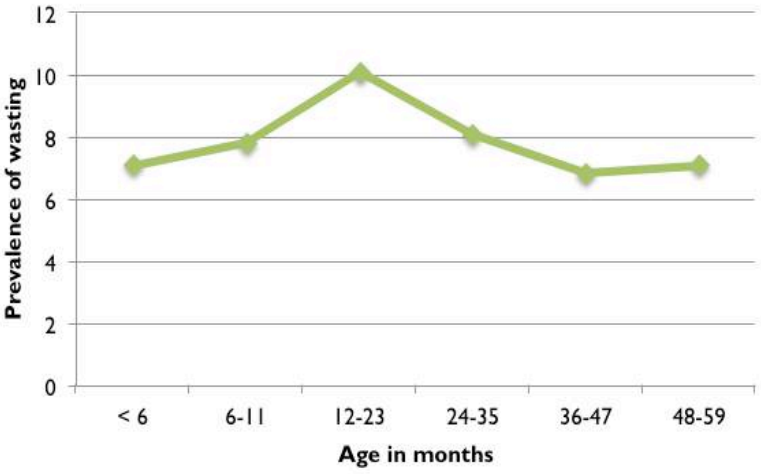
Acute malnutrition, also referred to as wasting, is an indicator of recent or current undernutrition and is typically measured using weight-for-height, mid-upper arm circumference (MUAC), or presence of edema. Acutely malnourished children are at significantly increased risk of mortality compared with their well-nourished peers. According to the MICS 2009-10, nearly 8% of children under five in Myanmar are acutely malnourished (low weight-for-height). As can be seen in Figure 4, the prevalence of wasting is highest among children 12 to 23 months of age, an age when children are typically more dependent on complementary foods for their energy needs and when many children may be weaned.

Wasting disproportionately affects children living in poor households. The prevalence of wasting among children under five in the poorest wealth quintile was 9.9% compared with 6.9% in the wealthiest households (MNPED & MOH, 2011). However, there is little difference in the prevalence of wasting in urban versus rural areas (7.4% and 7.9% respectively) (MNPED & MOH, 2011).

Substantial regional differences exist in the prevalence of acute malnutrition, with the highest rates being found in Rakhine State (10.8%) and Magway Region (10.4%), according to the MICS 2009-10. In the 2013 LIFT Household Survey, major differences in the prevalence of wasting were also found between different agro-ecological zones. In the Uplands, only 3.8% of children under five were found to be acutely malnourished, compared with 9.4% in the Coastal/Delta Zone (Rakhine State and Ayeyarwaddy Region) and 10.2% in the Dry Zone (Magway, Mandalay, and Sagaing Regions) (LIFT, 2013a).

2 Throughout Part 1 of this report, prevalence estimates of key indicators from the LIFT 2013 Household Survey are taken from the LIFT Survey Report (2013) unless otherwise specified.

Figure 4: Prevalence of wasting by child age (MICS 2009-10)



2.1.3. Underweight

Weight-for-age is a composite measure that can identify children with wasting or stunting. Weight-for-age is considered the easiest anthropometric indicator to measure, although it can become more complicated or less accurate in situations where mothers do no know their child's exact age. According to the MICS 2009-10, nearly 23% of all children under five are underweight in Myanmar, which represents an improvement from nearly 30% according to the previous MICS (2003). Weight-for-age data were also collected in the 2010 Integrated Household Living Conditions Survey (IHLCA). According to the IHLCA, the prevalence of underweight was 32.0% among children under five in 2010, which represents a non-statistically significant improvement from 34.3% in 2005 (MNPED, UNDP, SIDA & UNICEF, 2011).

Underweight follows the same pattern as stunting and wasting, wherein children living in poor households with less educated mothers are at greater risk of being underweight. There are significant differences in underweight prevalence by region. Rakhine State has the highest rate of underweight at 37.4%, which is a function of the high rates of both stunting and wasting in the state (MNPED & MOH, 2011). According to the 2013 LIFT Household Survey, the highest rate of underweight was found in the Dry Zone (26.5%), followed by the Coastal/Delta Zone (22.0%) and the Uplands (19.4%) (LIFT, 2013a).

2.1.4. Low birth weight

Birth weight is an important indicator of both child and maternal nutritional status. Low birth weight is highly correlated with perinatal, neonatal, and postnatal morbidity and mortality as well as chronic diseases in adulthood. Increasing birth weight contributes to a reduction in child growth faltering, resulting in less stunting and increased adult height. Additionally, global evidence has demonstrated that birth weight can be rapidly improved, even in populations of short adult women (UNSCN, 2011).

Low birth weight tends to move with underweight prevalence through time, towards zero rates for both. While previously collected using health systems data, birth weight data are now typically collected as a part of household surveys. The UN Standing Committee on Nutrition (UNSCN) has called for a revived focus on birth weight as an outcome of programs to improve child nutrition. Increasing birth weight not only improves child health outcomes but also has added benefits for the health of mothers and consequential positive implications for family well-being and overall development (UNSCN, 2011).

Because many infants are not weighed at birth and those who are weighed may represent a biased sample of all births (because they were more likely to be delivered in a health facility), the reported birth weights in developing countries cannot be used to estimate the prevalence of low birth weight. Therefore, the percentage of births weighing below 2,500 grams is estimated using 1) the mother's assessment of the child's size at birth (i.e. very small, smaller than average, average, larger than average, very large), and

2) the mother's recall of the child's weight or the weight as recorded on a health card if the child was weighed at birth (MNPED & MOH, 2011).

According to the MICS 2009-10, 8.6% of children born in the two years preceding the survey were low birth weight (less than 2,500 grams), representing an improvement from 15% in 2000. However, only 56.3% of children in the 2009-10 MICS were weighed at birth, with major regional differences. For instance, only about 17% of children in Rakhine State were weighed at birth, compared with more than 90% in Mon State (MNPED & MOH, 2011).

2.1.5. Micronutrient deficiencies

Data on micronutrient deficiencies in Myanmar are unfortunately scarce and, in some cases, of questionable quality and origin. However, MOH with support from UNICEF, is currently conducting a nationwide Micronutrient Deficiency Survey, which is expected to conclude in December 2015. The purpose of this survey is to provide updated evidence for the development of effective policies and guidelines for nutrition, including a comprehensive micronutrient deficiency control strategy. Data on selected biomarkers of key micronutrient deficiencies will be collected, as well as food consumption information and anthropometric measurements of children under five. Prevalence estimates of some micronutrient deficiencies will be representative to the state/regional levels, while others will be representative at the national level.

Table 1: Most recent data on indicators of micronutrient deficiencies in Myanmar

	Indicator	Prevalence rate (%)
Anemia	Anemia among children 6 to 23 months	>80.0[1]
	Anemia among children under 5	64.6[1]
	Anemia among non-pregnant women ages 15-49	45.2[1]
	Anemia among pregnant women	71.0[2]
	Anemia among adolescent girls	26.0[3]
Vitamin B1/ (Beriberi)	Vitamin B1 deficiency among pregnant women	6.8[4]
	Vitamin B1 deficiency among lactating mothers	4.4[4]
Vitamin A	Estimated prevalence of vitamin A deficiency (low serum retinol) among children 6 to 59 months	30.1[5]
	% of children (6-59 months) supplemented with vitamin A	55.9[6]
Iodine	% of households consuming adequate iodized salt	68.8[7]

[1] NNC & UNICEF, 2005 (referenced in MNPED & UNICEF, 2013); [2] NNC & UNICEF, 2005 (referenced in MOH, 2013); [3]NNC-DOH Survey, 2003 (referenced in MOH, 2013); [4] NNC-DOH Survey, 2002 (referenced in MOH, 2013); [5]NNC, 2009 (referenced in MOH, 2013); [6]UNSCN 2011; [7]MICS 2009-2010; [8] NNC, 2011 (referenced in MOH, 2013)

Table 1 presents the most recent data available on indicators of micronutrient status among priority groups. The following sections will discuss trends in the prevalence of key micronutrient deficiencies in more detail.

Anemia

Anemia is a condition in which the number of red blood cells (and consequently their oxygen-carrying capacity) is insufficient to meet the body's physiologic needs. Iron deficiency is thought to be the most common cause of anemia globally, but other nutritional deficiencies (including folate, vitamin B12 and vitamin A), acute and chronic inflammation, parasitic infections, and inherited or acquired disorders that affect hemoglobin synthesis, red blood cell production or red blood cell survival, can all cause anemia (WHO, 2011).

Anemia among young children can lead to increased susceptibility to disease, loss of appetite that can contribute to macronutrient undernutrition and slow cognitive development. Anemia is a major public health problem in Myanmar. According to NNC & UNICEF (2005), 64.6% of children

under five and more than 80% of children 6 to 23 months of age are anemic. A more recent estimate of the anemia prevalence among children under 5 by WHO is significantly lower, at approximately 40% as of 2011 (Stevens GA et al., 2013), the same rate cited by the World Bank.

Anemia can be a contributing factor to maternal mortality, spontaneous abortion, premature birth and low birth weight. Anemia can be caused by a micronutrient deficiency or by helminth infections and other diseases, particularly malaria. According to a study conducted by NNC and UNICEF in 2005 (referenced in MNPED & UNICEF, 2013), 45.2% of non-pregnant women ages 15 to 49 years are anemic. The WHO/World Bank estimate is lower, at 30.1% as of 2011 (Stevens et al., 2013). In a 2003 study by NNC and the Department of Health (DoH) (referenced in MOH, 2013), 71.0% of pregnant women are anemic, compared with 33.3% as estimated by WHO for 2011. The differences in estimates of anemia between NNC and WHO reflect differing methodologies and do not allow for interpretation of trends.

It is clear from the available data that the prevalence of anemia among women and children in Myanmar is unacceptably high and demands immediate intervention. Current data on anemia prevalence collected through standardized and transparent methods are also desperately needed.

Iron deficiency is exacerbated by the presence of intestinal parasites. The NNC & UNICEF (2005) survey found worm infestation to be associated with anemia in all groups. Levels of infestation were particularly high in coastal areas: 92% of pregnant women and 70% of children were found to have one or more of three common worm types (Ascaris, Trichuris and hookworm), compared with national estimates of 45% and 31%, respectively (MNPED & UNICEF, 2013).

Vitamin B1 Deficiency (Beriberi)

According to a cause-specific mortality survey conducted by the Ministry of Health and UNICEF (2003), infantile beriberi is the fifth leading cause of death among children 1 to 12 months of age in Myanmar, accounting for 7% of all infant deaths. Beriberi can occur in breastfed infants when the mother's body is lacking in vitamin B1 and can be fatal within 24 hours if not treated (MNPED & UNICEF, 2013). Vitamin B1 deficiency is aggravated by poor diet as well as cultural food taboos for pregnant and lactating women. According to a study by NNC in 2009 (referenced in MOH, 2013), the prevalence of vitamin B1 deficiency was 6.8% among pregnant women and 4.4% among lactating mothers.

Vitamin A Deficiency

Vitamin A deficiency has well-recognized clinical signs, including night blindness and corneal damage (eye signs are known as xerophthalmia or Bitot's Spots), that have low prevalence rates of typically of 2% or less, which are difficult to assess accurately by surveys (UNSCN, 2011). The prevalence of xerophthalmia in children under five in Myanmar in 1991 was between 0.6% (MOH, 2013) and 1.2% (UNSCN, 2011). Biannual supplementation with high potency vitamin A capsules reduced the prevalence of xerophthalmia to acceptable levels by 2000, with an estimated prevalence of 0.03% (MNPED & UNICEF, 2013; NNC & Government of Myanmar, 2013).

Increasingly, the extent and trends in vitamin A deficiency have come to be assessed

A child eating a meal of rice and curry in Thakawt Moo, Shan State, Myanmar.
Photo Credit: Lynette Lim/ Save the Children

using serum retinol concentration. The term "sub-clinical" has been generally dropped, and low serum retinol can be referred to as vitamin A deficiency, meaning the state of inadequate vitamin A nutrition. For clarity, the term used here is low serum retinol (< 20 µg/dl, which is the same as < 0.7 µmol/l) (UNSCN, 2011).

UNSCN estimates that the prevalence of low serum retinol among children 6 to 59 months of age in Myanmar was approximately 30.1% as of 2007 (UNSCN, 2011). NNC in collaboration with the Department of Medical Research (Lower Myanmar) conducted an assessment of vitamin A status among under-five children in 15 townships across the country in 2012. In line with the UNSCN estimate, results showed that 38% of children 6 to 59 months of age had low serum retinol (Htin Lin et al., 2014). Vitamin A deficiency (even without xerophthalmia) is associated with high rates of under-five mortality, diarrhea, measles and acute respiratory infections (ARI). Global evidence suggests that while the widespread use of vitamin A supplements has reduced the prevalence of xerophthalmia, the prevalence of low serum retinol has not been affected. However, vitamin A fortified foods have proven to be effective in increasing serum retinol and thereby reducing vitamin A deficiency (UNSCN, 2011).

Iodine Deficiency

Iodine deficiency is the leading cause of preventable brain damage and mental disability globally. During pregnancy, iodine deficiency can lead to irreversible brain damage in the foetus as well as a greater number of stillbirths, spontaneous abortions and congenital abnormalities. The prevalence of goiter, the most visible form of iodine deficiency, fell from 33% in 1994 to 2.2% in 2006 (MNPED & UNICEF, 2013) as a result of increased coverage of iodized salt. However, though coverage has increased dramatically in Myanmar, many households are not consuming adequately iodized salt. In a 2011 study

conducted by NNC, 91.5% of households were found to be consuming iodized salt, but only about 70% of households were consuming salt that was adequately iodized for the prevention of iodine deficiency (NNC, 2014 referenced in MOH, 2013).

2.1.6. Maternal nutrition

Maternal undernutrition poses serious risks for both mother and child. An undernourished woman is at greater risk of obstructed labor, more likely to die as a result of postpartum hemorrhage, and more susceptible to disease. Her child is at increased risk of being born with low birth weight, more likely to be undernourished later in life, more susceptible to disease, and at increased risk of mortality. Women's nutritional status is generally measured using BMI, MUAC, stature , and anemia status.

Nationally representative data on the nutritional status of women of reproductive age (other than anemia) in Myanmar are needed (FHI360/FANTA, 2014). Data on maternal BMI and MUAC are available in some states/regions and will be presented in Sections 3, 4 and 5. There are no data on women's stature in Myanmar.

2.2. Determinants of nutritional status

This section will present an overview of existing data on the determinants of undernutrition in Myanmar, noting gaps in knowledge when relevant. As there are few studies that have comprehensively explored associations between undernutrition and potential contributing factors in Myanmar, much of the data presented in this section are on presumed determinants of undernutrition based on global evidence.

2.2.1.Immediate causes: Inadequate dietary intake and disease

Inadequate dietary intake

To sustain growth, development and a healthy level of activity, individuals need enough (quantity) nutrient-rich (quality) food. Relevant indicators of insufficient dietary intake are those that directly impact the outcome variables of interest, namely measures of maternal and child undernutrition. Individual dietary diversity score (IDDS) is used as a proxy measure of the nutritional quality of an individual's diet. IDDS is a useful indicator for a number of reasons:, a more diversified diet is an important outcome in and of itself and is associated with improved outcomes in areas such as birth weight, child anthropometric status and improved hemoglobin concentrations (Swindale & Bilinsky, 2006). Although there are no nationally representative estimates of child IDDS, according to the 2013 LIFT Household Survey, only about one-third of children 6 to 23 months of age have an acceptable IDDS of at least 4. Evidence suggests that children living in the Uplands have diets that are particularly lacking in diversity. Only 26% of children in the Uplands had adequate dietary diversity scores, compared with 43% in the Delta/ Coastal Zone and 36% in the Dry Zone (LIFT, 2013a). Grains were the most commonly consumed by children 6 to 23 months of age (by nearly 100% of the sample), along with vitamin A rich fruits and vegetables (46%), other fruits and vegetables (44%) and flesh foods (44%) (LIFT, 2013b). Children living in different zones have significant differences in diet, but consumption of eggs and dairy (as well as legumes and nuts in the Delta) are low across all areas (LIFT, 2013a). According to a 2004 IYCF Survey conducted by NNC, more than 80% of sampled children under two were not introduced to meat or fish and about 76% were not introduced to beans until after their first birthday (NNC,

2004). Though this evidence is outdated, this finding taken together with evidence on IDDS of 6- to 23-month olds suggests that dietary diversity, particularly for very young children, is severely lacking in Myanmar.

Women's dietary diversity score (WDDS) is a proxy measure of the quality of diets of women of reproductive age, a particularly relevant target group given the importance of micronutrient adequacy for the growth, development and protection of the foetus and infant (Arimond et al., 2010; FAO, 2010). Data on women's dietary diversity are available only for the Dry Zone (Save the Children et al., 2014).

Infant and young child feeding (IYCF) practices, including breastfeeding and complementary feeding of children under-two years of age, are also immediate determinants of child undernutrition. The efficacy of adhering to recommended feeding practices in promoting the health of young children has been well documented (Bhutta et al., 2008). In particular, early initiation of breastfeeding (within the first hour of life), exclusive breastfeeding for 6 months, introduction of adequate complementary foods at 6 months and continued breastfeeding up to 2 years are key practices that ensure the health and survival of young children (UNICEF, 2011). This section presents a summary of trends in IYCF practices in Myanmar as well as related qualitative data, when relevant. Table 2 contains a summary of IYCF indicators from Multiple Indicator Cluster Surveys from 2000, 2003, and 2009-10.

Breastfeeding is the norm in Myanmar. Nearly all children are breastfed at some point and many continue to be breastfed until 2 years of age. More than three-quarters of all women included in the 2009-10 MICS reported initiating breastfeeding within 1 hour of birth (MNPED & MOH, 2011). Although useful, this indicator does not capture the prevalence of giving other liquids besides breastmilk to newborns, which is a common practice in certain regions in Myanmar (Dry Zone- Save the Chi et al., 2014; Rakhine State- Save the Children, 2014).

Less than 25% of all children 0 to 5 months of age are exclusively breastfed in Myanmar (MNPED & MOH, 2011). While this represents an increase from 11% in 2000, there is still significant room for improvement. The exclusive breastfeeding indicator, which measures the percentage of infants who were fed only breastmilk in the 24 hours preceding the survey, is calculated by dividing the total number of exclusively breastfed infants under-six months of age by the total number of infants under-six months of age. Thus it masks differences by age. By the end of the 6th month of life, less than 5% of children in Myanmar are being exclusively breastfed (MNPED & MOH, 2011). Even at the earliest stages, the majority of children are receiving liquids and foods besides breastmilk.

Table 2: Trends in IYCF Practices in Myanmar from 2000-2010 (MICS 2000; 2003; 2009-10)

Indicator	2000	2003	2009-10
Percent of infants (0-5 months) exclusively breastfed	11.0	14.7[1]	23.6
Prevalence of early initiation of breastfeeding (within 1 hour)	-	-	75.8
Prevalence of continued breastfeeding (at 20-23 months)	67.4	-	65.4
Timely complementary feeding rate[2]	67.3	66.4	80.9
Adequate frequency of complementary feeding (6-11 months)	-	-	56.5
Prevalence of adequately fed infants (0-11 months)	-	-	41.0

[1] Infants under-4 months; [2] Continued breastfeeding and provision of solid, semi-solid or soft foods at 6-9 months of age; [3] Proportion of 6-11 month olds who receive breastmilk and complementary food at least the minimum number of recommended times

The 2013 LIFT Household Survey found that nearly 70% of infants under-six months of age living in sampled households were being breastfed without solids. Unfortunately, however, the LIFT questionnaire did not include a question on exclusive breastfeeding, which refers to infants who

Table 3: Criteria for "adequate feeding" by child age

Age	Criteria for adequate feeding
0 to 5 months	Exclusive breastfeeding
6 to 8 months	Breastfeeding plus complementary food at least two times per day
9 to 11 months	Breastfeeding pus complementary food at least three times per day

received only breastmilk (and vitamin/mineral supplements or medicine) in the 24 hours prior to the survey. Data are only available on the percentage of infants 0 up to 6 months of age being breastfed without solids. It is not possible to determine whether infants were being given other liquids (LIFT, 2013a). Therefore, results from the LIFT survey cannot be compared with the prevalence of exclusive breastfeeding found by MICS or with prevalence rates from regional surveys.

