



Myanmar Micronutrient and Food Consumption Survey

MMFCS (2017 - 2018)

Interim Report

**National Nutrition Centre
Department of Public Health
Ministry of Health and Sports**



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Ministry of Health and Sports
Nay Pyi Taw, Myanmar

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National Nutrition Centre
Department of Public Health
Ministry of Health and Sports

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List of acronyms and abbreviations

AG	Adolescent Girls
AGP	Alpha-1 acid glycoprotein
BAZ	BMI for Age Z-score
BMI	Body Mass Index
CI	Confidence Interval
CRP	C-reactive Protein
DDS	Dietary Diversity Score
DMR	Department of Medical Research
DOH	Department of Health
EA	Enumeration Area
FAO	Food and Agricultural Organization
FFQ	Food Frequency Questionnaires
G6PD	Glucose-6-phosphate dehydrogenase
HAZ	Height for Age Z-score
Hb	Hemoglobin
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
HH	Household
ICCIDD	International Council for Control of Iodine Deficiency Disorders
ID	Iron Deficiency
IDA	Iron Deficiency Anemia
IDDE	Elimination of Iodine Deficiency Disorders
IHLC	Integrated Household Living Conditions
IQR	Inter-quartile Range
IYCF	Infant and Young Child Feeding
LAZ	Length for Age Z-score
LW	Lactation Women
MDHS	Myanmar Demographic and Health Survey
MICS	Multiple Indicator Cluster Survey
MMFCS	Myanmar Micronutrient and Food Consumption Survey
MoHS	Ministry of Health and Sports
MRA	Men of Reproductive Age
MUAC	Mid-upper Arm Circumference
mUIC	Median Urinary Iodine Concentration
NCD	Non-Communicable Disease
NHL	National Health Laboratory
NNC	National Nutrition Centre
PEM	Protein Energy Malnutrition

PPS	Population Proportionate to Size
PSC	Primary School Aged Children
PW	Pregnant Women
RBC	Red Blood Cell
RBP	Retinol-binding protein
RDA	Recommended Dietary Allowances
RM	Research Monitoring
RTK	Rapid Test Kit
S/R	State/Region
SD	Standard Deviation
SDG	Sustainable Development Goal
SF	Serum Ferritin
SPSS	Statistical Package for Social Sciences
SQ-FFQ	Semi-quantitative Food Frequency Questionnaires
sTfR	Soluble Transferrin Receptor
STH	Soil-transmitted helminthiasis
TEM	Technical Error Measurement
UCG	Urine Chorionic Gonadotrophin
UIC	Urinary Iodine Concentration
UIE	Urinary Iodine Excretion
UNICEF	United Nations International Children's Emergency Fund
USDA	United States Department of Agriculture
USI	Standard Salt Iodization
VGR	Visible Goiter Rate
WAZ	Weight for Age Z-score
WHO	World Health Organization
WHZ	Weight for Height Z-score
WLZ	Weight for Length Z-score
WRA	Women of Reproductive Age

Executive summary

Introduction

Micronutrient deficiencies are still prevalent globally affecting more than half of the world's population especially preschool children and women of reproductive age in developing countries. Children with micronutrients deficiencies are susceptible to infections, resulting in an increased risk of mortality, as well as stunting, blindness, impaired cognitive functions and other unfavorable outcomes. Major micronutrients deficiencies among young children are iron, iodine, vitamin A and zinc with deficiencies of more than one micronutrient often coexisting in developing countries. Myanmar is still suffering from micronutrient deficiency as demonstrated by high burden anemia (57.8% of children under five years of age and 46.5% of women of reproductive age) (MoHS and ICF 2017).

Five major nutrition intervention programs are being implemented in Myanmar, namely: 1) Prevention and control of protein energy malnutrition, 2) Prevention and control of iron deficiency anemia, 3) Prevention and control of infantile beri beri, 4) Iodine deficiency disorders elimination (IDDE) and Elimination of vitamin A deficiency. There is no up-to-date data on micronutrient status of vulnerable age groups and so there is a need to have a fresh look at the current situations. Therefore, Ministry of Health and Sports conducted Myanmar Micronutrient and Food Consumption Survey (MMFCS) in 2017-2018 with the aim to provide baseline information of key micronutrients across different states and regions.

Objective and Method

The main purpose of MMFCS was to provide program managers and policy makers the update and reliable data required for planning, implementation and monitoring and evaluation of nutrition interventions in Myanmar.

The MMFCS was a cross-sectional multi-stage cluster survey included 450 clusters throughout the country (30 clusters per state/region). The MMFCS examined the prevalence of nutrition and micronutrient status of population in addition to household dietary diversity, food security status, infant and young child feeding practices and food consumption pattern. The nutritional status included stunting, wasting or thinness, underweight and overweight; micronutrient status included the status of iron, iodine, vitamin A, zinc, vitamin B1, vitamin D, folate, sodium and worm infestation and these

status were examined in selected groups among 6-59 month children, 5-9 year children, 10-14 year adolescent girls, non-pregnant non-lactating women of reproductive age between 15-49 years (WRA); adult men between 15-49 years of age. Data collection activities were done between end of November 2017 and May 2018.