At 6 to 9 months of age, 80.9% of children receive breastmilk and solid or semi-solid foods (MNPED & MOH, 2011). It is clear from the low rate of exclusive breastfeeding that complementary foods are introduced too early (rather than too late) in Myanmar. Plain water and other liquids are commonly provided to infants from very young ages, and complementary foods are introduced earlier than the recommended 6 months (MNPED & MOH, 2011).

Approximately 65% of children 20 to 23 months of age and 91% of children 12 to 15 months of age are still being breastfed in Myanmar. Continued breastfeeding is a protective behavior that should be encouraged, particularly in areas where dietary diversity and food intake of children is insufficient. Evidence from specific regions in Myanmar suggests that breastmilk remains an important source of calories and micronutrients throughout infancy and early childhood (Save the Children UK, 2013).

Criteria for adequate infant feeding differ depending on child age (see Table 3). According to the MICS 2009-10, only 41% of infants under-one year of age are adequately fed in Myanmar (mainly due to low rates of exclusive breastfeeding among infants under-six months and inadequate meal frequency in older children). While nearly 70% of infants 6 to 8 months of age received breastmilk and complementary food two times in the 24 hours preceding the MICS 2009-10, less than half of all children 9 to 11 months of age were breastfed and receiving complementary foods three times per day (MNPED & MOH, 2011).

Interestingly, the MICS 2009-10 found little evidence of association between maternal education levels and breastfeeding and complementary feeding behavior, with the only major difference being that children with more educated mothers were less likely to be breastfeeding at 20-23 months. Similarly, there were no major differences in exclusive breastfeeding and complementary feeding behavior between children in different wealth quintiles (MNPED & MOH, 2011). This suggests a widespread lack of understanding of the recommended IYCF practices in Myanmar.

Disease

In addition to consuming enough good-quality food, individuals must be healthy in order to absorb nutrients from their food. Frequent bouts of illness can initiate growth faltering among infants and young children. 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. Helminth or worm infections are also important causes of undernutrition in women and children. Helminth infections can accelerate iron losses and cause or contribute to anemia. Indicators of disease status are the prevalence of disease among children under five (usually diarrhea, ARI, and fever within the two weeks preceding the survey) and, in some cases, presence of helminth infection.

Large-scale surveys with data on childhood disease in Myanmar include the MICS 2009-10, the 2011 MOH & UNICEF Knowledge, Attitudes and Practices (KAP) Survey on Water, Sanitation and Hygiene (WASH) in 24 townships in Myanmar[3], and the 2013 LIFT Household Survey. According to the MICS 2009-10, less than 7% of children under five in sampled households had diarrhea in the two weeks preceding the survey (MNPED & MOH, 2011). The MOH & UNICEF Survey (2011) found an 8% diarrhea prevalence rate in the 24 sampled townships, while the 2013 LIFT survey found a rate of about 15% in LIFT program areas.

All three surveys found significant regional disparities in diarrhea prevalence. The highest rate of diarrhea in the LIFT survey (2013) was found in the Uplands, where nearly 20% of children had diarrhea in the two weeks preceding the survey. In the MICS (2009-10), Chin State had the highest prevalence of diarrhea at about 13%. In both the LIFT and MOH & UNICEF KAP surveys, there was a significant association between child diarrhea and access to clean water and improved sanitation facilities. In the LIFT survey, nearly 20% of children living in households that did not treat their water had diarrhea in the past two weeks (compared with 14.5% in households treating their water). In the MOH & UNICEF survey (2011), children were twice as likely to have had diarrhea if they lived in a household using an unimproved water source. A significant finding from the MOH & UNICEF survey was that children were actually more likely to have diarrhea if they had an unimproved latrine than if they had no latrine at all (MOH & UNICEF, 2011). The use of unhygienic, unimproved latrines is likely an important contributing factor to child diarrhea.

Recent evidence suggests diarrhea may not be the only causal pathway between a poor WASH environment and undernutrition. Indeed, chronic exposure to fecal bacteria may actually contribute to stunting without necessarily manifesting as diarrhea. According to Humphrey (2009), subclinical environmental enteropathy resulting from frequent fecal contamination can increase the permeability of the small intestines, reducing nutrient absorption and increasing vulnerability to pathogens. Evidence suggests that this may be an important cause of undernutrition, stunting, and cognitive deficits (Humphrey, 2009).

According to the MICS 2009-10, less than 3% of children under five had symptoms of acute respiratory infection (ARI) in the two weeks preceding the survey (MNPED & MOH, 2011). However, severe respiratory infections including pneumonia are a leading cause of mortality among children under five in Myanmar, representing 21% of under-five deaths (MOH & UNICEF, 2003), which may be associated with high rates of vitamin A deficiency among young children (Dudley et al., 1997).

Malaria is also an important cause of morbidity and mortality in Myanmar, accounting for approximately 7.6% of deaths among children between 1 month and 5 years of age (MOH & UNICEF, 2003). Myanmar sees more than 600,000 clinical cases of malaria, an estimated 30% of which are among children under-15 years of age. However, the total

3 The 2011 MOH & UNICEF KAP Survey on WASH practices in Myanmar collected data from 6,000 households in 24 townships in 9 states and regions (Tanintharyi, Rakhine, Ayeyarwaddy, Kachin, Chin, Shan (North and South), Kayin, Sagaing, and Bago). As such this survey is not representative at the national level but does provide data from a cross-section of townships in the Coastal, Delta, Hilly, and Dry Zones of Myanmar.

Htay Htay teaches her son, Mg Min Khant Kyaw, 2 years 8 months, to wash his hands in Pha Yar Gyi Su Village, Kani Township, Sagaing Region, Myanmar.
Photo Credit: Lynette Lim/ Save the Children

malaria burden is likely to be much higher than reported given poor access to and utilization of care in remote areas where most malaria cases originate (MNPED & UNICEF, 2013).

Poor maternal nutrition

Poor maternal nutrition, both before and during pregnancy, is both an outcome indicator and an immediate determinant of child undernutrition. As noted in Section 2.1.6., nationally representative data on the nutritional status of women of reproductive age (other than anemia) in Myanmar are needed (FHI360/FANTA, 2014). Data on maternal BMI and MUAC are available in some states/regions and will be presented in Sections 3, 4 and 5. There are no data on women's stature in Myanmar.

2.2.2. Underlying causes: Food, care, environment

Household food insecurity

Households must be food secure for children and mothers to access and to consume enough nutritious food. Food security is said to exist when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Indicators of food security are often divided into measures of food availability, stability, access and utilization.

Indicators of availability are typically used to determine whether the food supply is adequate to meet the needs of a population. At the national level, the amount of food available is a function of national production plus stock and imports, minus the quantity of exports, seed, feed and post-harvest loss (FAO, 2011). Myanmar is largely self-sufficient in meeting basic food needs at the national level, with surplus production of rice, pulses and fish in most years (FAO, 2011; , 2012c; MNPED & UNICEF, 2013; Wilson & Naw Eh Mwee Aye Wai, 2013). According to FAO Food Security Data[4], the average dietary energy supply adequacy in Myanmar is 109% (2012-2014), indicating that the country's food supply is adequate in terms of total calories. Although Myanmar is food sufficient, some areas suffer from insufficient food, particularly in the food-deficit hilly region and central dry zone (WFP, 2012c).

4 FAO collects and regularly updates a database of food security indicators, available at: http://www.fao.org/economic/ess/ess-fs/fsdata/en/#.UwY1EvldXTo.

Rice is the main staple food in Myanmar. According to FAO, people eat more rice in Myanmar, compared with other Asian countries, though per capita rice consumption in kilograms is declining over time (WFP, 2012c; FAO, 2013). However, rice consumption is still high. An estimated 52% of Myanmar's energy supply comes from cereals, roots and tubers (FAO, 2013).

Despite the importance of the agricultural sector for Myanmar's economy, substantial constraints continue to impede its development including low levels of financial investment, poor physical infrastructure, inappropriate land policies, and limited access to markets and information. At the household level, production is restricted by poverty and lack of access to land, credit and agricultural inputs (WFP, 2012c; LIFT, 2013a) as well as poor or unreliable weather in 2013 (LIFT, 2013a).

Access to food is the ability of a household to secure enough nutritious food to meet the needs of each member in a way that is sustainable. There are numerous indicators of household food access, from measures of the quality and quantity of a household's diet to food provisioning and road infrastructure. Measures of socioeconomic status, such as the percent of total expenditure spent on food, are also important for determining food access.

It is widely held that the higher the income of a household, the lower the proportion of income spent on food. The food share of consumption in Myanmar is approximately 68% (MNPED et al., 2011). As of 2010, the poorest 30% of the population spends nearly 75% of total expenditures on food, representing an increase from 2005 (MNPED et al., 2011). At the same time, the price of staple food items in local markets continues to be subject to regular and often significant inflation, which can further compromise access to food in the absence of commensurate increases in household income. For

A family sharing a typical meal of rice and curry in Myanmar.
Photo Credit: Tim Mitzman/ Bridge

Table 4: Mean HDDS of households sampled in 2012 and 2013 LIFT surveys

Zone	Mean HDDS (LIFT, 2012)	Mean HDDS (LIFT, 2013)
Hilly	4.80	5.95
Dry	6.28	6.11
Coastal/Delta	5.45	6.09
Giri	4.74	-
LIFT villages	5.51	6.00
Comparison villages	5.42	6.00
Total	**5.34**	**6.05**

instance, in Kachin, restrictions on market access resulting from ongoing conflict have caused inflation, which has resulted in a marked increase in the proportion of income needed to purchase a basic food basket (from 35% to 90% between the third and fourth quarters of 2011) (WFP, 2012c).

Household dietary diversity (HDDS) measures the number of food groups[5] consumed by a household in the 24 hours preceding the survey. HDDS is used as a proxy measure of the socioeconomic status of the household (Swindale & Bilinsky, 2006) and thereby an indicator of access to food. In terms of a cutoff for "adequate" HDDS, preliminary information in Myanmar suggests that three or fewer food groups reflect severe dietary inadequacy while consumption of four food groups indicates moderate dietary inadequacy. Anything above 4 would indicate adequate dietary diversity (FSIN, 2012). However, it has been suggested that an adequacy threshold of 4 for HDDS is too low for certain areas of the country and that this cutoff should be reviewed (Save the Children et al., 2014).

There are no nationally representative data on HDDS in Myanmar, though this is a priority indicator outlined in the 2011-2015 National Plan of Action for Food and Nutrition (NPAFN). The 2012 LIFT Baseline Survey found an average HDDS of 5.34 in sampled households, with the lowest mean dietary diversity scores in Cyclone Giri-affected areas of Rakhine State (4.74) and in the Uplands (4.8) and the highest dietary diversity scores in the Dry Zone (6.28). The LIFT (2013a) Household Survey found that the mean HDDS had increased to 6.05, with statistically significant improvements in both LIFT and comparison villages. As expected, household income and land ownership are positively associated with HDDS. Table 4 compares mean HDDS in different agro-ecological zones from the 2012 and 2013 LIFT household surveys.

Months of adequate food provisioning (MAHFP), also known as the "annual food gap," measures a household's access (and stability of access) to food. MAHFP measures a household's capacity for coping with food insecurity. Over time, the MAHFP indicator can capture changes in a household's ability to address vulnerability in a way that ensures food availability above a minimum level year round. MAHFP can capture the combined effects of a range of interventions to increase household purchasing power (Bilinsky & Swindale, 2010). There are no nationally representative data on MAHFP in Myanmar, though it is included in the package of food security indicators recommended by FSIN (2012). In the 2012 LIFT baseline survey, about 71% of the total sample (75% in LIFT villages and 71.1% in comparison villages) reported some food inadequacy in the past 12 months, with 3% of households reporting less than 6 months adequate food supply (LIFT, 2012). According to the 2013 LIFT Household Survey, the preva-

5 Twelve food groups are used to calculate HDDS: 1) Cereals; 2) Roots and tubers; 3) Vegetables; 4) Fruits; 5) Meat; 6) Eggs; 7) Fish and seafood; 8) Pulses, legumes and nuts; 9) Milk and milk products; 10) Oil/fats; 11) Sugar/honey and 12) Miscellaneous (condiments, spices, etc.).

Table 5: FAO Food Security Indicators- Access[1]

Indicator	Value	Year
Percent paved roads over total roads	45.7%	2011
Road density	5.6 per 100 sq km land area	2011
Rail lines density	No data after 1991	-
GDP	No data	-
Domestic food price index	No data	-
Prevalence of undernourishment	16.7%	2012-14
Depth of food deficit	122 kcal/ person/ day	2012-14
Prevalence of food inadequacy	26.8%	2012-14

[1](Available at: http://www.fao.org/economic/ess/ess-fs/fsdata/en/#.UwY1EvldXTo)

lence of adequate food provisioning has increased dramatically (p-value <0.001) in both LIFT and comparison villages. Only about 10% of households in LIFT villages and 12% in comparison villages reported months in the past year when there was not enough food. Significantly, the proportion of households without enough food in the past year was twice as high for those without land, compared with those with land (LIFT, 2013a).

The household hunger scale (HHS) is a food deprivation indicator that captures household perceptions of hunger. There are no nationally representative data on HHS, though it is included in the package of food security indicators recommended by FSIN (2012). The 2012 LIFT baseline survey found that the median HHS score in all zones was 0.0, suggesting no significant hunger problem in LIFT intervention areas. Between 2012 and 2013, LIFT found the prevalence of households with little to no hunger increased from 92.6% to 99.1%, with statistically significant improvements in both LIFT and comparison villages (p-value <0.001) (LIFT, 2013a).

Indicators of coping strategies are used to better understand what households do in times of food insecurity. The LIFT 2012 Baseline Survey found that changing to cheaper/ less preferred food was the most commonly reported coping strategy (50% of households reported in past 4 weeks). Less than 20% of the overall sample but close to one-third of households in Giri-affected areas and the Coastal/Delta Zone reported reducing the size or frequency of meals (2012). In 2013, LIFT found that the proportion of households reporting they never employed coping strategies increased in both LIFT and comparison villages, though LIFT villages saw greater improvements. For instance, the proportion of households that never had to change their diet to cheaper or less-preferred foods in order to have enough to eat increased from 38% to 66% ($p < .001$) in LIFT villages and from 52% to 66% in comparison villages. Data on the reduced coping strategies Index (CSI)[6] indicator are not available for Myanmar, though it is included in the package of food security indicators recommended by FSIN (2012).

Table 5 presents national level indicators of food access collected and calculated by FAO. The prevalence of undernourishment, depth of food deficit, and prevalence of food inadequacy are all indicators of caloric deprivation measured at the national level. The prevalence of undernourishment indicator is defined as the probability that a randomly selected individual from the population consumes an amount of calories insufficient to cover his/her energy requirements. It is derived from the FAO Food Balance Sheet, which takes into account the annual production questionnaire (completed by the

6 The Reduced CSI captures information on five standard coping strategies: Eating less preferred/less expensive food; Borrowing food/money from friends or relatives; Limiting portions at meal times; Limiting adult intake so that children can eat; Reducing the number of meals per day. Respondents are asked to inform on the frequency of use of each strategy, over a week (7 days recall). CSI are then obtained by multiplying the score to the frequency of each strategy and then adding all the "strategies scores."

Government of Myanmar in 2012-13 using data from 2011) and trade data (projections prepared by the Trade and Market Division of FAO). Once the average dietary energy consumption is obtained using the food balance sheet, the prevalence of undernourishment is then estimated using a probabilistic approach that is informed by data from a household budget survey conducted in 2006 (FAO, IFAD & WFP, 2014; E. Mane, FAO, Personal Correspondence, 13 May, 2015).[7] The assumptions on which this and other macro-level indicators of caloric deprivation are based, along with limited nutritional relevance and potential for measuring trends over time as well as poor responsiveness to shocks (Headey & Ecker, 2012), call into question the utility of the prevalence of undernourishment indicators for food security and nutrition programs.

Stability of access to food is another important dimension of food security. To be food secure, a household or individual must have access to food at all times and should not be at risk of losing access to food because of sudden shocks or recurring events (seasonality). Many of the indicators of food availability and access mentioned above are also indicators of food stability (such as food price volatility and MAHFP). Additional indicators of food stability include the dependency of a country or region on imported food, household food production and political stability. Myanmar has a low cereal import dependency ratio and is relatively stable politically, but compared with the rest of Southeast Asia, there is a low proportion of arable land equipped for irrigation and high variability in per capita food production (FAO, 2013).

Food utilization refers to the body's ability to absorb safe and nutritious food required for good health, and it is an immediate contributing factor to nutritional status. Evidence on indicators of food utilization is discussed in Section 2.2.1. Immediate causes: Inadequate dietary intake and disease.

Inadequate care

Feeding and caregiving practices are underlying contributing factors to child and maternal nutritional status. Care can be defined as the provision in the household and in the community of time, attention and support to meet the physical, mental and social needs of the growing child and other household members (Engle et al., 1996). In terms of maternal and child health and nutrition, care is manifested in a set of behaviors performed by caregivers including: 1) care for pregnant and lactating women; 2) breastfeeding and feeding of very young children 3) psychosocial stimulation of children and support for their development; 4) appropriate food preparation and food storage behaviors; 5) recommended hygiene behaviors; and 6) care for the child during illness, including diagnosis of illness and health-seeking behavior. A caregiver's ability to provide adequate care is dependent on a number of factors, including but not limited to the caregiver's education, knowledge and beliefs, physical health, autonomy and control of resources, workload and time availability and family and community social support (Engle, Menon & Haddad, 1996).

Because IYCF practices are discussed as immediate contributing factors to undernutrition and no data are available on the care of pregnant and lactating mothers and psychosocial stimulation of children, this section focuses on adherence to recommended hygiene behaviors and care for children during illness. Table 6 presents data from the MICS 2009-10 on the treatment of childhood illness in Myanmar (MNPED & MOH,

7 For a detailed description of how the Prevalence of Undernourishment indicator is calculated and additional information on recognized limitations of the indicator, see: Annex 2 of FAO, IFAD and WFP. (2014). The State of Food Insecurity in the World 2014: Strengthening the enabling environment for food security and nutrition. Rome, FAO.

Table 6: Appropriate treatment of childhood illness indicators (MICS 2009-10)

Indicator	Prevalence (%)
Use of oral rehydration treatment for children with diarrhea	66.3
ORS or increased fluids AND continued feeding of children with diarrhea	50.3
Appropriate care seeking for suspected pneumonia	69.3
Antibiotic treatment of suspected pneumonia	34.2
Percent of mothers who know the two danger signs of pneumonia	6.5

2011).

As discussed in 2.2.1., acute respiratory infections (ARI) and pneumonia are leading causes of death in Myanmar, responsible for about 21% of all under-five deaths. Care is sought for pneumonia in nearly 70% of suspected cases and antibiotics are provided in about 34% of cases (MNPED & MOH, 2011). Appropriate care seeking for pneumonia is positively associated with residence in an urban area and higher socioeconomic status. Children under-one year of age were also more likely to see an appropriate provider than older children were. There was no notable difference in the likelihood of being taken to an appropriate provider among mothers with primary and secondary or higher education (MNPED & MOH, 2011). However, in terms of appropriate treatment, children with suspected pneumonia in households with mothers having secondary or higher education were more likely to be treated with antibiotics than children of mothers with only primary education were. This suggests that although education is not correlated with care-seeking behavior, it is correlated with appropriate treatment once care has been sought.

A mother's knowledge of danger signs is an important determinant of care-seeking behavior for pneumonia. According to the MICS 2009-10, only 6.5% of mothers surveyed could correctly identify the two danger signs of pneumonia - fast and difficult breathing. Awareness of danger signs does not vary much by urban/rural residence, mother's education or socioeconomic status (MICS 2009-10).

Diarrhea is the second leading cause of child death in Myanmar, causing 13% of all deaths of children under five (MOH & UNICEF, 2003). According to the MICS 2009-10, 66.3% of children with diarrhea in the two weeks preceding the survey were treated either with ORS packets or recommended home fluids while 33.7% received no treatment for diarrhea (MNPED & MOH, 2011). Only about half of all children with diarrhea in the past two weeks received either ORS or increased fluids plus continued feeding as recommended. Home management of diarrhea varied significantly by socioeconomic status, maternal education, and place of residence. Children in poor households in rural areas with less educated mothers were less likely to be treated appropriately for diarrhea (MNPED & MOH, 2011).

The 2011 MOH & UNICEF KAP Survey on WASH practices in Myanmar collected valuable information on hygiene practices, such as hand washing and safe disposal of child excreta. While nearly 90% of respondents reported washing their hands after defecating, only about 70% reported using soap. Almost all respondents wash their hands before eating meals (99.7%), but only about 40% with soap. This is concerning given that 90% of respondents reported eating meals with their hands (MOH & UNICEF, 2011).

According to the MOH & UNICEF survey (2011), many caregivers of young children have unsafe hygiene practices. While most caregivers report washing their hands after cleaning the excreta of babies (though far fewer with soap), infant feces is often not properly disposed of in a latrine. Unsafe disposal of feces is particularly common among

A traditional clay pot stores drinking water. Photo Credit: Elizabeth Whelan/ LEARN

caregivers of young children, with the magnitude of the problem decreasing with child age. For caregivers of children under one year, only 19% reported safely disposing of infant feces. The rate of safe disposal of feces rises to 37% among caregivers of one- to two-year olds. Though latrine usage is higher among children two to five years of age, still 37% defecate on the ground (MOH & UNICEF, 2011). Findings from focus group discussions suggest that some adults incorrectly believe that children's excreta is not as dangerous as an adults (MOH & UNICEF, 2011).

Unhealthy environment

Unhealthy household environment and poor access to health services are underlying causes of maternal and child undernutrition. Lack of adequate water, sanitation, and hygiene can lead to poor health outcomes such as increased incidence of illness and undernutrition. Ill health can lead to increased expenditures for curative care, lower productivity among adults, and poor performance in school by children and adolescents. WASH indicators such as access to safe water, treatment of drinking water, and access to improved sanitation facilities are important measures of the safety of the household environment. Access to health services can be measured using a number of indicators, including distance to health facility, coverage of basic maternal and child health services such as antenatal care, skilled attendance at delivery, immunization, and micronutrient supplementation.

National level data on WASH in Myanmar are available from the 2014 Myanmar Census, [8]the WHO & UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation (2014)[9], the MICS 2009-10, and the IHLCA 2010. The 2011 MOH & UNICEF KAP survey on WASH also collected data from 9 states/regions from the Uplands, Coast-

8 Some communities in Rakhine State, Kayin State and Kachin State were not enumerated in the 2014 census, which may affect prevalence estimates for key indicators at national and state levels.

9 Country file for Myanmar available at: http://www.wssinfo.org/documents/?tx_displaycontroller[type]=country_files

Table 7: Use of improved water source, water treatment, and access to improved sanitation (% of households) from 2009/10 to 2014

Indicator	MICS 2009-10			IHLCA 2009-10			WHO/UNICEF 2012			Census 2014		
	Urban	Rural	**Total**	Urban	Rural	**Total**	Urban	Rural	**Total**	Urban	Rural	**Total**
Use of improved water source	93.2	77.6	**82.3**	-	-	**-**	94.8	81.1	**85.7**	86.7	62.8	**69.2**
Access to improved sanitation	94.4	80.4	**84.6**	84.1	77.2	**79.0**	84.3	73.9	**77.4**	92.3	67.3	**74.3**

Source: MICS 2009-2010; IHLCA 2009-10; WHO/UNICEF JMP, 2014; Census 2014

al, Delta, and Dry zones. Table 6 provides a summary of the most recent nationally representative, comparable data on WASH indicators in Myanmar. According to the 2014 census, only about 69% of households are using an improved water source, which is considerably lower than the earlier estimate of about 86% by WHO/UNICEF JMP (2014) and 82% by MICS 2009-10. Nearly 87% of households in urban areas have access to an improved water source, compared with only about 63% of rural households (Department of Population, 2015). There are also significant regional disparities in clean water access: only about 38% of households in Rakhine State have an improved water source, compared with 88% in Nay Pyi Taw (Department of Population, 2015).

The 2014 census estimate of improved water source coverage is in line with findings from the 2011 MOH & UNICEF KAP survey, which found that only 70% of households in the 9 sampled states and regions were using improved water sources. This survey also investigated differences in water source by season. In the rainy season, about 80% of households use improved water sources, compared with only 68% in the summer season (MOH & UNICEF, 2011).

That more than one-third of rural households do not have access to an improved water source is particularly troubling especially since many households do not effectively treat their drinking water. While the 2014 census did not include a question about water treatment, the MICS 2009-10 found that only an estimated 34.5% of households were appropriately treating their drinking water, with significant differences between urban/rural dwellers (MNPED & MOH, 2011).

According to the 2014 census, about 74.3% of households in Myanmar have access to an improved sanitation facility (Department of Population, 2015). This is lower than earlier estimates by the MICS 2009-10, IHLCA 2010, and the WHO/UNICEF (2014). There are significant disparities across regions and urban/rural residence. About 92% of urban households have an improved latrine, compared with only about 67% of rural households. The coverage of improved sanitation is by far lowest in Rakhine State, where only about 32% of households have an improved latrine (Department of Population, 2015). Throughout Myanmar, about 14% of households have no toilet at all (19% in rural areas, compared with less than 3% in urban areas) (Department of Population, 2014).

The MOH & UNICEF WASH KAP survey (2011) found that nearly 90% of households surveyed had access to an "improved" sanitation facility, but the authors suggest that a large proportion of so-called improved latrines are actually unimproved and unhygienic. The majority (72%) of improved latrines in the 2011 survey were found to be flush/pour flush into pit, which in Myanmar refers to a high density polyethylene (HDPE) pan and pipe latrine that is not sealed or fly proof (MOH & UNICEF, 2011).

Both the MICS 2009-10 and MOH & UNICEF KAP survey (2011) found an open def-

ecation rate of approximately 7%, with major differences by region (MNPED & MOH, 2011; MOH & UNICEF, 2011) as well as by socioeconomic status, and maternal education (MNPED & MOH, 2011). The highest rates of open defecation, and lowest coverage of improved sanitation facilities, were reported in Rakhine State for both surveys.

Access to health services

Poor access to health services is an underlying determining factor for maternal and child undernutrition. Global evidence has demonstrated that improved access to and utilization of health services will result in a reduction in maternal and child undernutrition in many contexts. Indicators of health access typically measure coverage of basic maternal and child health services such as antenatal care, assistance at delivery and immunization. Data on health access indicators in Myanmar are available from administrative data from the Ministry of Health, the 2010 IHLCA, the 2009-10 MICS, and from WHO and UNICEF.

Evidence suggests that physical access to health facilities has improved in recent years. Of the households surveyed in the 2010 IHLCA, 81% were within one-hour walking distance of a health facility, compared with 65% in 2005 (MNPED et al., 2011). According to MOH, in the past decade Myanmar has added more than 200 hospitals and rural health centers (MNPED & UNICEF, 2013). Despite overall progress, major regional disparities in healthcare access exist. In 2012, MNPED and UNICEF estimated that about a quarter of all townships in Myanmar were labeled "hard-to-reach" by the national Expanded Program on Immunization (EPI) due to remoteness or conflict.

In terms of human resources for health, a ratio of 23 health workers per 10,000 population is needed to achieve 80% skilled attendance at delivery according to WHO. As of 2009, Myanmar had a ratio of about 14:10,000, with most doctors concentrated in urban areas where only 30% of the population resides. Although midwives are the first line of care for mothers and children, the number of midwives has only increased by about 10% since 1988, while the number of medical graduates has doubled (UNFPA, 2010).

According to MICS 2009-10, about 83% of women of reproductive age giving birth in the past 2 years received antenatal care (ANC) from a skilled provider (doctor, nurse or midwife). However, there are major disparities by region, with access to ANC being poorest in the Uplands. In Shan (North) 36.8% of women received no ANC at all and only 54% of women received ANC from a skilled provider. In Chin State, 24.4% of women received no ANC at all and only 50% received ANC from a skilled provider (MNPED & MOH, 2011). The types of services[10] provided during ANC visits also differ widely between states/regions and urban/rural residence (MNPED & MOH, 2011; MNPED & UNICEF, 2013).

Most births in Myanmar take place at home. Only about 36% of deliveries in the two years preceding the MICS 2009-10 took place in a health facility (with the lowest rates in Chin followed by Rakhine and highest in Yangon followed by Sagaing). Despite this, 70.6% of women delivered with a skilled attendant (with lowest rates in Chin and Shan North and highest in Shan East and Tanintharyi). Access to maternal health care is positively associated with education of women and socioeconomic status (MNPED & MOH, 2011).

10 According to WHO, ANC visits should include at least blood pressure measurement, urine testing for bateriuria and proteinuria, and blood testing to detect syphilis and severe anemia, and optionally weight/height measurement.

Ngun Hlei Zing assists a patient in Loklung village, Hakha township, Chin State, Myanmar. Photo Credit: Andre Malerba/ Save the Children

Indicators of immunization coverage measure access to basic child health services. Given that most immunizations in Myanmar are provided through campaigns, coverage rates speak more to the capacity of the health system to conduct mass campaigns rather than to the functioning of routine health services and well-child care. Immunization rates are remarkably high given the funding constraints, lack of personnel and accessibility issues in the country, though there has been debate over the reliability of immunization data. The coverage of the DTP1 vaccine (the first of three), a measure of service access and availability, was estimated at 98.3% by MICS 2009-10 and 90% by WHO &UNICEF in 2013. Both data sources are of questionable reliability. While standard MICS methodology for collecting immunization data is to ask mother respondents to provide vaccination cards for children under five (which interviewers then copy) and, if cards are not available, ask mothers to recall which vaccines their child received. In the most recent MICS in Myanmar, midwives collected immunization data and in some cases used midwife registers.. This potential source of bias is acknowledged in the MICS 2009-10 report, which notes that midwives have a tendency to inadvertently over-report coverage (MNPED & MOH, 2011). For this reason, WHO and UNICEF reject estimates of immunization coverage from the MICS 2009-10. WHO and UNICEF also note the questionable reliability of their joint working group data, which are collected from government administrative data (WHO & UNICEF, 2013).

The coverage rate of the DTP3 vaccine measures a health system's ability to deliver a series of vaccinations. According to MICS 2009-10, the coverage of DTP3 was nearly 96%, while WHO & UNICEF (2013) estimate coverage at 75% as of 2013. From January to February 2015, the Ministry of Health, with support from WHO, GAVI and UNICEF, conducted a national measles rubella (MR) vaccine campaign targeting all children in the age group of 9 months to 15 years irrespective of their previous immunization status. The campaign is estimated to have reached approximately 94% of the target population

(WHO, 2015a). This represents an improvement from measles immunization coverage estimates from previous years: 86% according to WHO & UNICEF in 2013, 90.7% according to the MICS 2009-10, and 82% according to the IHLCA in 2010.

Vitamin A supplementation is a core nutrition action that has proven to be effective in reducing the prevalence of diarrhea and child mortality (Bhutta et al., 2008). In Myanmar, vitamin A supplements are delivered together with immunizations to children 6 to 59 months of age and to postpartum women within eight weeks of delivery. According to MICS 2009-10, the coverage for children 6 to 59 months was about 56% and about 66% for postpartum women. There were significant regional disparities, with the lowest coverage rates in Shan (North), Rakhine and Chin States.

2.2.3. Basic causes

Poverty is the driving force behind maternal and child undernutrition. Income poverty, resulting from a lack of access to capital due to underlying social, economic and political factors, is often measured using a consumption expenditure-based poverty line. Proxies of poverty such as possession of assets, quality of housing, and ownership of land, among others, are also important measures. Access to human, physical, financial, social and natural capital are basic requirements for adequate nutritional status. Measures of access to capital include enrollment and completion of education, access to credit and other financial services, access to land, employment and underemployment, among others. Measures of the social, economic, and political context include indicators of governance and resource allocation, women's empowerment, demographic characteristics of the population, exposure to shocks such as localized conflict and natural disasters, and cultural norms, among others.

Moving down the conceptual framework on the determinants of undernutrition (Figure 1), the categories of contributing factors become broader and, in turn, the number of relevant measures for each factor increases. The purpose of this section is not to provide a comprehensive analysis of poverty in Myanmar but rather to highlight the most recent findings on key indicators, identify gaps in the knowledge base and point the reader to additional resources for more detailed information.

Poverty

The IHLCA is the only comprehensive survey on poverty levels in Myanmar. The 2010 IHLCA suffers from two major weaknesses that call into question the extent to which the survey is actually nationally representative. First, the sampling frame was based on administrative data of unknown quality because of the lack of current census data at the time of the survey. Second, many border areas were not included in the sample due to ongoing conflict (World Bank, 2014). Despite these weaknesses, the IHLCA is an integral part of the knowledge base and provides the most comprehensive picture of poverty currently available in Myanmar.

According to the 2010 IHLCA, the nationwide prevalence of food poverty, those who are unable to afford enough food to meet basic caloric needs only, fell from about 10% in 2005 to 5% in 2010, suggesting some improvements in basic food consumption (MNPED et al., 2011). However, though caloric intake and ownership of small assets are increasing, the food share of consumption is also increasing (especially for the poor). These contradictory results call into question the magnitude of the reduction in food poverty (MNPED et al., 2011). According to a study conducted by the Ash Center for

Democratic Governance and Innovation (2011), "it would make no sense for the share of income spent on food to rise, as it did, if poverty were falling" (p. 3). The prevalence of food poverty is highest in Chin State (25%), Rakhine State (10%), Tanintharyi State (9.6%) and Shan State (4%) (MNPED et al., 2011).

As of 2010, the poverty rate in Myanmar was estimated at 25.6%, compared with 32.1% in 2005 (MNPED et al., 2011). Poverty was most prevalent in Chin State (73%) and Rakhine State (44%). This is in line with the finding that Chin and Rakhine also have the highest rates of food poverty in the country (MNPED et al., 2011). However, reanalysis of the IHLCA dataset by the World Bank in 2014 suggests that the poverty rate in Myanmar is actually higher than previously estimated. According to the World Bank (2014), the poverty rate is 37.5%, with the highest rates seen in Rakhine (78%) and Chin (71.5%). Interestingly, the World Bank estimates a substantially higher poverty rate for Rakhine than the previous analysis by UNDP. By zone, the highest rates of poverty were seen in the Coastal area (53.1%) and the lowest in the Dry Zone (29.5%).[11] The World Bank also found high rates of poverty in urban areas of Yangon and Mandalay. Poverty was found to be associated with landlessness or small land holdings (less than 2 acres) as well as ethno-linguistic identity (World Bank, 2014).

The LIFT 2013 Household Survey also estimated the poverty rate using consumption data in the 200 sampled villages in 3 zones. The poverty headcount ratio is the proportion of the population in the survey area living in extreme poverty, which is defined as having consumption of less than US$1.25 per capita per day.[12] Using this metric, LIFT estimated that 29% of the sampled population was living in poverty (LIFT, 2013a), with the lowest poverty rates seen in the Uplands and the highest in the Dry Zone. The poverty rates estimated by LIFT and by UNDP/World Bank are not comparable because they employ different methodologies.

Households living in or near poverty are particularly vulnerable to economic shocks. The determinants of shocks such as price volatility tend to vary by location. WFP Food Security Situational Analysis and FSIN Food Security Updates (Early Warning and Situation reports) provide the most accurate and up-to-date data on these issues, though updates are not always published online in a timely manner.[13] Catastrophic health costs can also represent a significant shock for poor households, especially given the high rate of out-of-pocket expenditure for healthcare in Myanmar. A 2007 study found that about 27% of a sample of households had suffered a catastrophic health cost that represented more than 40% of total non-food expenditure (San San Aye et al., 2007).

Lack of capital

Poverty is a function of limited access to capital. This section will provide a brief over-
Poverty is a function of limited access to capital. This section provides a brief overview of how poor access to various forms of capital negatively impacts the health and nutrition of women and children in Myanmar.

Education is an indispensible form of human capital. This report contains numerous examples of health and nutrition disparities between children of educated and less educated or uneducated mothers. Education impacts nutritional status in a variety

11 The mapping of states and regions into the 4 agro-ecological zones is as follows: Hills (Chin, Kachin, Kayah, Kayin, Shan), Dry Zone (Bago, Magway, Mandalay, Sagaing), Coastal (Rakhine, Mon, Tanintharyi), and Delta (Ayeyarwaddy, Yangon).

12 Converted into Myanmar Kyat at the 2010 purchasing power parity (PPP) exchange rate.

13 WFP Food Security Monitoring website: https://www.wfp.org/countries/myanmar/publications/monitoring.

Ma Khin San Wai in her home vegetable garden, set up through a project with TDH Italia in Kywe Boke Village, Magway Region, Myanmar. Photo Credit: Lynette Lim/ Save the Children

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.

Though primary school attendance is high in Myanmar (MNPED & MOH, 2011; MNPED & et al., 2011), educational attainment levels are low throughout the country (MNPED et al., 2011; Wilson & Naw Eh Mwee Aye Wai, 2013). As of 2010, about two-thirds (65%) of household heads had achieved only a primary education or less, a figure that has remained constant since 2005 (MNPED et al., 2011). More recently, the 2014 Myanmar census determined that approximately 16% of adults aged 25 and older had never attended school and 45% had only attended primary school (Department of Population, 2015). There are large disparities in educational attainment by socioeconomic status, region, and urban/rural residence. Educational attainment is particularly low in ethnic minority areas. For instance, in Shan State about 45% of adults aged 25 and older have never attended school, and about 29% have only attended primary school (Department of Population, 2015). Maternal education has particular relevance for child nutrition in addition to household income. Among women 15 to 49 years of age surveyed in the MICS 2009-10, only about 51% had attended secondary school or higher (MNPED & MOH, 2011).

As a predominantly rural society with more than 50% of the population employed in agriculture, access to land is a critical factor for household socioeconomic status, food availability and access, and therefore nutritional status of women and children. Land is an income-generating asset if farmed or rented, as well as a source of collateral for access to credit (MNPED et al., 2011). Landless and functionally landless smallholder

households are among the most vulnerable to food insecurity (WFP, 2012c; LIFT, 2012; Wilson & Naw Eh Mwee Aye Wai, 2013). Small size of landholdings is also closely correlated to poverty levels (MNPED et al., 2011). The average farm size estimated by the IHLCA 2010 was 6.7 acres, which is average for Southeast Asia and has remained unchanged since 2005. This figure masks major disparities by socioeconomic status and region. Not surprisingly, poor households have significantly smaller land holdings. The largest average farm size is in Ayeyarwaddy (9.3 acres) and the smallest in Chin (1.7 acres) (MNPED et al., 2011).

Landlessness is a significant issue in Myanmar, and 24% of households whose primary economic activity is agriculture are landless. About 34% of poor households are landless, with many employed as casual workers in agriculture (MNPED et al., 2011). Again there are significant regional disparities. Landlessness was found to be most common in Bago (41%), Yangon (39%) and in Ayeyarwaddy (33%), where the largest average land holdings are found. Landlessness is an important correlate of poverty and findings from the IHLCA also suggest that landlessness may be increasing for the poor (MNPED et al., 2011; WFP, 2012c).

Nearly half of all households surveyed by LIFT (2013a) do not own land, with the highest rates of landlessness in the Coastal/Delta Zone (about 66%) and Dry Zone (36.5%). Land access is less of an issue in the Uplands, where land holdings are typically small and population density is lower (LIFT, 2012; LIFT, 2013a; Wilson & Naw Eh Mwee Aye Wai, 2013). In hilly areas, land tenure and land registration are major problems affecting the food security of households, where smallholder farmers are often unable to invest in agricultural activities due to the insecure status of their land assets. LIFT (2013a) found no significant differences in land ownership between male- and female-headed households. Households with higher incomes were significantly more likely to own land than those with lower incomes (LIFT, 2013a).

Access to credit has an important, but not always straightforward, relationship with poverty. Credit can serve as a means of financing income-generating activities or maintaining a certain level of consumption when income fluctuates. For farmers, it is particularly important given the time lag between sowing and harvest seasons and routine fluctuations in household income. At the same time, credit can lead to unsustainable debt loads and perpetuation of poverty, especially if incomes are not increasing (MNPED et al., 2011).

According to the IHLCA (2010), about one-third of all households received loans for agricultural activities in 2009. Credit access was poorest in Shan (East) and Shan (North), Chin and Tanintharyi. The size of loans is considerable, particularly for the poor. The average loan size according to IHLCA (about 170,000 MMK) was nearly 50% of the annual poverty line (MNPED et al., 2011). Poor households often take out loans to purchase food because income from employment or other productive activities are not sufficient to meet basic household needs (WFP, 2012c). Much of the credit accessed by rural households is informal, leaving families vulnerable to high interest rates (MNPED et al., 2011).

Among the landless and smallholder farmers, indebtedness is widespread and deep (MNPED et al., 2011; Wilson & Naw Eh Mwee Aye Wai, 2013). Though there was reportedly a decline in overall indebtedness in both poor and non-poor households (from 48% in 2004 compared with 30% in 2009, according to IHLCA), the size of debts is large.