Results

In this interim report, the findings on household characteristics (socio-demographic, food security and dietary diversity), anthropometric status, anemia, salt and urinary iodine and urinary sodium were presented. The remaining findings on other micronutrient status and dietary data will be presented in further report/s. A comprehensive report of MMFCS will be published subsequently after laboratory analyses of micronutrient status are done.

The MMFCS included total sample of 27,339 households from 450 clusters among 15 states/regions. The survey recruited total 39,129 subjects including 9,041 children 6-59 months of age, 9,070 children 5-9 years of age, 944 adolescent girls 10-14 years of age, 903 pregnant women and 907 lactating women, 9,132 women of reproductive age (15-49 years) and 9,132 adult men.

Summary of results

Target group	Indicator	Result	Table	Page
Household				
	Household dietary diversity score (HDDS)*	5 ± 1.7 [5.5-5.6]	Table 6.1.2.1	37
	Household consuming 6 or more food groups (HDDS ≥6)	49.3%	Table 6.1.2.1	37
	Household with food insecurity	33.2%	Table 6.1.3.1	40
	▪ Mild food insecurity	11.6%	Table 6.1.3.1	40
	▪ Moderate food insecurity	15.5%	Table 6.1.3.1	40
	▪ Severe food insecurity	6.1%	Table 6.1.3.1	40
	Household using salt containing iodine ≥ 15ppm (By Titration method)	36.8%	Table 6.6.1.3	96
Children 6-59 months of age				
	Stunting	26.7%	Table 6.2.1.1	46
	Wasting	6.7%	Table 6.2.1.1	46
	Underweight	19.1%	Table 6.2.1.1	46
	Overweight	0.8%	Table 6.2.1.1	46
	Anemia	35.6%	Table 6.4.1.1	74
	▪ Mild anemia	21.9%	Table 6.4.1.1	74
	▪ Moderate anemia	13.1%	Table 6.4.1.1	74
	▪ Severe anemia	0.5%	Table 6.4.1.1	74

Target group	Indicator	Result	Table	Page
Children 5-9 years of age				
	Stunting	22.1%	Table 6.2.2.1	55
	Thinness	14.6%	Table 6.2.2.2	57
	Overweight	3.3%	Table 6.2.2.2	57
	Anemia	51.1%	Table 6.4.2.1	77
	▪ Mild anemia	15.4%	Table 6.4.2.1	77
	▪ Moderate anemia	34.6%	Table 6.4.2.1	77
	▪ Severe anemia	1.1%	Table 6.4.2.1	77
	Median urinary iodine concentration	138.5 µg/L	Table 6.6.2.1	104
Adolescent girls 10-14 years of age				
	Stunting	24.2%	Table 6.2.3.1	60
	Thinness	18.8%	Table 6.2.3.2	62
	Overweight	5.5%	Table 6.2.3.2	62
	Anemia	29.8%	Table 6.4.3.1	80
	▪ Mild anemia	21.6%	Table 6.4.3.1	80
	▪ Moderate anemia	7.9%	Table 6.4.3.1	80
	▪ Severe anemia	0.3%	Table 6.4.3.1	80
Pregnant women				
	Anemia	40%	Table 6.5.1.1	83
	▪ Mild anemia	23.9%	Table 6.5.1.1	83
	▪ Moderate anemia	15.3%	Table 6.5.1.1	83
	▪ Severe anemia	0.8%	Table 6.5.1.1	83
	Median urinary iodine concentration	121.8 µg/L	Table 6.6.2.2	105
Lactating women				
	Anemia	35.4%	Table 6.5.2.1	86
	▪ Mild anemia	21.1%	Table 6.5.2.1	86
	▪ Moderate anemia	12.9%	Table 6.5.2.1	86
	▪ Severe anemia	1.4%	Table 6.5.2.1	86
Women of reproductive age (15-49 years of age)				
	Underweight	14.3%	Table 6.3.1.1	66
	Overweight	22.9%	Table 6.3.1.1	66
	Obesity	7.3%	Table 6.3.1.1	66
	Anemia	30.3%	Table 6.5.3.1	89
	▪ Mild anemia	18.2%	Table 6.5.3.1	89
	▪ Moderate anemia	11.2%	Table 6.5.3.1	89
	▪ Severe anemia	0.9%	Table 6.5.3.1	89
	Calculated sodium intake*	2.8±1.7 [2.6-3.0]	Table 6.7.1.1	107
	Calculated salt intake*	7.3±4.4 [6.8-7.8]	Table 6.7.1.1	107
Adult men (15-49 years of age)				
	Underweight	19.7%	Table 6.3.1.2	68
	Overweight	11.4%	Table 6.3.1.2	68
	Obesity	2.0%	Table 6.3.1.2	68
	Calculated sodium intake*	2.6±1.7 [2.4-2.8]	Table 6.7.1.2	109
	Calculated salt intake*	6.6±4.3 [6.1-7.1]	Table 6.7.1.2	109