2.2.4. Social, economic, political context

Myanmar's social, economic and political context influences all other determining factors for undernutrition in the country. Because of the numerous measures of the enabling environment for nutrition, this section will present recent evidence on indicators most relevant to maternal and child undernutrition in Myanmar.

The status of women in a society is an important contributing factor for maternal and child nutritional status. Though there is a need for more data on women's empowerment indicators in Myanmar, a few assessments on the situation of women have been conducted in specific geographic areas. In Rakhine State, WFP is currently conducting a study on nutrition and gender, and in Maungdaw and Sittwe ACF has conducted an anthropological study on the role of women. In the Delta, the Women's Protection Technical Working Group (2010) conducted an assessment on the status of women after Cyclone Nargis. Additionally, data on a few key indicators can be found in the IHLCA 2010, MICS 2009-10, and LIFT 2012 and 2013 surveys. UNFPA (2010) also published a situation analysis on reproductive health and gender that provides a useful summary of existing data up to 2010.

There are no gender disparities in child nutritional status at the national level, though there are differences in how girls and boys are fed and cared for in certain areas. In education, Myanmar has achieved gender parity in primary school enrollment. Recent evidence from the 2014 census suggests that the proportion of male and female children attending school is similar up to age 15, but after age 15 more boys attend school than girls do. There are regional disparities, however, and girls are at an educational disadvantage in Rakhine State and Shan (North) (MNPED & MOH, 2011).

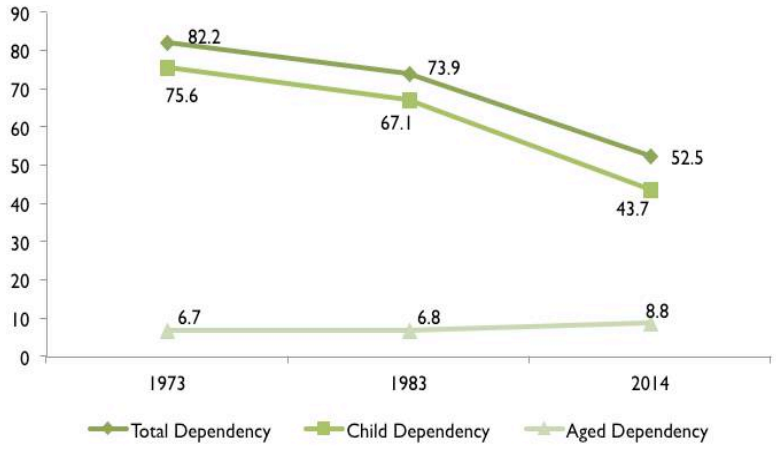
The rate of female adult literacy in Myanmar is high, though there are regional disparities. According to the 2014 census, the female literacy rate is 86.9% (compared with 92.6% among males) (Department of Population, 2015). Female literacy is lowest in Shan State at only 59.4% and highest in Yangon at 95.5% (Department of Population, 2015). The discrepancy between female and male literacy is highest in rural areas, where 83.8% of women are literate (compared with 93.7% of men) (Department of Population, 2015).

Delaying women's first pregnancy until after adolescence is one of the best ways to improve maternal nutritional status and to reduce low birth weight. Evidence has shown that for every year beyond 15 that a pregnancy is delayed, a woman can gain 1 centimeter in adult height (UNSCN, 2011). Taller, better-nourished women deliver healthy babies that are at reduced risk of undernutrition and other poor health outcomes. According to the Department of Population & UNFPA (2009), as of 2007, 1.5-2% of women in Myanmar give birth before 15 years of age and about 10% give birth before 18 years. UNICEF (2012b) estimates the adolescent birth rate for 2006 to 2010 to be 17.4 per 1,000 women aged 15 to 19 years.

Because most births in Myanmar take place within marriage, age of first marriage is an important indicator for understanding the impact of gender roles on maternal and child nutrition. According to MICS 2009-10, 7.4% of female adolescents (15 to 19 years) were already married, with major regional disparities. The highest rate of married adolescent women was found in Shan (East) at 22.3%, followed by Shan (North) at 13.7% (MNPED & MOH, 2011).

The contraceptive prevalence rate is a measure of women's empowerment and access to health services. An estimated 45.7% of married women in Myanmar are using a mod-

Figure 5: Trends in dependency ratios: 1973, 1983 and 2014 (Department of Population, 2015)



ern method of contraception, with major differences by region. Only 7.7% of married women in Chin reported a modern method of contraception, compared with 58.1% in Yangon (MNPED & MOH, 2011).

There is no association between poverty and female-headship of house, which may be due to income from remittances or that only better-off women can afford to head their own households rather than be absorbed into the household of a relative in the case of divorce or death of a spouse (MNPED et al., 2011). Evidence suggests that educated, urban women in Myanmar participate almost equally at home and in private business and enjoy joint decision-making. However, this is not always the case for rural women and ethnic minorities (UNFPA, 2010; Wilson & Naw Eh Mwee Aye Wai, 2013). Anecdotal evidence suggests there are wage differences between men and women, particularly for casual labor due to real or perceived differences in level of effort (Michigan State & USAID, 2013).

Demographic factors related to the characteristics of a country's population structure can be important contributing factors for poverty, health, and nutrition. Structural population changes can be illustrated by demographic dependency ratios, including the child dependency ratio (ratio of child population to the productive-age population), old age dependency ratio (ratio of the old age population to the productive-age population) and the total dependency ratio (the sum of the child and old age dependency ratios). The higher the ratio value, the higher the "dependency burden" on the household. In Myanmar, the total and child dependency ratios are falling, while the aged dependency ratio and the ageing index are increasing. Figure 5 presents trends in the Total, Child and Aged Dependency ratios in Myanmar from 1973 to 2014. According to the 2014 census, the child dependency ratio and the total dependency ratio are highest in Chin State (72.3% and 81.0% respectively) and Kayin (60.6% and 69.3% respectively). This suggests that in these areas, there is a large burden on the productive age population (Department of Population, 2015).

Because the 2014 census did not measure the prevalence of poverty, it is impossible to use the findings to better understand the relationship between dependency ratios and poverty. However, evidence from the IHLCA (2010) suggests there is actually an inverse relationship between dependency and poverty (MNPED et al., 2011). For instance, even in Chin State, which had the highest poverty incidence at 73%, the very high dependency ratio (71%) is not associated with poverty. In fact, the dependency ratio of poor households was 68% compared with 79% among non-poor households.[14] This finding suggests that poverty is not primarily driven by life-cycle considerations in Myanmar (MNPED et al., 2011).

The economic dependency ratio compares the number of economically inactive and active household members between the ages of 15-59 years. "Economically active" is defined as being engaged in an economic activity, including a contributing family worker. As above, the higher the ratio value, the higher the "economic burden" on the house-

14 The productive age group according to the IHLCA (2010) was 15 to 59 years, compared with 15 to 64 years in the 2014 census and LIFT Household Survey (2013).

hold (MNPED et al., 2011). According to the IHLCA (2010), the national economic dependency ratio was 0.67 (0.88 in urban areas and 0.60 in rural areas). As with the demographic dependency ratio, higher economic dependency was not associated with poverty in any state or region except for Rakhine State. This suggests that in general poverty in Myanmar is not due to economic inactivity of household members but rather low returns on economic activities. Rakhine State, however, has the highest level of economic dependency at 109%, and households with high economic dependency are more likely to be poor than households with more economically active members.

Localized conflict has negatively impacted the food and nutrition security of households in Myanmar in a number of important ways. Conflict has resulted in reduced access to markets and health facilities, food price increases, and loss of livelihoods among many other serious consequences for affected populations. Because the extent to which conflict has impacted the food and nutrition security situation in a given area differs based on the unique context of each area and the nature of the conflict, these issues will be explored in greater detail in later region-specific sections.

Contributing to the many determinants of undernutrition in Myanmar is extremely low expenditure by the government on health, education, and water and sanitation. According to the World Bank, about 0.48% of total GDP was spent on health and 0.79% on education in 2013. WHO estimates that in 2013 nearly 70% of total expenditure on health in Myanmar was paid out-of-pocket by consumers (WHO, 2015b). The need to pay even relatively small sums is a barrier to improved health for poor people, exacerbating poverty and inequality (MNPED & UNICEF, 2013).

People unloading sacks of rice seed from boats in Maung Shin village in Rakhine, Myanmar. Photo Credit: Elizabeth Whelan/ LEARN

3. Food and Nutrition Security Situation in the Coastal/ Delta Zone

This section will present an overview of the food and nutrition security situation in the Coastal/Delta Zone, which includes Rakhine State and Ayeyarwaddy Region. Section 3.1 will explore the scope of the undernutrition problem in the Zone and individual state/ regions while Section 3.2 includes the most recent data on likely determinants of undernutrition. The purpose of this section is to present trends in food and nutrition security in the Coastal/Delta Zone, identify potential causes for observed trends using existing data, and highlight key data sources. It is not intended to be exhaustive; although all available data from the past five years were reviewed, not all of it is presented in the text. For more information, citations refer the reader to specific resources.

Throughout this section, prevalence estimates for key indicators of food and nutrition security in Ayeyarwaddy and Rakhine will be compared. Although there is room for improvement in both areas, families and children in Rakhine State are clearly far worse off than those in Ayeyarwaddy Region are. Therefore, aggregating the data to the Coastal/ Delta Zone level masks important differences and seems to hold limited benefit for understanding the situation in either area.

3.1. Prevalence of undernutrition

The MICS 2009-10 is the only recent survey with undernutrition prevalence data for Myanmar that are representative to the state/regional level. The IHLCA 2010 contains data on underweight prevalence only at the state/regional level, while the 2013 LIFT Household Survey estimates the prevalence of undernutrition in LIFT program areas at the zonal level. Additionally, SMART surveys conducted by ACF contribute prevalence data from Maungdaw District (including Maungdaw and Buthidaung Townships) and Rathedaung Township. Table 8 presents the most recent data available on the prevalence of stunting, wasting and underweight in LIFT program areas of the Coastal/Delta Zone (LIFT, 2013a), Ayeyarwaddy Region as a whole (MICS 2009-10), Rakhine State as a whole (MICS 2009-10), and Rathedaung, Buthidaung and Maungdaw Townships, Rakhine State (ACF, 2014b; ACF, 2014a).

As can be seen from Table 8, Rakhine State has a higher prevalence of undernutri-

Table 8: Prevalence of undernutrition (stunting, wasting/edema, underweight) among children under five (unless otherwise noted) in the Coastal/Delta Zone

Indicator	Coastal/Delta (LIFT 2013)[1]	Ayeyarwaddy (MICS 09-10)[1]	Rakhine			
			Rakhine (MICS 09-10)[1]	Rathedaung (ACF, 2014b)[2]	Rathedaung (ACF, 2014b)[2]	Maungdaw (ACF, 2014a)[2]
Stunting	**27.0**	**37.0**	**49.9**	**37.9**	**58.6**	**47.6**
Severe	-	12.9	26.7	15.6	28.6	22.4
Wasting/Edema	**9.4**	**9.8**	**10.8**	**10.5**	**21.4**	**20.0**
Severe	-	2.3	2.8	1.6	3.7	3.0
Underweight	**22.0**	**26.5**	**37.4**	**30.4**	**51.9**	**42.9**
Severe	-	6.0	14.9	10.5	17.2	15.6
Low Birth Weight	**-**	**7.3**[3]	**7.4**[4]	**-**	**-**	**-**

[1] Children 0 to 59 months of age; [2] Children 6 to 59 months of age; [3] 49.7% of children were weighed at birth in Ayeyarwaddy; [4] 17.1% of children were weighed at birth in Rakhine

Table 9: Summary results from anemia study in Nyaung Done Township, Ayeyarwaddy Region (Htet et al., 2012)

Indicator	Prevalence among adolescent females (N=1234)
Stunting	21.2
Thinness (low BMI for age)	10.7
Anemia	59.1
Estimate of iron deficiency anemia (Green and King's Index)	35.8

tion than Ayeyarwaddy Region, and rates of stunting, wasting and underweight are particularly high in Maungdaw, Buthidaung and Rathedaung.[15] Nearly 60% of children 6 to 59 months of age in Buthidaung are stunted, with about 29% severely stunted. At least 20% of children are acutely malnourished or wasted in Buthidaung and Maungdaw (ACF, 2014a).

Micronutrient deficiencies

There are no data on anemia that are representative to the zone or state/regional level. However, national level estimates suggest a significant anemia problem in the Coastal/Delta Zone as in the rest of the country.

A study by Htet, Dillon, Akib, Utomo, Fahmida & Thurnham (2012) in Nyaung Done Township, Ayeyarwaddy Region, found prevalence of anemia among adolescent females (N=1234) was 59.1%. Using Green and King's Index, the authors estimate that about 36% of anemic adolescent females were suffering from iron-deficiency anemia. Nearly 11% of the sample were too thin (low BMI for age) and over 21% were stunted (Htet et al., 2012). This evidence suggests that many women enter pregnancy undernourished, underscoring the importance of intervening early, during the pre-pregnancy period or early stages of pregnancy, to halt the intergenerational cycle of undernutrition.

Worm or helminth infestation can exacerbate anemia and inhibit the absorption of micronutrients. A 2005 survey conducted by NNC and UNICEF (referenced in MOH, 2013) found that levels of worm infestation were particularly high in coastal areas, where 92% of pregnant women and 70% of children were found to have one or more of three common worm types (Ascaris, Trichuris and hookworm), compared with national level prevalence rates of 45% and 31%, respectively (MNPED & UNICEF, 2013).

A 2012 study conducted by researchers from NNC found a low serum retinol (vitamin A deficiency) prevalence of 32.7% among children 6 to 59 months of age in Ayeyarwaddy Region (Htin Lin et al., 2012). The prevalence of illness was high and consumption of vitamin-A rich foods was found to be low across the six states/regions where the study was conducted. In fact, 47% of children were sick (with ARI, diarrhea or measles) in the month preceding the survey (Htin Lin et al., 2012).

Maternal nutrition

The only studies including data on maternal nutrition in the Coastal/Delta Zone are ACF SMART surveys from Maungdaw, Buthidaung and Rathedaung Townships. These studies measured the mid-upper arm circumference (MUAC) of pregnant and lactating women (PLW). According to ACF (2014a; 2014b), while literature available on optimal targeting cut offs is limited, data from a recent global mapping exercise indicate that for

15 The MICS and LIFT (2013a) surveys measured a sample of children 0 to 59 months of age, while ACF SMART surveys included only children 6 to 59 months of age. Because undernutrition rates for children under-six months are typically lower than older children, this may have resulted in slightly lower prevalence estimates in the MICS and LIFT (2013a) survey. However, this would not account for the substantially higher rates of undernutrition in ACF SMART surveys.

Table 10: Percent of pregnant and lactating women aged 15-45 years with low MUAC in Maungdaw, Buthidaung, and Rathedaung (ACF, 2014a; ACF, 2014b)

Township	"Severe" (MUAC < 210 mm)		"Moderate" (MUAC ≥210 and <230 mm)	
	Pregnant	Lactating	Pregnant	Lactating
Maungdaw	16.0	11.1	38.0	29.9
Buthidaung	13.2	11.1	43.4	41.4
Rathedaung	13.9	8.3	22.2	24.8

targeted supplementary feeding, over 90% of countries implementing targeted supplementary feeding programs for PLW were using MUAC as the anthropometric admission criteria; with an even split between countries using cut-offs for admission of <210 mm and 230 mm (WFP/Valid 2013- Ververs 28 et al., in press, referenced in ACF, 2014a).

Table 10 presents data on MUAC of pregnant and lactating women in Maungdaw, Buthidaung and Rathedaung. For ease of reading the table, MUAC < 210 mm has been labeled "severe" and MUAC ≥210 and <230 mm "moderate." It is clear from this data that a substantial portion of pregnant and lactating women in these townships is undernourished. In Maungdaw, pregnant women are more likely to be malnourished while in Buthidaung and Rathedaung there was no statistically significant difference between the prevalence of pregnant and lactating women with low MUAC.

3.2. Determinants of undernutrition in Coastal/Delta zone

This section will present an overview of existing data on the determinants of undernutrition in the Coastal/Delta Zone, noting gaps in knowledge wherever relevant. As few studies have comprehensively explored associations between undernutrition and potential contributing factors, much of the data presented in this section are on presumed (based on global evidence) determinants of undernutrition.

3.2.1. Immediate causes: Inadequate dietary intake and disease

Data on dietary intake and disease among selected children in the Coastal/Delta come from the LIFT 2013 Household Survey, while data at the state/regional level are from the MICS 2009-10 and from ACF SMART surveys at the township level. Qualitative data are available on IYCF practices in Giri-affected townships in Rakhine State (Save the Children, 2014). Table 11 presents a summary of all available data points on the immediate causes of undernutrition.

The early initiation of breastfeeding prevalence in Rakhine State is substantially lower than the national average of about 76% (MNPED & UNICEF, 2011). In the Giri-affected townships[16] of Rakhine State, qualitative evidence suggests that grandmothers are responsible for the care of babies immediately after delivery and that it is common

16 Kyaukphyu, Minbya, Myebon and Pauktaw.

practice to provide water and other liquids to babies (Save the Children, 2014). In Maungdaw and Buthidaung, colostrum is believed to cause diarrhea and for this reason is not given to newborns (ACF, 2014a). Poor breastfeeding behavior is likely an important contributing factor to undernutrition in Rakhine State, especially where less than 2% of children 0 to 5 months of age are exclusively breastfeeding. Liquids and foods are introduced far too early, from 1 week to 3 months, and many mothers feel that breast-

Table 11: Existing data on relevant indicators of immediate determinants of undernutrition

Cause	Indicator	Coastal/ Delta Zone	Rakhine		Ayeyarwaddy*
			State	Township	
Inadequate dietary intake	**Early initiation of breastfeeding**	-	44.2[1]	Qualitative data for some townships[5]	73.3[1]
	Exclusive breastfeeding	-	1.3[1]	Qualitative data for some townships[5]	25.0[1]
	Continued breastfeeding at 20-23 months	-	82.5[1]	Maungdaw[2]: 78.7 Buthidaung[2]: 89.4 Rathedaung[3]: 90.9	83.6[1]
	Timely introduction of complementary food (6-9 months)	-	90.1[1]	Maungdaw[2]: 81.4 Buthidaung[2]: 84.4 Rathedaung[3]: 90.4	83.6[1]
	Mean IDDS	-	2.1	Maungdaw[2]: 1.9 Buthidaung[2]: 1.9 Rathedaung[3]: 2.5	2.5
	Minimum dietary diversity (IDDS ≥ 4)	42.9[4]	-	Maungdaw[2]: 11.2 Buthidaung[2]: 7.8 Rathedaung[3]: 20.8 Qualitative data for some townships[5]	-
	Minimum meal frequency (6-11 months)	-	53.7[6]	-	55.5[6]
	Minimum meal frequency (6-23 months)	-	-	Maungdaw[2]: 45.4 Buthidaung[2]: 63.6 Rathedaung[3]: 84.3	-
	Minimum acceptable diet	-	-	Maungdaw[2]: 3.2 Buthidaung[2]: 2.1 Rathedaung[3]: 12.4	-
	Adequately fed infants	-	32.0[1]	-	42.2[1]
Disease	**Diarrhea in past 2 weeks**	11.9[4]	7.6[1]	-	9.4[1]
	Any illness in past 2 weeks	-	-	Maungdaw[2]: 78.0 Buthidaung[2]: 70.7 Rathedaung[3]: 65.0	-

*There are no township-level data for Ayeyarwaddy Region

[1]MICS 2009-10 (MNPED & MOH, 2011); [2]ACF, 2014a; [3]ACF, 2014b; [4]LIFT, 2013a; [5]Save the Children, 2014; [6]Proportion of 6-11 month olds who receive breastmilk and complementary food at least the minimum number of recommended times; 7 Proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) at least the minimum number of recommended times.

milk alone is not enough to satisfy babies (Save the Children, 2014).

Dietary diversity for children 6 to 23 months of age is generally low throughout the Coastal/Delta Zone and particularly poor in Maungdaw District, where less than 8% of children (in Buthidaung) have an adequate IDDS of 4 or more (ACF, 2014a). In Maungdaw and Buthidaung, the average IDDS is only 1.9. Evidence from Giri-affected townships in Rakhine suggest that complementary foods are typically carbohydrate-based food such as rice porridge and that children receive a limited diet until the age of 2. While 32% of children in Rakhine and 42.2% of children in Ayeyarwaddy are "adequately fed" according to the MICS 2009-10,[17] only between 2% (in Buthidaung) and 12% (in Rathedaung) of children 6 to 23 months of age in the northern part of Rakhine State have a minimum acceptable diet, which takes into account breastfeeding, meal frequency, and dietary diversity.