* Values are weighted figures presented in mean ± SD [95% Confidence Interval]

1. Introduction

1.1. Background

Micronutrient deficiencies are still prevalent globally affecting more than half of the world's population especially preschool children and women of reproductive age in developing countries (Haddad, Ross et al. 2004). Deficiencies of iron, iodine and vitamin A are the most widespread forms of micronutrient malnutrition with public health consequences (Kennedy, Nantel et al. 2003). Children with micronutrient deficiencies are susceptible to infections, resulting in an increased risk of mortality, as well as stunting, blindness, impaired cognitive functions and other unfavorable outcomes (Neumann, Gewa et al. 2004, Gibson and Ferguson 2008). Major micronutrient deficiencies among young children are iron, iodine, vitamin A and zinc with deficiencies of more than one micronutrient often coexisting in developing countries (Bhan, Sommerfelt et al. 2001, Winichagoon 2008).

Five major nutrition intervention programs are being implemented in Myanmar, namely: 1) Prevention and control of protein energy malnutrition (PEM) through regular growth monitoring and promotion activities, 2) Prevention and control of iron deficiency anemia (IDA) through iron folate or multiple micronutrients supplementation to pregnant women and adolescent girls, 3) Prevention and control of infantile beri beri through vitamin B1 supplementation to pregnant and lactating women, 4) Iodine deficiency disorders elimination (IDDE) through Universal Salt Iodization (USI) and Elimination of vitamin A deficiency through high-potency vitamin A supplementation to children 6 mo-5 years and post-natal women. These nutrition interventions are implemented in all townships throughout the country.

There is no up-to-date data on micronutrient status of population especially among vulnerable age groups and therefore there is a need to have a fresh look at the current situation.

Magnitude and consequences of micronutrient deficiencies in Myanmar

Anemia is a major public health problem affecting 1.62 billion people worldwide with the prevalence of 43% in countries with low development (McLean, Cogswell et al. 2009). Children and women of reproductive age (WRA) are at highest risk, with global anemia prevalence estimates of 42.6%% among 6-59 month children, 38.2% in

pregnant women, and 29% in non-pregnant women (WHO 2015). Anemia presents with several functional adverse effects including cognitive performance, behavior, and physical growth of under-five children and school-aged children (WHO, UNICEF et al. 2001). In Myanmar, anemia has been identified as a public health problem for many years: community hemoglobin surveys conducted by National Nutrition Centre (NNC) showed the prevalence of anemia was 44.9% in non-pregnant women (2001), 26.4% in adolescent girls (2002) and 71% in pregnant women (2003) (MOH 2007). The National Micronutrient Survey conducted in 2005 showed that anemia was present in 64.6% of pre-school children (but above 80% in 6 to 23 month old children), iron deficiency anemia (IDA) in 40.4% and iron deficiency (ID) in 57.7%. While in women of reproductive age, anemia was present in 45.2%, IDA in 22.6%, and ID in 49.2%. The main etiology of anemia was due to ID, with an estimated 63% of the anemia in children attributable to ID and 50% of anemia in women (MNS Survey Draft Report, MOH 2005, unpublished data). The recent findings from 2016 Myanmar Demographic and Health Survey (MDHS) showed that 57.4% of 6-59 month children and 46.6% of women were anemic (MOHS and ICF 2016). Compared to 2005, the prevalence of anemia in children in 2016 was lower but still a public health problem.

Iron deficiency is a major contributing factor to anemia in Myanmar, however other factors such as deficiencies in folate, vitamin B12, and vitamin A, malaria infection, hookworm infestation, and **hemoglobinopathies** can also cause anemia. WHO has estimated that about 7% of the world's population were carriers of important hemoglobin disorders and around 0.5 million children were born each year with serious hemoglobin disorders (Weatherall 2008). This condition offers potential major public health burden for many countries. Data on hemoglobinopathies in Myanmar are only available from small-scale studies: 10% of anemic Kayin ethnic women of reproductive age (WRA) had Thalassemia (DMR 2000), 64.2% of anemic adolescent school girls had β -thalassemia trait and 36 out of 228 subjects submitted for electrophoresis suffered from hemoglobinopathies (Htet, Dillon et al. 2012).

In Myanmar the current high prevalence of anemia in women target groups and updated international recommendations indicate that WRA should be supplemented with iron folic acid or multiple micronutrients as part of the iron deficiency anemia (IDA) control program. However, there is insufficient nation-wide data on the prevalence of hemoglobinopathies among WRA for planning appropriate interventions to reduce anemia.

Iron supplementation, deworming and nutrition education are the main strategies for control of anemia in Myanmar. Iron folic acid tablets have been distributed to pregnant women throughout the country since 1982 with once a day starting from first ante-natal visit till 7 months of pregnancy and followed by twice a day to complete 180 tablets during pregnancy and biweekly iron supplementation for adolescent school girls in selected (20) townships since 2002. Starting from 2016, iron folic acid tablets will be distributed to adolescent school girls in all townships and multiple micronutrients tablets to all pregnant women throughout the country.