The rate of continued breastfeeding at 20 to 23 months is high in both Rakhine and Ayeyarwaddy, which is positive given that breastmilk remains a critically important source of nutrition beyond infancy. A cost of diet (CoD) analysis conducted by Save the Children UK in Giri-affected townships (2014) found that among children 12 to 23 months of age, breastmilk provided more than half the recommended requirements for fat, a third of requirements for energy and calcium and between 20% and 30% of requirements for vitamin A, vitamin B1, vitamin B2, niacin, folic acid and zinc (Save the Children UK, 2013).

Unfortunately, there are no quantitative data on dietary diversity for pregnant and lactating women in the Coastal/Delta Zone. However, qualitative evidence from Giri-affected townships suggests that there are numerous food taboos during pregnancy and lactation and that postpartum women adhere to a particularly restrictive diet (Save the Children, 2014). In Maungdaw and Buthidaung, qualitative evidence suggests that lactating mothers eat a restricted diet for as long as 3 to 6 months after delivery (ACF, 2014a). The 2014 CoD analysis in Giri-affected areas showed that cultural eating habits (particularly consumption of large quantities of rice) are a key barrier to households obtaining a nutritious diet. In fact, comparative analysis showed that households in all wealth groups in 3 livelihood zones would need to decrease rice consumption by at least 50% to allow for the quantities of other foods required to meet nutrient requirements (Save the Children UK, 2013).

Disease

Nearly 12% of children in LIFT program areas of the Coastal/Delta Zone suffered from diarrhea in the two weeks preceding the 2013 household survey. According to the MICS 2009-10, the prevalence of diarrhea among children under-five was 9.4% in Ayeyarwaddy Region and 7.6% in Rakhine State. However, rates of illness among children in sme areas of Rakhine State seem to be substantially higher, with between 65% (Rathedaung) and 78% (Maungdaw) of children 6 to 59 months of age reportedly ill (with ARI, fever or diarrhea) in the two weeks preceding the survey (ACF, 2014a; ACF, 2014b). Poor child-feeding practices compounded by repeated bouts of illness are contributing to high levels of undernutrition among children in the Coastal/Delta Zone and especially in certain townships of Rakhine State.

17 "Adequately fed" indicator does not take into account dietary diversity.

A girl having a meal in the Delta Zone of Myanmar. Photo Credit: Egan Hwan/ Save the Children

3.2.2. Underlying causes: Food, care, environment

Household food insecurity

In terms of food availability, the Delta region is one of the most agriculturally productive areas of the country. Despite the widespread destruction and unprecedented loss of life resulting from Cyclone Nargis, almost all acreage was being cropped in Bogale and Laputta Townships within 18 months after the disaster, though with lower yields than under optimal conditions (WFP & FAO, 2009). In Rakhine State, rice is the main crop and occupies about 85% of total agricultural lands. However, technology is limited and there is a lack of appropriate inputs as well as limited access to high yield seeds and fertilizers (ACF, 2014b). The LIFT & Save the Children (2014) CoD analysis noted that despite a limited variety of fruit, pulses, roots/tubers and dairy products in some markets, the availability of nutrient-rich food was unlikely to be a key barrier to poor households in Giri-affected townships from accessing a nutritious diet (Save the Children UK, 2013).

In the Coastal/Delta Zone, evidence shows that landless households or households with holdings of 2 acres or less are much more likely to be food insecure than landholding households (WFP, 2011b; WFP, 2011c; LIFT, 2013a). In the LIFT (2013) sample, the average land size in the Coastal/Delta Zone was 4.5 acres. According to IHLCA (2010), average land size in Rakhine is 4.1 acres, and nearly the same between poor (4.2 acres) and non-poor (4.6) households. In Maungdaw District, ACF estimates the average land size to be about 2.5 acres (ACF, 2014a). Ayeyarwaddy Region has the largest average land holdings in the country, at 9.3 acres, with major differences between poor (5.5 acres) and non-poor (10.3 acres) households (MNPED et al., 2010).

Landlessness affects a significant proportion of households in the Coastal/Delta Zone,

but rates of landlessness vary substantially by geographic area. In LIFT target areas, an estimated 66% of households do not own land (LIFT, 2013a). According to IHLCA (2010), about 25% and 32% of households in Rakhine and Ayeyarwaddy, respectively, do not own land. In Maungdaw, Buthidaung and Rathedaung Townships, an estimated 60% to 70% of households are landless (WFP, 2011c; ACF, 2014a). In Giri-affected townships, more than 50% of households were landless as of 2011 (with a high of 63% in Minbya and a low of 46% in Myebon) (WFP, 2011b).

Households in the Coastal/Delta Zone spend a significant proportion of their total consumption on food, and food share of consumption is highest among the poor (WFP, 2011b; WFP, 2011c). According to the IHLCA 2010, the food poverty rates in both Rakhine State and Ayeyarwaddy Region are above the national rate, at 10% and 6.1% respectively.

In LIFT areas of the Coastal/Delta Zone, the average HDDS is 6.09 (LIFT, 2013a). Mean HDDS is lower in Maungdaw (5.5) and Buthidaung (5.2) but higher in Rathedaung (6.4) (ACF, 2014a; ACF, 2014b). Comparing HDDS with child IDDS in the same townships, it seems that even though many households have adequate dietary diversity, children eat a limited number of foods. In Giri-affected townships, dietary diversity does not differ significantly by wealth group, suggesting that increasing incomes alone would not be enough to diversify the diet given the cultural habits and preferences at play (Save the Children UK, 2013).

Natural disasters are important causes of food insecurity in the Coastal/Delta Zone. After Cyclone Giri struck Rakhine State, food consumption scores (FCS) in affected townships were poor: from 5% of households having "poor" FCS in Myebon to 11.9% in Kyaukphyu (WFP, 2011b). Despite the impact of Nargis, by the end of 2009, only 3% of households in Bogale and Laputta had "poor" FCS (WFP & FAO, 2009). In the northern part of Rakhine State, food insecurity is chronic, with 45% of the population classified as food insecure by WFP (WFP, 2011c). As of 2011, WFP found that 25% of households in Maungdaw, Buthidaung and Rathedaung Townships had "poor" food consumption scores, which is much higher than estimates by ACF in 2014 (WFP, 2011c; ACF,

People collect palm leaves, used as a material to make roofs in Maung Shin village in Rakhine, Myanmar.
Photo Credit: Elizabeth Whelan/ LEARN

2014a; ACF, 2014b).

Households in Rakhine State routinely adopt coping strategies in times of food insecurity. After Cyclone Giri, 28% of households in the affected area ranked "high" on the coping strategy index (CSI), indicating high levels of stress (WFP, 2011b). In Maungdaw District, high levels of stress unfortunately seem to be the norm, with 30% of households having "high" CSI (WFP, 2011c). In Rakhine State, households working in wood/bamboo cutting, casual labor or marginal livelihoods are more vulnerable to food insecurity than those reliant on farming, regular salaries or remittances (WFP, 2011b; WFP, 2011c). The most common coping strategies reported by households in the Coastal/Delta region are switching to cheaper or less preferred food and reducing the size or number of meals (WFP & FAO, 2009; WFP, 2011b; WFP, 2011c; LIFT, 2013a). Borrowing money to purchase food and buying food on credit are also common (WFP & FAO, 2009; WFP, 2011b; WFP, 2011c; LIFT, 2013a).

In all areas besides the Coastal Fishing Zone of Rakhine State, poor households tend to purchase most or all of their food while better off households produce more of their own food (LIFT, 2013a). After Cyclone Giri, over 60% of households in affected townships were dependent on unreliable food sources (WFP, 2011b). In Maungdaw District, more than half of all households reported an unreliable source of food as of 2011 (WFP, 2011c). In Ayeyarwaddy Region, an increasing proportion of households reporting purchase as their main food source signaled a reduced dependence on food aid and moved into the rehabilitation and early recovery phase after Nargis (WFP & FAO, 2009).

CoD analysis in Giri-affected households in 2014 suggests that despite the availability of nutritious food, most households cannot afford a nutritious diet. Even well-off households in predominantly agricultural zones cannot afford a nutritious diet plus non-food expenditures (Save the Children UK, 2013).

Despite food access and stability issues, nearly 82% of households in the LIFT (2013) sample of the Coastal/Delta Zone reported that they faced 0 months of food shortage (compared with less than 1% with adequate food 12 months of the year). Also according to LIFT (2013), 99.3% of households in the Coastal/Delta Zone faced little to no hunger on the household hunger scale (HHS).

Inadequate care

There are little data on care practices for mothers and children in the Coastal/Delta Zone. In terms of treatment of diarrhea, an estimated 54% of children with diarrhea were treated with oral rehydration salts (ORS) in Rakhine State, compared with nearly 70% in Ayeyarwaddy Region (MICS 2009-10). Hand washing, a key hygiene behavior, is not widely practiced at all critical times in Rathedaung Township, where only 21% of adults report washing their hands after using the toilet and only 5% after helping a child use the toilet (ACF, 2014b). These unhealthy behaviors are exacerbated by an extremely poor water and sanitation environment, which will be described in more detail in the next section.

A caregiver's mental state can affect his/her ability to provide adequate care. According to ACF (2014a; 2014b), the majority of mothers (76%) in Maungdaw and Buthidaung townships have a poor state of well-being, characterized by unhappiness and high levels of stress. In a women's protection assessment in Bogale, Pyinzalu, and Dedaye townships 18 months after Nargis, a large proportion of women reported feelings of sadness, depression and confusion despite going about their lives as usual (Women's Protection

Technical Working Group, 2010)..

Unhealthy environment

Access to safe water and sanitation facilities varies substantially across townships in the Coastal/Delta Zone. Table 12 summarizes existing data on the coverage of improved drinking water sources and improved sanitation facilities, as well as the rate of open defecation (where available) and households with no latrine. Data at the state/regional level and by urban/rural residence are from the 2014 census (Department of Population, 2015). While the WASH situations in both Ayeyarwaddy and Rakhine are poor, available data suggest that communities in Rakhine are far worse off. Furthermore, the situation is likely to be worse in communities that were not enumerated during the 2014 census, so the coverage of improved water and sanitation amenities might actually be overestimated in Rakhine State.

More than two-thirds of rural households in Rakhine State have no latrine at all (Department of Population, 2015). With such poor access to sanitation facilities, it is clear that open defecation is common in rural communities in Rakhine State. Indeed, about 64% of those surveyed in the 2011 UNICEF/MOH KAP survey reported openly defecating. Only about one-third of rural households in Rakhine State have access to an improved drinking water source (Department of Population, 2015), and access is as low as 3% in Rathedaung Township (ACF, 2104b).

Table 12: Access to improved water and sanitation and proportion of households without a latrine in townships of Rakhine State and Ayeyarwaddy Region

State/Region	Township(s)	Households with improved drinking water source (%)	Households with improved sanitation facility (%)	Households with no latrine (%)	Households practicing open defecation (%)
Rakhine	**State[1]**	**37.7**	**31.8**	**62.9**	**-**
	Urban[1]	62.1	75.9	18.7	-
	Rural[1]	33.2	23.6	71.2	-
	Townships				
	Maungdaw[2]	67.0	-	55.0	-
	Buthidaung[2]	33.0	-	58.0	-
	Rathedaung[3]	3.0		73.0	-
	Ponnagyun[4]	17.6	31.9	65.7	64.4
	Giri-affected (2011)[5]	54.0	-	89.1	-
Ayeyarwaddy	**Region[1]**	**50.3**	**74.9**	**12.8**	**-**
	Urban[1]	70.3	90.6	3.4	-
	Rural[1]	47.2	72.4	14.3	-
	Townships				
	Bogale[4]	12.5	70.8	24.4	1.6
	Phyapon[4]	20.7	65.8	21.3	2.1
	Pantanaw[4]	63.1	75.7	16.8	3.9
	Kyaunggone[4]	97.0	85.7	12.6	0.9
	Hinthada[4]	99.5	85.5	9.9	0.3

[1]Department of Population, 2015; [2]ACF, 2014a; [3]ACF, 2014b; [4]MOH & UNICEF, 2011; [5]WFP, 2011b

The situation in Ayeyarwaddy is better, particularly in terms of coverage of improved sanitation facilities, but still far from ideal. About 72% of rural households have an improved sanitation facility and only about 14% have no latrine at all. Open defecation is also relatively rare (MOH & UNICEF, 2011). However, fewer than half of all rural households have access to an improved water source (Department of Population, 2015).

According to data from the LIFT 2013 Household Survey, the main source of drinking water in the Coastal/Delta Zone differs by season. In the rainy season, the majority of households (82.5%) rely on rainwater collection (an improved source) while during the cool and summer seasons, most households (85.9% and 87.1% respectively) rely on surface water (an unimproved source). Given the widespread reliance on unprotected water sources, water treatment is an essential health behavior in many areas. Nearly all (99.1%) of households in the LIFT sample (2013a) reported treating drinking water in some way (effective or not) before drinking. However, only about 18% and 19% of households in Rakhine and Ayeyarwaddy reported appropriately treating their drinking water as of 2009-10 (MNPED et al., 2011). Nearly all (99.1%) of households in LIFT program areas of the Coastal/Delta Zone reported treating drinking water in some way (effective or not) before drinking (LIFT, 2013a), suggesting that the use of ineffective treatment methods is common. According to an ACF SMART survey, only 4% of households in Maungdaw and 10% in Buthidaung reported treating their drinking water. In both townships, 92% of households have unimproved water sources and do not treat drinking water (ACF, 2014a). Drinking water treatment in Rathedaung was more common at 69% (ACF, 2014b).

The most recent data on access to health services and immunization coverage in Rakhine State and Ayeyarwaddy Region are from the MICS 2009-10 and IHLCA 2010. [18] According to the MICS 2009-10, nearly 100% of children one year of age in Rakhine and Ayeyarwaddy received DTP1, DTP3 and measles vaccinations (MNPED & MOH, 2011). However, there are known issues with MICS 2009-10 estimates of the coverage of immunization services. Findings from the IHLCA are more conservative, with only 68.2% of children one year of age vaccinated for measles in Rakhine and 89.9% in Ayeyarwaddy (MNPED et al., 2011). In 2014, after many free immunization campaigns were stopped due to conflict in 2012, only about 59% of all children 9 to 59 months of age in Rathedaung were vaccinated for measles (ACF, 2014b). Coverage of vitamin A supplementation was lower, at only 32.5% in Rakhine and 62.7% in Ayeyarwaddy according to MICS 2009-10 and 39.7% in Rathedaung (ACF, 2014b).

Data on access to maternal health services come from the MICS 2009-10 and IHLCA 2010. Compared with national rates, fewer women in the Coastal/Delta Zone receive ANC from a skilled provider or have skilled attendance at delivery. Only about 12% of women in Rakhine and 23% in Ayeyarwaddy give birth in a health facility (MNPED & MOH, 2011).

3.2.3. Basic causes

Poverty

Poverty is an important determining factor for maternal and child undernutrition in the Coastal/Delta Zone. According to results from the IHLCA 2010, the prevalence of poverty in Rakhine State increased from 38.1% in 2005 to 43.5% in 2010 and from 29.5%

18 State/regional level coverage estimates from the 2015 MR vaccine campaign have not yet been disseminated, but may be available from the EPI of MOH.

in 2005 to 32.5% in 2010 in Ayeyarwaddy Region. The prevalence of food poverty in Ayeyarwaddy is about 6%, compared with 10% in Rakhine (MNPED et al., 2011). Reanalysis of the IHLCA dataset by the World Bank, however, estimates a substantially higher poverty rate in the zone. In fact, the World Bank estimates that 78% of the population in Rakhine is living in poverty, compared with 45.7% in Ayeyarwaddy. High poverty prevalence and large population make both states important areas for intervention. Indeed, nearly 15% and 18% of Myanmar's poor live in Rakhine State and Ayeyarwaddy Region, respectively (World Bank, 2014).

An estimated 26% of the population in LIFT target areas of the Coastal/Delta Region are living below the poverty line of US$1.25 per day converted into Myanmar Kyat and the 2010 PPP exchange rate. In 2011, a household economy analysis of Giri-affected townships in Rakhine State estimated that 15% to 30% of households in the inland agriculture zone were very poor, compared with 25% to 35% of households in the coastal fishing zone and 10% to 25% in the embankment paddy zone (LIFT, 2013b). By all metrics, it is clear that a significant proportion of the population in the Coastal/Delta Zone is living in poverty.

Events in recent years have shown that the Delta/Coastal Zone is particularly vulnerable to natural disasters. Poor and near poor households are also vulnerable to more commonplace economic shocks that may lead to food insecurity and negative health and nutrition outcomes for women and children. In both Rakhine State and Ayeyarwaddy Region, the main shocks reported by households are: few job opportunities and low wages, sickness of family member/health expenditure, and debts to reimburse (WFP & FAO, 2009, WFP, 2011b; WFP, 2011c).

Lack of capital

According to the IHLCA (2010), access to credit is better in Ayeyarwaddy Region than in Rakhine State, with nearly twice as many households reporting that they took out loans to finance agricultural activities (MNPED et al., 2011). At the same time, most households in Rakhine State are in debt. Household indebtedness among households in Giri-affected areas was substantial after the cyclone, with 85% in debt and an average debt size of about 250,000 Myanmar Kyat (WFP, 2011b). About 40% of households in debt after Cyclone Giri reported taking out loans to buy food (WFP, 2011b). In Maungdaw, Buthidaung and Rathedaung Townships, indebtedness is common (more than 80% of households are in debt), but debts are reportedly smaller, at an average of about 30,000 Myanmar Kyat (WFP, 2011c).

Table 13: Percent of population 25 years and over by highest level of education completed and sex (Department of Population, 2015)

State/Region		None	Primary (Grade 1-5)
Rakhine	**Total**	**20.2**	**51.3**
	Male	12.8	50.5
	Female	26.3	51.9
Ayeyarwaddy	**Total**	**12.3**	**54.2**
	Male	10.3	50.7
	Female	14.0	57.3
Union	**Total**	**16.2**	**45.2**
	Male	13.3	45.2
	Female	18.8	47.7

Education is a vital form of capital for poor and landless households. Low caregiver education is also significantly associated with suboptimal health behaviors and poor health and nutrition outcomes for children.

Daw Khin Thanda Aye teaches a grade 3 class in in a school set up by Save the Children in Setyokekya, Rakhine State, Myanmar. Photo Credit: Lynette Lim/ Save the Children

Table 13 summarizes data on educational attainment in the Coastal/Delta Zone from the 2014 census. In Rakhine State, about 20% of the population over age 25 has never attended school (with substantial disparities between men and women), and more than 50% have only completed primary school (Department of Population, 2015). Although about 85% of the population in Rakhine State is literate (Department of Population, 2015), literacy levels are reportedly very low in Maungdaw District, with only about 10% of the population in Maungdaw and 20% in Buthidaung able to speak and write Burmese (UNHCR, 2010, referenced in ACF, 2014a).

Educational attainment is better than the national average in Ayeyarwaddy Region, but still about 12% of people over the age of 25 have never attended school and about 54% have only attended primary school. The difference in the proportion of male and female adults who have never attended school is smaller in Ayeyarwaddy Region than in Rakhine State.

3.2.4. Social, economic, and political context

In terms of access to education, Ayeyarwaddy Region has achieved gender parity for primary and secondary school, while the gender parity index (GPI) in Rakhine State is the highest in the country, at 0.94 for primary school and 0.85 for secondary school (MNPED & MOH, 2011). Adult female literacy is substantially lower (79%) than adult male literacy (92%) in Rakhine State (Department of Population, 2015).

There is a need for additional research on the role of gender as a determining factor for undernutrition in the Coastal/Delta Zone. The low status of women in some households and communities may negatively impact maternal health and nutrition as well as intrahousehold food allocation and child feeding behaviors. For instance, in Maungdaw

District, there are reported differences in the way that male and female children are fed. Girls tend to be breastfed longer because they are considered more fragile than boys are. At the same time, girls are more likely to be undernourished according to MUAC than boys are (ACF, 2014a).