Soil-transmitted helminthiasis (STH) infections mostly affect children in developing countries where hygiene and sanitation conditions are poor. STH infections are associated with poor growth, reduced physical activity and impaired learning ability. In Myanmar, starting from January 2006, an integrated de-worming program has been implementing all over the country by distributing Albendazole 400 mg single dose twice a year for all 2-9 year children and Mebendazole 500mg once during pregnancy after the first trimester. Home fortification with micronutrient sprinkles has started in 11 townships since 2012 giving one sachet per day for 6-35 month children for 2 months duration with 4 months interval per year and is now being expanded to cover all townships in the country.

Iodine is required for the synthesis of thyroid hormones and plays a key role in cell replication. Gestational iodine deficiency leads to abortions, still births, congenital anomalies, low birth weight, cretinism, psychomotor defects and increased neonatal mortality. Iodine deficiency disorders include a wide spectrum of manifestations including goiter, hypothyroidism, impaired mental function, retarded mental and physical development and diminished school performance which can be seen during childhood and adolescence. Severe iodine deficiency can cause substantial linear growth retardation. In adults, complications of goiter such as hypothyroidism and impaired mental function persist (Bhan, Sommerfelt et al. 2001).

In Myanmar, the universal salt iodization (USI) program has been running since 1997 as a preventive measure against iodine deficiency disorders and the percentage of households consuming iodized salt has increased from 18.5% in 1994, 79.9% in 2000, 86% in 2003, 87% in 2007 and to 91.5% in 2011. The percentage of households consuming adequately iodized salt (≥ 15 ppm) was 65% in 2003, 73% in 2005 and

68.8% in 2011 based on rapid test kit results while 33.4% based on the results of titration tests (MOH 2013).

The prevalence of visible goiter rate (VGR) 6-11 year school children has gradually declined from 33% in 1994 to 5.5% in 2004 and <5% in 2006. Median urinary iodine concentration (mUIC) among those school children was 205µg/L in 2003-2004 and 123µg/L in 2006. There is no more updated data on mUIC since 2006.

Vitamin A deficiency used to be a public health problem among Myanmar children during the early 1990s. Biannual supplementation with high potency vitamin A capsules is the main strategy against vitamin A deficiency among under-five children to reduce morbidity and mortality rate and to enhance their growth. One dose of vitamin A (200,000 IU) is distributed for all lactating mothers within 42 days after delivery. At the same time, age specific doses of vitamin A in capsules are distributed to every child between the age of 6-59 months (single dose of 100,000 IU capsule for 6-11 month infants and twice a year dose of 200,000 IU capsule for 12-59 month children).

The prevalence of Bitot's spot among under-five children has declined from 0.6% in 1991 to 0.03% in 2000. Although clinical presentation of vitamin A deficient children is rare, sub-clinical deficiency is still common. A vitamin A survey conducted by NNC in three townships in 2000 indicated that all rural under-five children and 96% of urban children had normal serum vitamin A status while only 4% of the urban children had mild sub-clinical deficiency (serum retinol <0.7µmol/L). However, the nationwide vitamin A survey conducted in 13 townships by NNC in collaboration with Department of Medical Research in 2012 showed that 38% of under-five children had serum retinol <0.7µmol/L regardless of infection/inflammation status and 28.8% still had serum retinol <0.7µmol/L after excluding children with evidence of infection. There have been no more updated data on the vitamin A status of under-five children, and pregnant and lactating women.

Unlike neighboring countries, infantile beriberi still exists in the country as one of the major nutrition problems. Beriberi was found to be the second most common cause of death among infants aged 28 days to 1 year while acute respiratory infection was the leading cause of death (MOHS and UNICEF 2014). The prevalence of **Vitamin B1 deficiency** was 6.8% among pregnant women and 4.4 % among lactating women (NNC B1 Study 2008). Infantile Beriberi surveillance started in Myanmar in May 2005 with data collected from 56 General Hospitals. The control of infantile beriberi project was initiated in June 2006 with vitamin B1 supplementation to all pregnant women starting

from 9th month of pregnancy till 3 months after delivery. Injection B1 ampoules are also distributed to hospitals for treatment of beriberi cases.

Stunting can be considered as an indirect indicator of **zinc deficiency** in population as zinc is one of the growth limiting nutrients (Cole and Lifshitz 2008). In addition, dietary patterns of the Myanmar population are poor in food diversity and contained less animal source than plant source foods. Animal source foods can provide a wide range of micronutrients that are difficult to obtain in sufficient amounts from plant source foods alone (Murphy and Allen 2003).

It was estimated that 59,436 children in Myanmar are born with birth defects annually (Christianson, Howson et al. 2006). These include 8,026 children with defects of cardiovascular system, 711 with neural tube defects, 4064 with hemoglobinopathies, 1,727 with Downs, syndrome and 3,150 with G6PD deficiency. Previous studies showed that periconceptional **folic acid** supplementation either alone or in combination with other vitamins and minerals has a protective effect for neural tube defects as compared to other interventions without folic acid. Myanmar is planning to initiate an iron and folic acid, or multiple-micronutrient supplementation program for women of reproductive age as one of the strategies for prevention birth defects. However, there is lack of data on folate status of these women in the country.

Myanmar confronts an increasing burden of non-communicable diseases (NCD) with increasing morbidity and mortality among population from conditions such as hypertension, obesity, fatty liver, ischemic heart disease and cancer. A high prevalence of hypertension (23.5% and 30%) was found in both WHO STEP wise approaches to NCD Surveillance conducted in 2003-2004 and 2009-2010. Food quality, food safety and dietary habits are still the main factors affecting NCDs. Daily consumption of **sodium**, total fat and saturated fat play a strong role in NCDs. Salty food consumption is also associated with food insecurity and lack of local fresh food accessibility. There is no current data on salt intake in Myanmar.

Vitamin D is essential for bone health and its deficiency increases the risk of osteoporosis. Vitamin D deficiency during pregnancy is shown to be associated with multiple adverse health outcomes in mothers, neonates and children (Vandevijvere, Amsalkhir et al. 2012). Nowadays, changing life style limited exposure to sun light and spending more hours indoor are challenges for adequate Vitamin D synthesis. There is no current data on Vitamin D status in Myanmar and Vitamin D status was assessed in pregnant and lactating women who are more prone to stay indoor than any other population.

Table 1.1.1. Prevalence of micronutrient deficiencies in Myanmar

Nutritional status	Target group	Biomarker	Prevalence (%)	Source
Anemia	6-69 month children	Hemoglobin	57.8	†MDHS 2016
	6-23 month children	Hemoglobin	>70	
	Women reproductive age	Hemoglobin	46.5	
	Pregnant women	Hemoglobin	71	‡NNC, 2003
	Adolescence school girls	Hemoglobin	26	‡NNC, 2002
	Non-pregnant women	Hemoglobin	44.9	‡NNC, 2001
Iron Deficiency Anemia	Preschool Children	Ferritin, CRP	40.4	‡‡NNC, 2005
	Women reproductive age	Ferritin, CRP	22.6	
Iron Deficiency	Preschool children	Ferritin, CRP	57.7	
	Women reproductive age	Ferritin, CRP	49.2	
Iodine Deficiency Disorders	Households with adequately iodized salt consumption	Iodine content ppm (RTK)	68.8	††NNC 2011
	6-11 year school children	Visible Goiter	2	††NNC 2006
	6-11 year school children	MUIC	123µg/L	††NNC 2006
	6-11 year school children	% UIE <100 µg/L	22.3	††NNC 2004
Vitamin A deficiency	6-59 mo	Bitot Spot	0.03	‡‡NNC 2000
		Serum Retinol <0.7 µmol/L	38	†††NNC 2012
Vitamin B1 deficiency	Pregnant women	Serum transketolase	6.8	††NNC, 2009
	Lactating mothers	Serum transketolase	4.4	
Worm Infestation	Under-five children		30.8	*NNC, 2003
	Pregnant women		44.3	*NNC, 2003
	15-49 year women		45	*NNC, 2003

† Myanmar Demographic and Health Survey (MDHS: 2015-16)

‡ Anemia survey done by National Nutrition Centre (2001, 2002, 2003)

‡‡ Micronutrient Survey done by National Nutrition Centre (2005)

†† Iodine deficiency disorder survey done by National Nutrition Centre (2004, 2006, 2011)

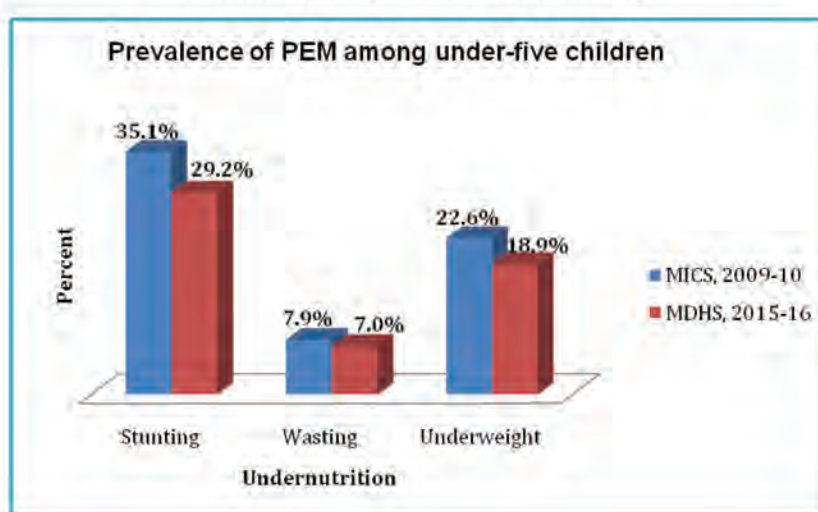
Growth Status and BMI in Myanmar

In Myanmar, undernutrition among under-five children based on the new WHO growth standard (WHO 2006) declined between 2009 and 2016; the prevalence of stunting from 35.1% to 29.2%, underweight from 22.6% to 18.9%, and wasting from 7.9% to 7% respectively (MOH and MONPED 2010, MOHS and ICF 2016). The rate of Low Birth Weight was 24% in 1994 (hospital based study) while 10% in 2004 and 7.9% in 2010 by community surveys (NNC, DOH) comparing to 8.6% in 2009 (MICS).