There are little data on wage differences between men and women in the Coastal/ Delta Zone, but a gender assessment in Pyinzalu, Bogale and Dedaye found that women earned on average about two-thirds the wages of their male counterparts (WP-TWG, 2010). Evidence in Ayeyarwaddy and in certain areas of Rakhine State suggests that despite the lack of association between poverty and households headed by females (MNPED et al., 2011), female-headed households in some parts of the Coastal/Delta Zone are at increased risk of food insecurity (WFP, 2011c) and have lower incomes (WP-TWG, 2010).

About 6.5% and 10.9% of females 15 to 19 years of age are already married in Rakhine State and Ayeyarwaddy Region, respectively, according to the MICS 2009-10. According to a gender assessment after Cyclone Nargis, about 23% of women were married before the age of 18 in Pyinzalu, Bogale and Dedaye (WP-TWG, 2010). The contraceptive prevalence rate in both Rakhine and Ayeyarwaddy is slightly higher than the national average (MNPED & MOH, 2011), though there are likely major differences across the state and region.

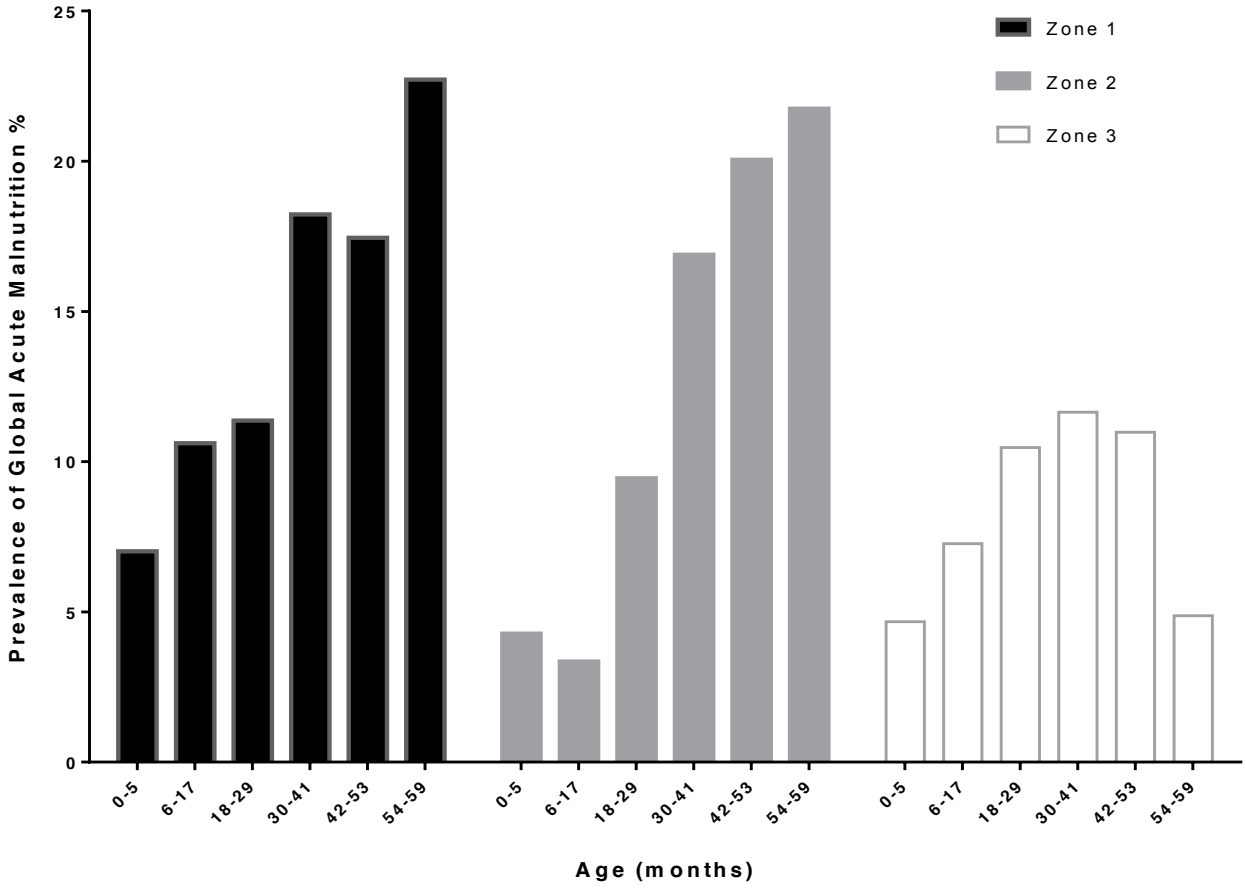
Rakhine State is characterized by a young population and high economic dependency ratio. According to IHLCA (2010), the economic dependency in Rakhine is the highest in the country at 109%, and economic dependency is more strongly associated with poverty than elsewhere in the country (MNPED et al., 2011). The estimate of economic dependency is even higher in Maungdaw, Buthidaung and Rathedaung Townships at 130% as of 2011 (WFP, 2011c).

Conflict is a major contributing factor for poor maternal and child nutrition in Rakhine State. As of 2014, UNOCHA estimated that there were nearly 140,000 displaced persons across 10 townships in Rakhine State. Assessments from Sittwe (WFP, 2013a) indicate that local economies had been severely affected by conflict and displacement, with a breakdown of traditional trade networks, increased competition for wages, and food price increases in some areas. Across the state, marginalization of ethnic minori-

Table 14: Prevalence of stunting, wasting, underweight and low birth weight among children under five in the Dry Zone

Indicator	**Dry Zone** (LIFT, 2013)	**Dry Zone** (WFP et al. 2014)	**Agro-ecological zone** (WFP et al. 2014)			**Region** (MNPED & MOH, 2011)		
			Dry farming (1)	**Highland farming (2)**	**Flood plains (3)**	**Magway**	**Mandalay**	**Sagaing**
Stunting Severe	**27.5**	**27.5**	**30.8**	**27.3**	**21.4**	**36.4** 12.6	**31.5** 9.5	**38.6** 12.6
Wasting Severe	**10.2**	**12.3** 0.5	**13.9** 0.5	**12.2** 0.9	**9.5** 0.4	**10.4** 3.2	**7.1** 1.7	**7.0** 2.5
Underweight Severe	**26.5**	**27.7**	**31.2**	**29.2**	**19.0**	**26.9** 5.6	**20.7** 3.4	**22.5** 5.9
Low Birth Weight	-	**17.2**	**36.2**	**7.8**	**9.1**	**9.8**	**9.9**	**7.1**

Figure 6: Prevalence of acute malnutrition by age and zone [1] (WFP et al., 2014)



[1] Zone 1: Dry land farming; Zone 2: Highland farming; Zone 3: Flood plains.

ties is common.

The Coastal/Delta Zone is prone to natural disasters including cyclones, flooding, and landslides, as exemplified by the widespread destruction caused by cyclones Nargis and Giri and the widespread impact of flooding on households in Maungdaw, Buthidaung and Rathedaung townships (WFP, 2011c). Natural disasters tend to lead to food insecurity through the destruction of productive assets, increases in food prices, and decreases in wages (WFP, 2011b).

4. Food and Nutrition Security Situation in the Dry Zone

This section will present an overview of the food and nutrition security situation in the Dry Zone, which includes Magway, Mandalay and Sagaing regions (for the purpose of this report). Section 4.1 will explore the scope of the undernutrition problem in the Dry Zone while Section 4.2 will seek to explain some of the most important determinants of undernutrition using available evidence.

4.1. Prevalence of undernutrition

Table 14 presents the most recent estimates of the prevalence of child undernutrition in the Dry Zone. Regional prevalence rates for Magway, Mandalay and Sagaing are from the MICS 2009-10. The LIFT (2013a) household survey estimated the prevalence of undernutrition in LIFT program areas in the Dry Zone, while the Save the Children et al. (2014) survey estimated prevalence rates for the entirety of the Dry Zone and its three main agro ecological zones: dry land farming, highland farming, and flood plains/

Table 15: Prevalence of maternal undernutrition in the Dry Zone (WFP et al., 2014)

Indicator	Dry Zone	Agro-ecological zone		
		Dry land Farming	Highland Farming	Flood Plains/ Irrigated Farming
BMI < 18.5 (Non pregnant)	**19.7**	20.6	21.9	17.0
Mean MUAC (All mothers[1])	**26.0**	25.6	25.8	26.6
Mean MUAC (non-PLW2)	**26.8**	26.3	27.0	27.3
MUAC < 210 mm (All mothers[1])	**3.6**	2.7	4.3	4.7
MUAC < 210 mm (non-PLW[2])	**3.7**	1.3	0.3	2.2
MUAC < 230 mm	**19.3**	21.9	21.5	13.8

[1] Including pregnant and lactating mothers, [2] Non pregnant and lactating women

irrigated farming areas.

The Dry Zone is characterized by high rates of wasting, medium rates of stunting and high rates of low birth weight (Save the Children et al., 2014). Households in the flood plains/irrigated areas tend to be better off in terms of health and nutritional status than those living in dry land or highland farming areas, though only an estimated 15% of villages in the Dry Zone are irrigated or located in flood plains (Save the Children et al., 2014). Many health and nutrition indicators are unacceptable throughout the Zone.

About 12% of children under five in the Dry Zone are wasted. Wasting rates are highest among older children, as can be seen in Figure 6. Typically, the highest rates of wasting are seen among younger children, when complementary foods are first introduced and weaning occurs. However, high rates of wasting among older children in the Dry Zone are consistent with higher rates of disease among older children in this area (Save the Children et al., 2014). Wasting is a risk factor for stunting, underscoring the importance of tackling both acute and chronic malnutrition (Save the Children et al., 2014).

Table 16: Data on IYCF practices in the Dry Zone, Magway, Mandalay and Sagaing

IYCF Indicator	Dry Zone[1]	Magway[2]	Mandalay[2]	Sagaing[2]
Early initiation of breast-feeding	**34.6**	83.7	72.5	81.1
Exclusive breastfeeding	**37.5**	34.9	30.5	28.9
Continued breastfeeding at 20-23 months	**90.6**	94.8	72.1	85.5
Timely complementary feeding (6 – 9 months)	**97.4**	85.7	85.7	84.6
Minimum meal frequency (6 – 11 months)	-	63.8[3]	69.4[3]	53.6[3]

[1] WFP et al., 2014; [2] MICS 2009-10 (MNPED & MOH, 2011); [3] Proportion of 6-11 month olds who receive breastmilk and complementary food at least the minimum number of recommended times

Table 15 presents findings on the prevalence of maternal undernutrition in the Dry Zone, according to Save the Children et al. (2014). Nearly 20% of non-pregnant mothers in the sample had low BMI (< 18.5), which is a risk factor for child wasting. The MUAC of non-pregnant and lactating mothers is significantly higher than those who are pregnant or lactating, a troubling finding given that poor nutritional status during pregnancy negatively affects both mothers and children, putting babies at greater risk of low birth weight and undernutrition during childhood. BMI and MUAC are higher among women living in the flood plains and irrigated areas of the Dry Zone, where indicators of child nutritional status are also better (Save the Children et al., 2014).

The prevalence of low birth weight, which is a measure of both child and maternal undernutrition, is very high in the Dry Zone. Consistent with global evidence, Save the Children et al. (2014) found a strong association between birth weight and stunting. In fact, a low birth weight baby is ten times more likely to be stunted than a baby weighing 2,500 grams or more at birth in the Dry Zone (Save the Children et al., 2014). Maternal BMI is also a risk factor for acute malnutrition in children. These findings underscore the importance of improving maternal nutrition.

Micronutrient deficiencies

There are little data on the prevalence of micronutrient deficiencies, and no data on the prevalence of anemia, in the Dry Zone. Data from a study by Htin Lin et al. (2012) suggest high rates of low serum retinol (i.e. vitamin A deficiency) in the Dry Zone. An estimated 62% of children 6 to 59 months of age in Magway are vitamin A deficient, compared with about 55% in Sagaing and 33% in Mandalay. Global evidence suggests that although regular vitamin A supplementation can reduce the prevalence of xerophthalmia, it will not affect the prevalence of low serum retinol (UNSCN, 2011).

4.2. Determinants of undernutrition in the Dry Zone

The following section will present what is known about the causes of maternal and child undernutrition in the Dry Zone and in individual regions, townships and agro-ecological zones, wherever possible. The most valuable resource available for understanding the many determinants and their relative importance in the Dry Zone is the Save the Children et al. (2014) Nutrition and Food Security Assessment of the Dry Zone of Myanmar, which was conducted in June and July 2013. In-depth analysis of data from this survey revealed only small statistically significant contributions of any specific variable to differences in maternal and child nutritional status. These findings suggest that there are many causes of undernutrition in the Dry Zone (Save the Children et al., 2014). This section will explore the various determining factors for undernutrition in the Dry Zone and the potential size of each factor's contribution to the problem of undernutrition.

Table 17: Indicators of maternal and child dietary adequacy in the Dry Zone and its 3 agro-ecological zones

Indicator	Dry Zone (LIFT, 2013)	Dry Zone (WFP et al. 2014)	Agro-ecological Zone		
			Dry land farming	Highland farming	Flood plain/ irrigated
Minimum meal frequency (6 to 23 months)*	-	56.6	58.3	57.8	52.4
Minimum adequate diet (6 to 23 months)*	-	10.5	11.1	12.5	8.3
Mean IDDS (Children 6-23 months)	-	2.4	-	-	-
Minimum dietary diversity (Children 6-23 months)	36.3	19.4	18.5	21.0	20.4
Mean IDDS (All mothers)	-	4.3	4.3	4.0	4.4
Mean IDDS (Pregnant/lactating mothers)	-	4.2	4.3	4.0	4.3
Mean IDDS (Non-pregnant/lactating mothers)	-	4.4	4.5	4.1	4.5

*Breastfed children

4.2.1. Immediate causes: Inadequate dietary intake and disease

Inadequate dietary intake

As presented in Section 4.1, low birth weight and maternal undernutrition are significant contributing factors to undernutrition in the Dry Zone. In fact, low birth weight explains about 13% of all stunting (Save the Children et al., 2014). Table 16 presents data on indicators of dietary intake among children, namely the prevalence of recommended IYCF practices in the Dry Zone (Save the Children et al., 2014) and in each region (MICS 2009-10). Interestingly, the prevalence of early initiation of breastfeeding estimated by Save the Children et al. (2014) is substantially lower than estimates for individual regions from the MICS 2009-10, which could be due to differences in the way mothers were asked about early initiation of breastfeeding or in the way questionnaires were administered.[19] Evidence from the 2014 study suggests that feeding water and other liquids to babies prior to starting breastfeeding is common (Save the Children et al., 2014).

The rate of exclusive breastfeeding for children under-six months of age in the Dry Zone (34.6%) is higher than the national average (23.6%) but still leaves significant room for improvement. The low rate of exclusive breastfeeding together with the near universal practice of introducing complementary foods by 6 to 9 months of age, suggests that in the Dry Zone, as in most areas of Myanmar, complementary foods are introduced earlier than is recommended. Encouragingly, continued breastfeeding until 20 to 23 months of age is the norm in the Dry Zone.

Although the rate of breastfeeding is high in the country, the rate of exclusive breastfeeding is low.
Photo Credit: Tim Mitzman/ Bridge

19 In the MICS 2009-10 questionnaire, the question about early initiation of breastfeeding (MN13) was asked during the Maternal and Newborn Health Module, following questions about mother's most recent delivery. In the Save the Children et al. (2104) questionnaire, the question about early initiation of breastfeeding (5.3) was the third question in the Module on Infant and Young Child Feeding, which followed the Module on Child Health.

Interestingly, the Save the Children et al. (2014) found no significant associations between the IYCF indicators shown in Table 16 and child nutritional status. The researchers believe that this unusual finding may be due to the lack of variance in these indicators across the population, suggesting that most households have similar IYCF behaviors.

Table 17 presents indicators of maternal and child dietary adequacy from the Save the Children et al. (2014) survey as well as the LIFT (2013) survey. These results demonstrate that the diets of children 6 to 23 months of age in the Dry Zone are poor. Only about 57% of children received an adequate number of meals each day, and the mean dietary diversity score for children 6 to 23 months of age was only 2.4 (minimum of 4 is recommended). In fact, less than one-fifth of children had adequate dietary diversity. As a result, only about 10% of children have an acceptable diet (a composite indicator measuring adherence to recommended dietary diversity, meal frequency and breastfeeding practices). The only statistically significant associations between measures of adequate dietary intake and nutritional status found in the Save the Children et al. (2014) study were between stunting and meal frequency and wasting and minimum acceptable diet. Once again, this absence of significance may be due to the lack of variance in the population.

Disease

Despite low prevalence rates of diarrhea among children under five according to the MICS 2009-10, data from LIFT (2013) and Save the Children et al. (2014) suggest that young children in the Dry Zone are regularly ill. According to LIFT (2013), about 12% of children under five in program areas suffered from diarrhea in the two weeks preceding the survey. According to Save the Children et al. (2014), over a quarter of all children under five suffered from some illness within two weeks of the survey, the most common of which was fever.

4.2.2. Underlying causes: Food, care, environment

Household Food Insecurity

The Dry Zone is heavily influenced by its climate, which is characterized by rain levels that are lower than the rest of the country but nonetheless moderate. However, rainfall is concentrated in the period from May to October, followed by a long dry period. Poor access to water, combined with limited inputs and a lack of good quality seeds severely hamper agricultural productivity in the Dry Zone (FAO, 2014). Dry spells and droughts are commonplace, and as such, access to irrigation is a decisive determining factor for household food security (WFP, 2011a).

Land and livestock ownership are important determinants of food security in the Dry Zone (WFP, 2011a; LIFT, 2013a; FAO, 2014; Save the Children et al., 2014). There is also an association between maternal BMI and land/livestock access in the Dry Zone (Save the Children et al., 2014). The prevalence of landlessness varies by region and township. Evidence suggests that at least a third (MNPED et al., 2011; LIFT, 2013a; Save the Children et al., 2014) and as many as half (JICA, 2010; WFP, 2011a; FAO, 2014) of all households in the Dry Zone are landless, with major variations by region and township. For instance, in 2010, JICA estimated the prevalence of landlessness in Ayadaw (Sagaing) was only 5%, compared with about 80% in Pokkoku (Magway). In general, land plots in the Dry Zone are larger than in the Uplands and smaller than in the Coastal/Delta Zone.

Two young boys eat mangoes, rich in Viitamin A, from their home garden in Pakokku, Dry Zone, Myanmar.
Photo Credit: Elizabeth Whelan/ LEARN

In LIFT target areas of the Dry Zone, the average plot size is 3.8 acres, compared with 3.2 acres in the Uplands and 4.5 acres in the Coastal/Delta Zone (LIFT, 2013a). Most households are dependent on purchasing foods from the market and therefore physical access to markets and purchasing power are important determinants of food access (Save the Children et al., 2014).

As of 2011, WFP estimated that 17% of the population in parts of Magway and Mandalay were severely food insecure (WFP, 2011a). However, the mean HDDS in the Dry Zone is well above the threshold for adequacy (> 4) suggested by FSIN Myanmar (FSIN, 2012). Mean HDDS in LIFT program areas is 6.11 (2013), compared with 6.2 in the Dry Zone according to Save the Children et al. (2014), leading researchers to suggest that an HDDS threshold of 4 may be too conservative in the Dry Zone (Save the Children et al., 2014). Indeed about 90% of households in the Dry Zone have an HDDS of more than 4 (LIFT, 2013a; Save the Children et al., 2014). Children living in households with inadequate HDDS are, however, at increased risk of being stunted (Save the Children et al., 2014). About 82% of households also have adequate food consumption scores (FCS) according to Save the Children et al. (2014). However, there are differences by agro-ecological zone, and significantly fewer households in the highland farming area have adequate FCS than in flood plains and dry land farming areas (Save the Children et al., 2014).

A significant proportion of households in the Dry Zone have issues meeting food needs each year. Indeed more than a third of households in the Save the Children et al. (2014) survey reported that there were times in the past year where they had difficulty meeting food needs. However, the majority of households have 12 months of adequate household food provisioning (MAHFP) (LIFT, 2013a, Save the Children et al., 2014). Few households report experiencing hunger, according to HHS (LIFT, 2013a; Save the Chil-

Table 18: Access to improved water and sanitation and proportion of households with no latrine in Magway, Mandalay, Sagaing, and the Dry Zone

Region/Zone		Households with improved drinking water source (%)	Households with improved sanitation facility (%)	Households with no latrine (%)
Magway[1]	**Region**	**76.6**	**68.4**	**17.5**
	Urban	84.3	83.6	4.3
	Rural	75.4	65.9	19.7
Mandalay[1]	**Region**	**85.6**	**79.8**	**15.7**
	Urban	91.8	92.6	3.4
	Rural	82.8	73.9	21.3
Sagaing[1]	**Region**	**81.1**	**71.6**	**16.2**
	Urban	87.6	90.5	3.4
	Rural	79.8	67.8	18.8
Dry Zone[2]	**Total**	**64.5** [3]	**-**	**25.1**
	Dry land	58.0 [3]	-	29.0
	Highland	61.5 [3]	-	16.5
	Flood plains	77.5 [3]	-	21.7

[1] Department of Population, 2015; [2] Save the Children et al., 2014; [3] Indicates year-round access to an improved water source

dren et al., 2014).