While Myanmar is trying to combat the problem of undernutrition, the rate of overweight and obesity are increasing at the same time. The WHO STEP wise approach

to NCD Surveillance shows that 22.4% of 25-64 year adults were overweight and 5.5% were obese in 2014 (MOH, WHO et al. 2015). The rate of obesity among 15-64 year adults has increased significantly from 0.6% in 2003-2004 to 6.8% in 2009-2010 (WHO and MOH 2003, 2009). A study by the NNC conducted in urban and suburban areas of State and Regions' capital city in 2001 also revealed that 14.6% and 7.2% of 18-60 year women and men were overweight and 3.8% and 1.4% of them were obese respectively. According to the Multiple Indicator Cluster Surveys (MICS 2000), the prevalence of overweight among the mothers and fathers of under-five children was 7.5% and 4.5%, while the prevalence of obesity was 1.8% and 0.7%, respectively.

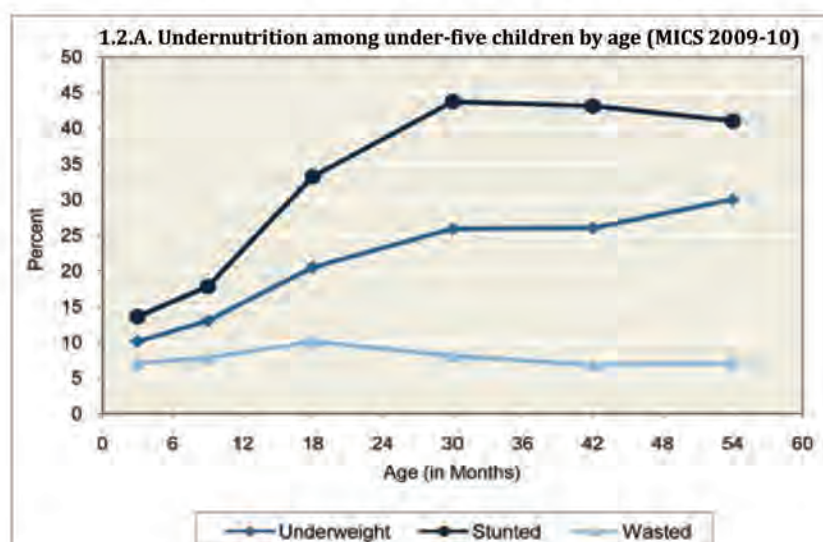
Figure 1.1.1. Prevalence of three indicators of undernutrition among under-five children (2009-10 vs. 2015-16)

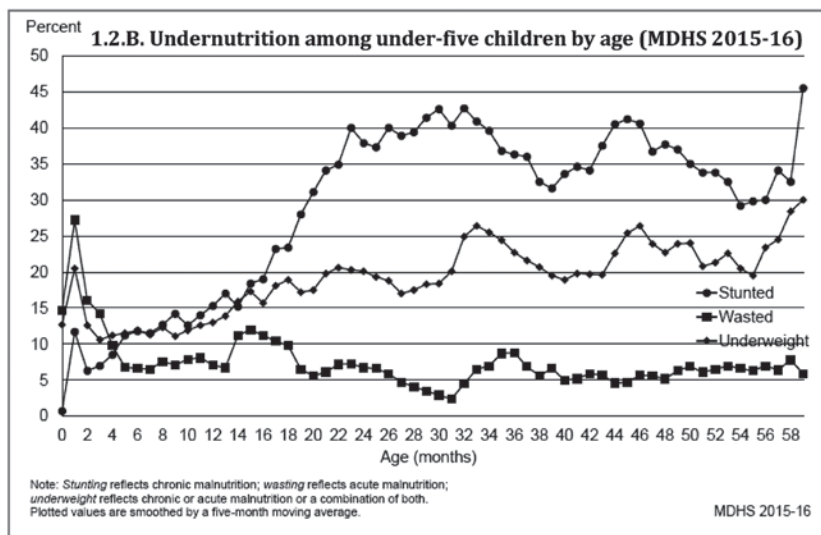


MICS = Multiple Indicator Cluster Survey (2009-10)

MDHS = Myanmar Demographic and Health Survey (2015-16)

Figure 1.1.2. Percentage Prevalence of three indicators of undernutrition among under-five children by age group





Infant and young child feeding practices in Myanmar

Feeding practices of infants and young children in Myanmar have been regularly assessed in a series of MICS and reasons and associated factors were identified by a survey on infant and young child feeding (IYCF) practices in Myanmar, conducted by the National Nutrition Centre, 2004. MICS was composed of questionnaires that produced data to create some indicators of IYCF practices for children under five years which are shown in the following table.