Coping strategies in the Dry Zone are similar to those in the Coastal/Delta Zone, with the most commonly reported dietary coping strategies being consumption of cheaper or less preferred food (LIFT, 2013a) or reducing rice portion size (Save the Children et al., 2014). Few households report using coping strategies daily and about 80% of households have "adequate" coping strategy index scores (Save the Children et al., 2014). At the same time, households in the Dry Zone are vulnerable to becoming food insecure. Most households are dependent on markets for purchasing food. At the same time, median travel time to a market is 1.8 hours, and about two-thirds of all households have less than one month's stock of staple food (Save the Children et al., 2014). WFP (2011) also estimated that more than a quarter of all households are reliant on an unstable source of food.

Households in the Dry Zone spend a significant proportion of their income on food, leaving fewer finances available for other household needs. According to FAO (2014), the poor in this region spend about 67% of their income on food, compared with about 24% by the better off. Save the Children et al. (2014) estimated that households across the Dry Zone spend about 55% of total income on food.

In terms of dietary diversity, evidence from LIFT (2103) and Save the Children et al. (2014) suggest there are severe and potentially harmful restrictions on the diets of pregnant and lactating women and young children. This is particularly troubling given the importance of nutrition for both mother and child during the 1,000-day period when critical cognitive and physical development is taking place. Additional research on intrahousehold food allocation is needed, as well as investigation of reasons for apparent low household consumption of locally available nutritious foods such as beans, nuts and lentils (Save the Children et al., 2014).

Inadequate care

Sickness is common among children in the Dry Zone (LIFT, 2013a; Save the Children et al., 2014). Use of ORS for treatment of diarrhea is low, with about 37% of children with diarrhea in the past two weeks reportedly being treated appropriately (Save the Children et al., 2014). Additionally, feeding and providing more liquid to children during bouts of illness as recommended is not common practice in the Dry Zone (Save the Children et al., 2014). Hand washing is common, but the use of soap is not. Fewer than half of all households safely dispose of children's feces (Save the Children et al., 2014), a dangerous health behavior that was also identified by MOH & UNICEF (2011). This is important given that there is a significant association between child nutrition status and hand washing with soap after helping a child pass stool and safe disposal of feces in

a latrine (Save the Children et al., 2014).

Unhealthy environment

MICS 2009-10 estimated high coverage of improved latrine coverage in the Dry Zone, from 84% in Magway to 91% in Sagaing. More recent evidence from the 2014 census suggests that improved latrine coverage is highest in Mandalay at nearly 80% and lowest in Magway at about 68% (Department of Population, 2015). Table 18 summarizes the most recent data from each region and the Dry Zone as a whole. Despite reasonably high coverage of improved latrines in the Dry Zone, there is still a significant proportion of households with no latrine. In Mandalay, for instance, about 21% of rural households have no latrine at all and likely practice open defecation. According to Save the Children et al. (2014), about a quarter of all households in the Dry Zone have no latrine. This is significant given that there is a small but positive association between household latrine access and maternal BMI (Save the Children et al., 2014).

Water sources vary by season (LIFT, 2013a), and at least a third of households in the Dry Zone use an unprotected water source at some point during the year (Save the Children et al., 2014). Nearly 65% of households in the Dry Zone have year-round access to improved drinking water sources. According to the 2014 census, between 77% of households (Magway) and 86% of households (Mandalay) have access to an improved drinking water source. However, this does not take into account seasonal differences in access to water sources (Department of Population, 2015).

Treatment of drinking water is a common practice in the Dry Zone, although as of 2009-10, fewer than half of all households were using appropriate methods (MICS 2009-10). Encouragingly, evidence from LIFT (2013) illustrated almost universal treatment of drinking water in LIFT program areas, with the preferred method by most households being boiling. However, Save the Children et al. (2014) found that most households in the Dry Zone were using an ineffective method for water treatment (filtering through a cloth). Improving water treatment behavior is an important action to improve child nutrition given that children living in households that do not treat their drinking water are significantly more likely to have diarrhea (LIFT, 2013a; Save the Children et al., 2014). Findings from LIFT (2013) and Save the Children et al. (2014) support the assumption that a poor public health environment and poor hygiene practices lead to increased incidence of diarrhea and increased risk of undernutrition.

Evidence, though limited, suggests that access to health services is reasonably good in the Dry Zone. Coverage of measles vaccination is high (MNPED et al., 2011; MNPED & MOH, 2011; Save the Children et al., 2014), along with DTP1, DTP3 (MNPED & MOH, 2011) and BCG (Save the Children et al., 2014). Coverage of vitamin A supplementation is about 70%, with significantly poorer coverage in highland farming areas (Save the Children et al., 2014). Fewer than 50% of children receive anti-helminths (Save the Children et al., 2014), which is significant given the links between anemia and worm infestation and the reportedly high levels of anemia among children in Myanmar (NNC & UNICEF, 2005, referenced in NNC, 2013).

According to MICS 2009-10, more than 80% of women in Magway, Mandalay and Sagaing receive ANC from a skilled provider. Estimates of coverage of skilled assistance at delivery in the Dry Zone range from about 65% in Magway (MNPED & MOH, 2011) to more than 83% in Mandalay (MNPED et al., 2011), with most estimates at or above the national average. Nearly 85% of all women in the Dry Zone reported taking iron tablets during pregnancy, with about 71% of those taking iron more than five days per week

Yin Yin Myat with her students at an ECCD centre in Kum Village, Pakkoku Township, Magway State, Myanmar.
Photo Credit: Lynette Lim/ Save the Children

Table 19: Percent of population 25 years and over by highest level of education completed and sex (Department of Population, 2015)

Region		None	Primary (Grade 1-5)
Magway	**Total**	**19.3**	**49.9**
	Male	16.7	45.8
	Female	21.3	53.5
Mandalay	**Total**	**12.5**	**48.2**
	Male	8.8	44.4
	Female	15.5	51.4
Sagaing	**Total**	**11.9**	**55.2**
	Male	8.8	51.9
	Female	14.4	58.0
Union	**Total**	**16.2**	**45.2**
	Male	13.3	45.2
	Female	18.8	47.7

(Save the Children et al., 2014). Only about half of all women reported taking a B1 supplement during pregnancy or after delivery. In terms of physical access to health centers, the median length of time it takes to reach a health center is 1 hour (2 hours in highland villages and 30 minutes in flood plains) (Save the Children et al., 2014).

4.2.3. Basic causes

Poverty

Evidence from the IHLCA 2010 suggests that the prevalence of poverty is declining in the Dry Zone. Between 2005 and 2010, the poverty rate declined in Magway (from 42.1% to 27.0%), Mandalay (from 38.9% to 26.6%) and Sagaing (from 26.6% to 15.1%) according to the original analysis of the IHLCA. Food poverty affects 1.3% of households in Sagaing, 3.6% in Magway and 5.3% in Mandalay (MNPED et al., 2011). Reanalysis of IHLCA 2010 data by the World Bank indicated that the Dry Zone (including Bago, Magway, Man-

dalay and Sagaing) had the lowest poverty prevalence (compared to Hilly, Coastal, and Delta Zones) in the country at 29.5%. Save the Children et al. (2014) found that about 3.2% of the population in the Dry Zone is below the food poverty line and 26.1% are below the national poverty line. In LIFT (2013a) program areas, about 37% of households are below the international poverty line of US$1.25 per day, while Save the Children et al. (2014) estimate this figure at about 27% in the Dry Zone as a whole.[20]

By any measure, a significant proportion of the population of the Dry Zone is living in poverty, though poverty may be decreasing and, on average, households in the Dry Zone seem to be better off than those in other parts of the country are. Incomes are nevertheless low, from an average of about 70,000 Myanmar Kyat per month in highland areas to about 130,000 in irrigated areas (Save the Children et al., 2014), and families are vulnerable to a number of shocks that leave them at risk of becoming food insecure. According to WFP (2011), common shocks reported by households in the Dry Zone include few job opportunities and low wages, drought, and sickness/ health expenses.

Lack of capital

Though there is no estimate of educational attainment for the Dry Zone as a whole, data from the 2014 census suggest that educational attainment in the individual regions of the Dry Zone is low. Table 19 summarizes the proportion of the population over the age of 25 in Magway, Mandalay and Sagaing with no education or only primary school education. Nearly one-fifth of all adults in Magway have no education, compared with about 12% in Sagaing (Department of Population, 2015).

Evidence suggests that households in the Dry Zone have better access to credit than households in ethnic minority areas. According to the 2010 IHLCA, roughly one third of agricultural households in Magway, Mandalay and Sagaing received a loan for agricultural activities in 2009, with a slight decrease in each region since 2004. LIFT (2013a) has demonstrated an increase in the availability of micro-credit loans with low monthly interest rates in LIFT intervention villages. In the Dry Zone, more than three-quarters of all households in LIFT program areas report taking out a loan in the past year. The most important use of loans is to purchase food (about 35% of households), but evidence suggests that this is becoming less common in LIFT areas (LIFT, 2013a). Data from WFP (2011) suggest that health expenditures are also an important reason for households taking out loans. Given the large proportion of households reporting the use of loans, it is not surprising that most households in the Dry Zone are in debt (WFP, 2011; LIFT, 2013a; Save the Children et al., 2014). Although the prevalence of indebtedness in the Dry Zone is high, in LIFT program areas the value of debts in the Dry Zone is lower than in the Coastal/Delta and the Uplands (LIFT, 2013a).

4.2.4. Social, economic and political context

Data are lacking on the impact of gender on maternal and child undernutrition in the Dry Zone, though there are some data on key indicators from the 2014 census as well as the IHLCA 2010, MICS 2009-10 and Save the Children et al. (2014) Dry Zone survey. According to JICA (2010), ethnic Burmese women in the Dry Zone are typically in charge of everyday household finances and important decisions are made jointly be-

20 However, according to the World Bank, "a direct comparison of the incidence of poverty in Myanmar to that in other countries, using a 2005 PPP $1.25-a-day line, is not possible because there are no reliable price survey-based estimates of the 2005 PPP conversion factors for Myanmar," suggesting that estimates of poverty using the international poverty line be interpreted with caution (World Bank, 2014, p. 21).

tween husband and wife. The Dry Zone has achieved gender parity in primary but not secondary school enrollment (MICS 2009-10). Though female literacy is high in the Dry Zone, discrepancies exist between male and female literacy rates in all three regions. The largest discrepancy is in Magway, where about 89% of women over the age of 15 are literate, compared with 97% of men. Contraceptive use in Mandalay is the highest in the Dry Zone at 44.9%, compared with 38% in Magway and 20.5% in Sagaing (MNPED & MOH, 2011). Most mothers in the Dry Zone give birth after the adolescent period, with the average maternal age at first delivery being 23.4 years (Save the Children et al., 2014).

The mean dependency ratio in the Dry Zone is low at 0.3 (Save the Children et al., 2014). According to the IHLCA (2010) the economic dependency ratio is higher, at 0.48 in Magway and 0.61 in Mandalay. In the Dry Zone, non-poor households tend to have higher economic dependency ratios (MNPED et al., 2011). Migration is common in the Dry Zone, with about 31% of households reporting at least one vacant migrant at the time of survey (Save the Children et al., 2014). WFP (2011) and FAO (2014) also identified high rates of migration, at 22% and 26% of households reporting economic migrants, respectively. In survey areas, WFP (2011) found that households in the Dry Zone with long term or permanent migrants were more likely to be food secure than seasonal, short-term migrants. Additional research is needed to better understand the impact of migration on maternal and child nutritional status.

5. Food and Nutrition Security Situation in the Uplands

This section will present an overview of the food and nutrition security situation in the Uplands, which includes Kachin, Shan, and Chin States.[21] Section 5.1 will explore the scope of the undernutrition problem in the Uplands while Section 5.2 will present existing data on the likely determinants of undernutrition.

5.1. Prevalence of undernutrition

Data on the prevalence of undernutrition in the Uplands come from three major sources:

21 Shan State is sometimes divided into Shan (North), Shan (East) and Shan (South).

Table 20: Prevalence of stunting, wasting/edema, underweight and low birth weight among children under five (unless otherwise stated) by zone and state

Indicator	Uplands[1]	Kachin[2]	Shan (N)[2]	Shan (E)[2]	Shan (S)[2]	Chin	
						State[2]	Paletwa[3]
Stunting	**38.9**	**36.6**	**46.9**	**38.5**	**41.8**	**58.0**	**49.8**
Severe	-	10.7	21.3	19.0	18.8	26.3	15.7
Wasting/ Edema	**3.8**	**4.8**	**9.4**	**3.4**	**5.3**	**8.9**	**3.0**
Severe	-	1.7	4.1	1.6	3.3	2.7	0.9
Underweight	**19.4**	**13.0**	**24.1**	**15.5**	**17.7**	**30.7**	**24.7**
Severe	-	2.4	8.0	4.2	5.2	8.9	4.5
Low Birth Weight	-	**9.3**[4]	**9.6**[5]	**6.2**[6]	**6.9**[7]	**9.4**[8]	-

[1] LIFT (2013); [2] MICS 2009-10 (MNPED & MOH, 2011); [3] ACF (2013)- Children 6 to 59 months of age; [4]7.2% of children were weighed at birth in Kachin; [5]19.2% of children in Chin were weighed at birth; [6]36.4% of children in Shan (N) were weighed at birth; [7]92.6% of children in Shan (E) were weighed at birth; [8]73.8% of children in Shan (S) were weighed at birth

Table 21: Prevalence of anemia in special regions of Kachin and Shan states (Zhao et al., 2012)

Region	Children 6-36 months		Mothers
	Male	Female	
Kachin Special Region 1 (KSR1)	98.4	99.4	97.8
Kachin Special Region 2 (KSR2)	36.3	23.4	15.6
Shan Special Region 4 (SSR4)	89.6	91.4	74.4
Total	**73.7**	**71.5**	**62.2**

the LIFT (2013) Household Survey, which is representative only in sampled LIFT working areas; the ACF (2013) SMART survey of Paletwa Township, Chin State; and the MICS 2009-10 (MNPED & MOH, 2011). Data from the MICS 2009-10, particularly from states in the Uplands, should be interpreted with caution. Due to security concerns, 1 cluster in Kachin, 1 cluster in Shan (North), 10 clusters in Shan (South) and 19 clusters in Shan (East) were not visited during data collection. Instead these clusters were replaced by similar clusters, which is not a recommended procedure for MICS (MICS 2009-10, p. 125).

In general, the Uplands Zone is characterized by higher rates of stunting and lower rates of wasting than other zones in Myanmar (LIFT, 2013a). The highest prevalence of stunting is found in Chin State, where nearly 60% of children under five are stunted according to MICS 2009-10. In Paletwa Township, in Southern Chin State, nearly 50% of children 6 to 59 months of age are stunted (ACF, 2013). The lowest rate of stunting is in Kachin State, where still more than one-third of all children are stunted (MNPED & MOH, 2011). The prevalence of wasting varies across the zone, with the lowest rates in Shan (East) and highest in Shan (North) (MNPED & MOH, 2011). The prevalence of low birth weight, a hugely significant risk factor for child undernutrition, ranges from 6.2% in Shan (East) to 9.6% in Shan (North) (MNPED & MOH, 2011). Table 20 presents a summary of estimates of the prevalence of child undernutrition in the Uplands and its individual states. Unfortunately, there are no data on maternal nutrition in the Uplands.

Micronutrient deficiencies

As in the rest of the country, little data are available on the prevalence of undernutrition in the Uplands. A recent study conducted in conflict areas of Kachin and Shan States (Zhao et al., 2012), however, provides valuable insight into the scope of the anemia problem in some areas of Myanmar. Table 21 summarizes the estimates of anemia prevalence from this study. It should be noted that convenience sampling was used in this study, and as such, results may not be representative of the overall population. Alarmingly, about 73% of sampled children 6 to 36 months of age in Kachin Special Region 1 (KSR1), Kachin Special Region 2 (KSR2) and Shan Special Region 4 (SSR4) were found to be anemic. The lowest rates of anemia were in KSR2 and the highest (nearly 100% of children) in KSR1 (Zhao et al., 2012). About 62% of mothers were also found to be anemic, with the highest prevalence in KSR1 (97.8%). Significant risk factors for anemia in children were: stunting, being younger than 24 months, maternal anemia, low maternal education, living in a low-income household, fever in the past three months, and drinking un-boiled water (Zhao et al., 2012).

About 55% of the sampled children were stunted and about 13% wasted (Zhao et al., 2012). Dietary diversity of young children was also reportedly poor, with an estimated 64% of children eating meat and 65% of children eating eggs[22] "never or less than once per week" in the past month (Zhao et al., 2012). Though these results are not representative, they present convincing evidence that children living in remote and

22 Foods rich in iron.

conflict-affected areas are worse off than those living in stable areas. Furthermore, this study underscores the scope of the anemia problem in Myanmar and the urgent need to address its multiple causes.

Evidence from a recent study by NNC mentioned in previous sections suggests that vitamin A deficiency in the Uplands is common. In fact, an estimated 31% of children 6 to 59 months of age in Southern Shan were found to have low serum retinol or vitamin A deficiency (Htin Lin et al., 2012).

5.2. Determinants of undernutrition in the Uplands

This section will present an overview of existing data on the determinants of undernutrition in the Uplands, noting gaps in knowledge wherever relevant. As few studies have comprehensively explored associations between undernutrition and potential contributing factors, much of the data presented in this section are on presumed determinants of undernutrition based on global evidence.

5.2.1. Immediate causes: Inadequate dietary intake and disease

Table 22 presents data on IYCF indicators in Kachin, Shan and Chin States from the MICS 2009-10 (MNPED & MOH, 2011). Caution should be used when interpreting the prevalence of recommended IYCF behaviors, not only because of methodological issues already mentioned but also because of small sample sizes (indicated in Table 19). The lack of reliable data on IYCF underscores the importance of more research in this area.

Available evidence suggests that early initiation of breastfeeding is common in the Uplands. Prevalence rates ranged from 72.5% in Northern and Eastern Shan to nearly 90% in Southern Shan (MNPED & MOH, 2011). The prevalence of exclusive breastfeeding is low throughout the Uplands, with the lowest rate in Northern Shan (about 13%) and highest in Kachin (about 41%), while the national average is 23.6%. Fewer children than in most other parts of the country continue breastfeeding until 2 years of age as recommended by WHO, especially in Kachin and Shan States. In fact, only about 18% of children 20 to 23 months of age are still breastfeeding in Kachin (MNPED & MOH, 2011). Evidence suggests that a significantly higher percentage of children continue to breastfeed for 2 years and beyond in Chin State.

In terms of complementary feeding, most children are introduced to complementary foods by 6 to 9 months of age, though there are differences by state. In Northern Shan, nearly 40% of children 6 to 9 months of age have not been introduced to solid or

Table 22: IYCF indicators in Kachin, Shan and Chin states from MICS 2009-10

	Kachin	Shan (N)	Shan (E)	Shan (S)	Chin
Early initiation of breastfeeding (within one hour)	83.6	72.5	72.5	89.3	88.2
Exclusive breastfeeding (0-5 months)	40.6	12.9	23.3	27.8	25.4
Continued breastfeeding (20-23 months)	22.6	17.7	(34.5)[1]	(46.8)	83.0
Timely complementary feeding (6 – 9 months)	69.0	61.8	(76.3)	71.4	80.6
Minimum meal frequency[2] (6–11 months)	56.9	60.5	(68.8)	63.0	65.6
Adequately fed infants (0–11 months)	48.3	41.6	44.3	63.0	46.7

[1] ( ) indicates small sample size ; [2] Proportion of 6-11 month olds who receive breastmilk and complementary food at least the minimum number of recommended times

Nge Mu feeding her child in their home in Honar Village, Shan State, Myanmar.
Photo Credit: Lynette Lim/ Save the Children

semi-solid foods (MNPED & MOH, 2011). However, more than half of all children in Paletwa Township, Chin State, were introduced to complementary foods too soon, before 6 months of age (ACF, 2013). According to MICS 2009-10 data, over half of all children in Kachin, Shan and Chin are fed the minimum number of times each day (2 times for 6-8 month olds, 3 for 9 to 11 month olds). Evidence from Paletwa (ACF, 2013), suggests that in Southern Chin State, most young children are fed twice per day, but fewer older children are fed three times per day as recommended. Fewer than half of all children in the three states are adequately fed for their age (breastfeeding plus minimum recommended meal frequency) according to MICS 2009-10 (MNPED & MOH, 2011).

Estimates of dietary diversity for children 6 to 23 months of age are only available for Paletwa Township, where the diets of young children are poor. The mean IDDS in Paletwa is 2.33, and only 14% of children have adequate dietary diversity (≥4). In areas of the Uplands sampled by LIFT (2013), about 26% of children 6 to 23 months of age have adequate dietary diversity. This evidence suggests that dietary diversity for young children in the Uplands is generally poor, but more data are needed. There are no data on maternal dietary diversity in the Uplands, though evidence from an anthropological study in Chin State suggests that pregnant and lactating women eat very restrictive diets due to strong food taboos (Boutry, 2013).

Despite low diarrhea prevalence estimates from the MICS 2009-10, more recent evidence suggests that young children in the Uplands are regularly sick. LIFT (2013) found that nearly 20% of children under five in the Uplands had diarrhea in the two weeks preceding the survey. In Paletwa, ACF (2013) found that almost 70% of children 6 to 59 months of age were sick within the two weeks preceding the survey, the most common of which were "other" and ARI. An emergency food security assessment conducted by WFP in former poppy growing areas of Pinlaung and Pekon in Southern Shan State

found that two thirds of all children under five had been sick in the two weeks preceding the survey, most commonly with ARI, followed by diarrhea (WFP, 2012b). In their 2012 study, Zhao et al. found that 65.5% of sampled children 6 to 26 months of age in remote and conflict-affected areas of Kachin and Shan had been sick in the past 3 months, most commonly with diarrhea and fever.

5.2.2. Intermediate causes: Food, care, environment

Household food insecurity

The Uplands is home to a number of different ethnic groups with unique approaches to agriculture that are shaped by their environment and culture. As such, it is difficult to draw overarching conclusions about food and nutrition security in the Uplands. In general, the Uplands Zone is characterized by higher rates of land access and small average plot sizes (WFP, 2010a; WFP, 2010b; WFP, 2010c; WFP, 2010d; WFP, 2011d; Solidarities International, 2012a; GRET, 2012; LIFT, 2013a). In some areas, such as Kanpetlet Township in Chin State, land access is near universal. Indeed in many parts of Chin State, land is not privately owned but rather used for short-periods of time by different households depending on their ability and resources to cultivate the land.[23] However, WFP (2010d) found that about 8% of households had no access to land in parts of Chin State. WFP (2010c) reported that about 10% of households in the Taunggyi area of Southern Shan State do not have access to land. In Northern Shan, only about 2% of households in the Lashio area (WFP, 2011d), 2% in Wa (WFP, 2010b), and 3% in Kokang (WFP, 2010a) did not have access to land.

Though landlessness is relatively rare compared with the rest of the country, still about 24% of households in LIFT areas of the Uplands do not own land. According to IHLCA 2010, landlessness is most common in Kachin (17.2%) and least common in Eastern Shan (1.9%) (MNPED et al., 2011). Average plot sizes among agricultural households range from only 1.7 acres in Chin State to 6.1 acres in Kachin State (MNPED et al., 2011). Average plot size also varies by township and agro ecological zone (i.e. upland, rain-fed lowlands) (WFP, 2010a; WFP, 2010b; WFP, 2010c). In LIFT program areas, average plot size is about 3.2, which is substantially smaller than average plot size in Coastal/Delta and Dry Zones (LIFT, 2013a).

Not surprisingly given that most families in the Uplands are cultivating their own land, shortage of labor is a major constraint to agricultural productivity in some areas (WFP, 2010b; WFP, 2010c; WFP, 2010d; LIFT, 2013a). Other important constraints are loss of crop due to bad/unreliable weather, lack of money to buy inputs, lack of money to pay for labor, and loss of crops due to pest infestation (WFP, 2010a; WFP, 2010b; WFP, 2010c; WFP, 2010d; LIFT, 2013a). In Chin State, rat infestation resulting from the bamboo bloom[24] caused widespread destruction of crops and food stocks, resulting in severe food shortages in some areas (Solidarities International, 2012a). Long term, the bamboo bloom also reduced soil fertility and led to increased weed infestation (GRET, 2012; Pasquet, 2013).

Though household dietary diversity in the Uplands is generally adequate, there are times and areas when families eat severely restricted diets. Mean HDDS in the LIFT (2013) sample was 5.95 in the Uplands, compared with an average HDDS of 6.05 across

23 For more information on farming systems in Chin State see: GRET, 2012, and Pasquet, 2013.

24 Bamboo bloom refers to an event that occurs rarely, wherein the bamboo flowers bloom, causing an invasion of crop-destroying rats.

Table 23: Access to improved water and sanitation and proportion of households without a latrine by state (Department of Population, 2015) and township (MOH & UNICEF, 2011)

State/Region	Township(s)	Households with improved drinking water source (%)	Households with improved sanitation facility (%)	Households with no latrine (%)	Households practicing open defecation (%)
Chin	**State[1]**	**70.2**	**74.6**	**15.8**	**-**
	Urban[1]	80.3	93.0	3.0	-
	Rural[1]	66.7	69.4	19.3	-
	Townships				
	Mindat[2]	58.0	93.2	1.7	1.1
	Kanpetlet[2]	30.1	59.0	14.5	10.4
Shan	**State[1]**	**54.7**	**63.8**	**11.1**	**-**
	Urban[1]	86.0	92.3	0.9	-
	Rural[1]	44.9	54.9	14.4	-
	Townships				
	Pinlaung[2]	62.7	83.8	8.3	0.4
	Taunggyi[2]	81.5	83.1	6.4	0.0
	Pekon[2]	83.2	87.0	7.6	1.6
	Kutkai[2]	64.5	47.5	8.1	3.5
Kachin	**State[1]**	76.6	85.5	2.0	-
	Urban[1]	87.7	91.6	0.6	-
	Rural[1]	70.5	82.1	2.8	-
	Townships				
	Mogaung[2]	99.1	88.3	3.8	2.3
	Bamaw[2]	98.5	92.0	5.0	2.0

[1]Department of Population, 2015; [2]MOH & UNICEF, 2011

all sampled households. ACF (2013) found a similarly adequate mean HDDS (5.48) in Paletwa, Chin State. However, in emergency situations, such as the severe food insecurity of chili farmers in Southern Shan State identified by WFP (2012b), dietary diversity can decrease substantially. Indeed, WFP (2012b) found that over half of all chili-farming households surveyed in Pekon and Pinlaung Townships were eating two or fewer food groups each day. After widespread destruction of crops due to rat infestation, 65% of households in Kanpetlet Township, Chin State, were found to have poor food consumption scores (Solidarities International, 2012a). Also in Chin State, WFP (2010d) found that 22% of households had poor FCS, while more recently ACF (2013) found that in Paletwa food consumption was surprisingly adequate (only 2% of households with poor FCS). In Northern Shan State, between 18% (in Lashio) and 25% (in Wa) of households had reportedly poor FCS (WFP, 2010a; WFP, 2010b; WFP, 2010d). The situation seems better in the Taunggyi area, where only 2% of households have poor FCS (WFP, 2010c). The varying levels of food insecurity reported by assessments at the township level and below underscore the difficulty of drawing general conclusions about household food access in the Uplands.

The main source of food for households in the Uplands varies by state and township. In Chin State, households consume almost all the staple crops that they produce (Solidarities International, 2012b; ACF, 2013; Boutry, 2013). This is important given that many areas of the state are extremely remote, with poor or no access to markets (Solidarities International, 2012a; Pasquet, 2013). Even though Chin farming households consume

all that they produce, they still do not produce enough to be self-sufficient. According to WFP (2010d), half of all households in surveyed areas in Chin reported purchase as their most important source of food. In Northern Shan State, the most important source of food in Kokang is purchase while in Wa it is production (WFP, 2010a; WFP, 2010b). In Southern Shan, severe food insecurity among chili farmers in Pekon and Pinlaung was characterized by widespread dependence on unreliable food sources such as purchasing food on credit, exchanging items for food, and receiving gifts of food from family (WFP, 2012b). Even in a non-emergency setting, about one-fifth of households in the Lashio area have poor access to food characterized by dependence on unreliable food sources (WFP, 2011d).

As in the Dry Zone, existing data suggest that most households in the Uplands spend a significant proportion of their total expenditure on food. In Wa, a quarter of all households spend 75% or more on food (WFP, 2010b), compared with an average of 51% food share of expenditure in Kokang (WFP, 2010a). In Taunggyi, households spend about 50% of total expenditure on food (WFP, 2010c), and in Chin, half of all households spend 50% or more on food (WFP, 2010d).

In LIFT areas of the Uplands (as well as in the Coastal/Delta and Dry Zones), there was a substantial improvement from 2012 to 2013 in the proportion of households that reported facing difficulty accessing enough food in the previous year. As of 2013, only about 6% of households in the LIFT sample of the Uplands reported having any months without enough food in the past year. In contrast, 96% of households in Kanpetlet reported having problems accessing enough food in the year following the rat infestation in Chin State (Solidarities International, 2012a). Over 99% of households in the Uplands surveyed by LIFT (2013) had little to no hunger according to household hunger scale (HHS), compared with 60% moderate or severe hunger in chili growing areas of Pekon and Pinlaung, Southern Shan State (WFP, 2012b), and 36% in Kanpetlet, Chin State (Solidarities International, 2012a). These differences highlight the vulnerability of many households to severe food insecurity.

In terms of how households cope with food shortages, the pattern in LIFT areas of the Uplands was similar to that of households in the Coastal/Delta and Dry Zones. That is, the most commonly reported coping strategy was switching to a less preferred or cheaper food, followed by reducing the size or number of meals, followed by increased consumption of wild food. Adoption of these coping strategies was relatively rare, however, with only 0.6% reporting that they switch to less preferred food often and 22% rarely (LIFT, 2013a).

Inadequate care

Unfortunately there are little data on practices related to the care of mothers and children in the Uplands and how they may be impacting nutritional status. The only available data on treatment of childhood illness are from the MICS 2009-10. Adherence to treatment of diarrhea with ORS is low, with only 27% of children under five with diarrhea in the past two weeks treated with ORS in Northern Shan. The highest rate of treatment with ORS is in Southern Shan State, at 80% (MNPED & MOH, 2011), though the sample size is small. Even fewer children with diarrhea are treated with ORS or increased fluids and continued feeding as recommended (low of 33% in Northern Shan and high of 80% in Southern Shan) (MNPED & MOH, 2011).

No data are available on hygiene practices such as hand washing and safe disposal of child excreta or on care-seeking behaviors for childhood illness in the Uplands.

Table 24: Percent of population 25 years and over by highest level of education completed and sex (Department of Population, 2015)

Region		None	Primary (Grade 1-5)
Chin	**Total**	**25.8**	**36.1**
	Male	6.8	18.0
	Female	35.7	35.2
Shan	**Total**	**44.9**	**29.1**
	Male	39.7	30.9
	Female	49.8	27.3
Kachin	**Total**	**12.3**	**38.8**
	Male	9.6	36.9
	Female	15.2	40.7
Union	**Total**	**16.2**	**45.2**
	Male	13.3	45.2
	Female	18.8	47.7

Unhealthy environment

Table 23 presents a summary of available data on key WASH indicators in Kachin, Shan and Chin States from the 2014 census (Department of Population, 2015) and selected townships from MOH & UNICEF (2011). Findings from the 2014 census suggest that access to improved sanitation is best in Kachin State and worst in Shan State, where only about 64% of households (and only 55% of rural households) have an improved latrine (Department of Population, 2015). There are substantial disparities between urban and rural dwellers in all three states. Nearly one-fifth of rural households in Chin State have no latrine, compared with about 14% in Shan State and only 2% in Kachin State.

According to the 2014 census, access to improved water sources is best in Kachin and worst in Shan, though there are substantial differences between urban/rural households and by township. While 67% of rural households in Chin have improved drinking water sources according to the 2014 census, MOH & UNICEF (2011) estimated that only about 30% of households in Kanpetlet Township have an improved water source. According to Solidarites International (2012a), many households in Kanpetlet have "piped" water that reaches villages from a stream or river through a gravity flow system, which allows multiple opportunities for contamination. In Shan State, only about 45% of rural households have an improved water source, compared with 86% of urban households. In Northern Shan, earlier data from WFP (2010c) suggest that only about 28% of households in Taunggyi have access to improved drinking water, and that most households obtain their water from mountain streams and rivers. In areas of the Uplands surveyed by LIFT, most households obtain their drinking water from protected springs, followed by protected wells dug year round (LIFT, 2013a).

Estimates of the prevalence of water treatment vary substantially by state, township, and data source. LIFT (2013a) found that the Uplands had the lowest proportion of households treating their drinking water of any zone at 74%. Eastern Shan and Kachin states had the lowest prevalence of effective water treatment according to MICS 2009-10 at 39.5% and 47.5%, respectively (MNPED & MOH, 2011). According to MICS 2009-10, about 83% of households in Chin State treat their drinking water effectively (MNPED & MOH, 2011). WFP (2010d) also found that most households in Chin State were treating their drinking water by boiling. However, in a sample of households from Kanpetlet Township, Solidarites (2012a) found that only about half of all households were treating drinking water. In Northern and Southern Shan, water treatment prevalence estimates by MICS 2009-10 at the state level were substantially higher than those reported in Lashio and Taunggyi (WFP, 2011d; WFP, 2010c).

Data on access to health services in the Uplands come from MICS 2009-10 and IHLCA 2010. As expected, the MICS 2009-10 reported near universal coverage of DPT1, DTP3 and measles immunization coverage for children 12 to 24 months of age. Given the lack

Hkun Pha weaving traditional Kachin fabrics to make Kachin dresses, in Shan State, Myanmar. Photo Credit: Lynette Lim/ Save the Children

of reliability of this data, it should be interpreted with caution. Measles immunization coverage estimates by IHLCA (2010) were far lower, with only between 60% and 80% of 12-month-old children in Chin, Shan, and Kachin vaccinated for measles. Coverage of vitamin A supplementation of children 6 to 59 months of age varied substantially by state, with only 50% coverage in Chin and 96% coverage in Eastern Shan (MNPED & MOH, 2011).

In terms of maternal health services, women in Chin State seem to have the poorest access. Only half of all women received ANC from a skilled provider, and less than 40% had a skilled attendant at delivery (MNPED & MOH, 2011). In contrast, about 96% of women in Eastern Shan received ANC from a skilled provider and nearly 95% had skilled attendants at birth (MNPED & MOH, 2011). Less than 6% of women in Chin delivered in health facilities, compared with 41% in Eastern Shan. It is well known that access to health services in Chin State is very poor due to the remoteness of many villages, limited road infrastructure, and lack of health personnel and facilities (ACF, 2013).

5.2.3. Basic causes

Poverty

Evidence from the IHLCA (2010) suggests that the prevalence of poverty in the Uplands is declining. However, poverty continues to affect nearly three-quarters of all households in some areas. Chin State is known as being the poorest state in Myanmar, with an estimated food poverty prevalence of 25% and poverty rate of 73.3% according to the IHLCA 2010. Reanalysis of IHLCA data by the World Bank yielded a slightly lower estimate of the poverty prevalence in Chin State (71.5%), making the state the second

poorest (to Rakhine) in Myanmar. Poverty rates in the other hilly states are lower than Chin State but nonetheless unacceptably high. Southern Shan has the lowest poverty rate at 25.2%, but a relatively high rate of food poverty (8.2%). Kachin has the second lowest poverty rate at 28.6%, with a food poverty rate of 4.3%. According to IHLCA (2010), Northern Shan and Eastern Shan have poverty rates of 37.4% and 46.4%, respectively.

The World Bank (2014) estimates that the prevalence of poverty in the Uplands is about 41%, however this estimate includes Kayah and Kayin States. LIFT (2013) estimated that the poverty prevalence in program areas of the Uplands was about 24%.[25]

The high prevalence of poverty and dependence on wage labor and undiversified crop cultivation leaves households in the Uplands vulnerable to economic shocks. Lack of employment, health expenses, debt, and post-harvest losses are among the most common shocks according to households in the Uplands (WFP, 2010a; WFP, 2010b; WFP, 2010d; WFP, 2011d).

Lack of capital

States in the Uplands have among the lowest rates of educational attainment in Myanmar: about 45% of adults over the age of 25 in Shan State have never attended any school, compared with about 26% in Chin State and 12% in Kachin State. There are also disparities in educational attainment between men and women in the Uplands, with a particularly dramatic difference in Chin State, where about 36% of women over 25 have never attended school (compared with 7% of men). Nearly half of all adult women in Shan State have never attended school, compared with about 40% of men (Department of Population, 2015).

According to IHLCA (2010) data, access to credit in states in the Uplands is more limited than in other areas of the country. In particular, few households reported taking out loans to fund agricultural activities in Eastern and Northern Shan as well as in Chin State (MNPED et al, 2011). However, evidence suggests that a significant proportion of households in the Uplands do take out loans to fund food purchases (WFP, 2010a; WFP, 2010b; WFP, 2010c; WFP, 2010d), though encouragingly, more households in the Uplands included in the LIFT (2013) survey reported taking out loans to purchase agricultural inputs than to purchase food.

Levels of indebtedness are high in the Uplands. Assessments conducted by WFP found the proportion of households in debt ranged from 50% in Wa, Southern Shan (WFP, 2010b) to 87% in Chin (WFP, 2010d). Solidarites also found that nearly all (95%) of households in Kanpetlet were in debt, and average debt sizes were large, which may in part be explained by the large size of loans taken out by economic migrants planning to travel abroad for work (Solidarities International, 2012a).

5.2.4. Social, economic and political context

Women's status in society is an important determining factor for maternal and child health and nutritional status. In particular, delaying the age of first pregnancy until after adolescence has enormous benefits for both mother and child. As such, adolescent marriage, contraceptive prevalence, and school enrollment (because girls in attending

25 Using the international poverty line of US$1.25 per day converted into Myanmar Kyat using the 2010 PPP exchange rate.

school are less likely to marry and become pregnant) are important measures of the risk of adolescent pregnancy. In the Uplands, the unique culture and environment of each ethnic group shape the gender norms in communities. As in many other areas, it is difficult to draw overarching conclusions about the status of women in the Uplands.

According to MICS 2009-10 data, Kachin, Shan and Chin states have achieved gender parity in primary school enrollment. Girls are also more likely than boys to be attending secondary school in all areas except Northern Shan and Chin. Approximately 7% of 15- to 19-year-old females in Chin State are already married, and the contraceptive prevalence rate is only 7.7 (MICS 2009-1). According to the 2014 census, only about 72% of women over the age of 15 are literate in Chin State (compared with 89% of men) (Department of Population, 2015).

Female literacy is highest in Kachin State at about 89% (compared with 94% of men) (Department of Population, 2015). According to the MICS 2009-10, nearly 11% of 15- to 19-year-old females in Kachin are already married, and the contraceptive prevalence is higher than in Chin but still low at 38.5% (MNPED & MOH, 2011).
According to the 2014 Census, Shan State has the lowest adult literacy rate in the Uplands at about 65% (Department of Population, 2015). Less than 60% of women over the age of 15 in Shan State are literate compared with about 70% of men (Department of Population, 2015). Shan State also had the highest rate of adolescent marriage according to the MICS 2009-10, with nearly a quarter of women age 15 to 19 in Eastern Shan already married (MNPED & MOH, 2011).

Migration is common in the Uplands. Though there are no estimates of the prevalence of economic migrants at the zonal level, WFP (2011d) found that 23% of households in the Lashio area and 24% in Chin had at least one economic migrant (WFP, 2010d). The high prevalence of female-headed households in Chin may be related to economic migration.

Conflict is a major cause of food and nutrition insecurity in the Uplands. In particular, unresolved armed conflict and recent escalation of fighting in Kachin and Northern Shan has led to severely limited access to essential services for households living in affected areas, particularly those beyond government control. UNOCHA (2014) estimates that there are 120,000 IDPs and crisis affected people in Kachin and Shan State.

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