Table 1.1.2. Infant and young child feeding (IYCF) practices in Myanmar (1995-2016)

SN.	IYCF Indicators	Percentage					
		1995	1997	2000	2003	2009	2016
	<u>Core indicators</u>						
1	Early initiation of breastfeeding (within 1 hour)	-	-	-	-	75.8	-
2	Exclusive breastfeeding (0-3 months of age)	30.1	43.6	15.8	14.7	29.3	59.3
3	Exclusive breastfeeding (0-6 months of age)	-	-	-	-	23.6	51.2
4	Continued breastfeeding at 1 year	83.0	84.5	89.0	85.0	91.0	-
5	Timely complementary feeding	40.4	77.6	67.3	66.4	80.9	72.4
	▪ 6-8 months who received breast milk and complementary food at least 2 times in prior 24 hours	-	-	-	-	69.2	-

SN.	IYCF Indicators	Percentage					
		1995	1997	2000	2003	2009	2016
	▪ 9-11 months who received breast milk and complementary food at least 3 times in prior 24 hours	-	-	-	-	45.2	-
	▪ 6-11 months who received breast milk and complementary food at least the minimum recommended number of times per day	-	-	-	-	56.5	-
6	Adequately Fed Infants (0-11 months)	-	-	-	-	41.0	-
7	Continued breastfeeding at 2 years	55.8	74.6	67.4	67.1	65.4	-
8	Introduction of complementary foods before 6 months	25	-	-	-	-	-
9	Predominant breastfeeding under 6 months	74.2	-	-	-	-	-
10	Bottle feeding	0.9	-	-	-	-	-
11	Introduction of complementary foods (6-8) months	69	-	-	-	-	-

Source: IYCF surveys done by NNC (1995, 1997, 2000), MICS (2003, 2009), MDHS (2015-16)

Food consumption patterns in Myanmar

Most of the studies tried to assess the intake of particular nutrients by using dietary assessment methods such as 24 hour recalls, qualitative food frequency questionnaires (FFQ) and semi-quantitative food frequency questionnaires (SQ-FFQ). The anemia surveys (NNC, DOH 2003) also revealed that only 8.3% of non-pregnant women and 5.5% of adolescent girls adequately consumed iron-rich foods.

The integrated household living conditions (IHLC) surveys were conducted in Myanmar in 2005 and 2010. The proportion of the population living below the minimum level of dietary energy requirements has declined as measured by a proxy indicator known as food poverty incidence. Overall, there was a significant reduction in food poverty incidence from 10% to 5% from 2005 to 2010. In terms of rural-urban differences, food poverty was found to be higher in rural areas. When disaggregated by states/regions, Chin state had the highest food poverty incidence at 25% followed by Rakhine state (10%), Tanintharyi region (9.6%) and Shan state.(9%).

Another household food security survey in 1998 showed that the average per capita energy consumption met 92.4% of the recommended dietary allowances (RDA). About one-third of households consumed more than 100% while another one third (30.5%) consumed less than 80% of the RDA for energy. The survey found that pregnant and lactating women in particular were not consuming sufficient quantities of calories and nutrients. Inadequate consumption was largely due to avoidance of certain foods such as meat, fish, beans and milk because of traditional beliefs. Other foods were said to be unaffordable in rural areas, like eggs, vegetables and fruits. There was clearly a problem of lack of food diversity.

Improving balanced diets can be difficult from a cultural perspective. Although local supplies of some foods may be sufficient, such as meat, eggs, and vegetables, traditional food habits and cooking practices cause nutrient loss, play a crucial role in inadequate food and nutrient consumption, and need to be addressed by improving knowledge on nutrition.

The STEPS survey of non-communicable diseases risk factors (2009) showed that in a typical week fruits were consumed more than 4 days a week while the mean consumption of vegetables was 5.65 days for both males and females aged 15-64 years. However, over 90% of those included in the study ate less than 5 of the combined servings of fruits and vegetables per day. The National Diabetes and NCD Risk Factors Survey (2014) showed the average number of days per week that fruits and vegetables were consumed by the respondents was 2.5 days and 5.5 days a week (MOH, WHO et al. 2015). The overall mean number of servings of fruit and/or vegetables per day was 2.8 (males 2.8% and females 2.7%). About 86.6% of the respondents had less than five servings of fruit and/or vegetables on an average per day (85.2% for males and 87.9% for females). Those findings combined with unhealthy lifestyles like smoking, alcohol consumption; low physical activity and high BMI have been implicated as risk factors for NCDs including diabetes mellitus.

1.2. Rationale

Data on nutritional status of Myanmar population is scarce and that on micronutrient status is lacking except the findings from hemoglobin and vitamin A surveys mentioned above. In addition, existing nutrition programs need review and revision according to the current nutritional status of the population and updated international recommendations.

Preschool children, usually defined as less than five years of age, are particularly vulnerable to the consequences of micronutrient malnutrition and are an important target group in which to assess micronutrient deficiencies. Iron and vitamin A deficiencies are often prevalent among under-five children in developing countries. Despite the high prevalence of stunting (indirect indicator of zinc deficiency), there is no nation-wide data for zinc status of growing children in Myanmar.

To see the effectiveness of iodine deficiency disorders elimination (IDDE) program, urinary iodine excretion and iodine contents of household salt should be measured in the study. According to the recommendation of the ICCIDD, urine sample should be collected from children of defined ages from the same study households. Although daily iodine intake for pregnant women is recommended to be 200 µg, current interventions cannot ensure an adequate intake of iodine among pregnant women. In addition, iodine deficiency during pregnancy can impose adverse consequences on the child's physical and mental development. However, there is no data on iodine intake among pregnant mothers.

To know the trends in vitamin B1 deficiency from pre-conception, during pregnancy until lactation, vitamin B1 status should be assessed in women of reproductive age in addition to pregnant and lactating women.

Pre-conception supplementation of folic acid is one of the strategies to prevent neural tube defects and evidence is needed of the existing prevalence of folate deficiency among women of reproductive age. Although life style change of spending more hours indoor can impose to vitamin D deficiency, no data is available on vitamin D status of pregnant and lactating women.

Dietary assessment of nutrient intake is needed to identify the causes of micronutrient deficiencies and to be followed up with food-based nutrition interventions. Moreover, calorie consumption is important sustainable development goal (SDG) indicator

(Proportion of population below minimum level of dietary energy consumption). Data on diet consumption patterns and sodium excretion can reveal the possible ways to reduce salt consumption and risk the reduction for hypertension. There is no current data on salt intake in Myanmar and 24-hour collection of urine should be done as a gold standard method for measuring population sodium intake (Land, Webster et al. 2014).

At critical ages in the life cycle adequate growth is dependent on type II nutrients such as energy yielding nutrients (including carbohydrate and fat, essential amino acids), zinc, nitrogen, sulphur, potassium, sodium, magnesium, phosphorus. Adult nutritional status is a chronic outcome of food consumption and life style and an essential information for constructing dietary guidelines and revising existing nutrition intervention programs.

There was a significant reduction in the prevalence of soil-transmitted helminthiasis (STH) among primary school age children in two of the four ecological areas of Myanmar from 69.7% in 2002-2003 to 21% in 2012 (Tun, Myat et al. 2013). Worm infestation can aggravate malnutrition, anemia and stunting levels and retard both physical and cognitive development (WHO 2007). Worm infestation at both national and regional levels has not been assessed after the start of the deworming intervention in 2005. Stool assessment for worm infestation is important to see the program's achievement and to review the strategies for the deworming program.

Although iron deficiency is believed to be the most important cause of anemia, hemoglobinopathies are also considered as one of the causes of anemia in Myanmar. There is a lack of nation-wide data in Myanmar on the prevalence of hemoglobinopathies such as Thalassemia among WRA. Unlike nutritional anemia, providing iron supplements alone is not the solution for these cases. By assessing the level of hemoglobinopathies among WRA, we can identify the number of hidden cases and plan to provide them effective treatment as otherwise they would be counted as common anemia cases.

The prevalence of households with inadequate food consumption is one of the post-2015 development indicators and it will be measured in this survey using USDA guidelines to measure household food security status (Bickel, Nord et al. 2000)

1.3. Objective

1.3.1. General objective

To determine micronutrient status and food consumption pattern among selected populations in Myanmar.

1.3.2. Specific objectives

1.3.2.1. To assess the micronutrient status and related indicators of selected populations in Myanmar including:

- a) Hb, iron, vitamin A and zinc status in 6-59 month children and 10-14 year girls
- b) Hb, iron, vitamin A, B1 and folate status in women of reproductive age
- c) Hb, iron, vitamin A, B1 and vitamin D status in pregnant and lactating women
- d) Hb level in 5-9 year children
- e) Urinary iodine level in 5-9 year children and pregnant women
- f) Urinary sodium level in 15-49 year men and women
- g) Worm infestation in 6-59 month and 5-9 year children

1.3.2.2. To assess nutritional status among selected populations in Myanmar including:

- a) Stunting, wasting, underweight and overweight in 6-59 month children
- b) Stunting, underweight and overweight in 5-9 year children and 10-14 year girls
- c) Underweight, overweight and obesity in 15-49 year men and women

1.3.2.3. To identify sub-clinical inflammation status by measuring C reactive protein and alpha-1-acid glycoprotein, and to apply these indicators to adjust the biomarkers confounded by inflammation (i.e., serum ferritin, soluble transferrin receptor, retinol binding protein), where necessary, in selected target groups

1.3.2.4. To determine household food consumption and nutrient intake among adolescent girls, pregnant and lactating women

1.3.2.5. To identify Hemoglobinopathies in women of reproductive age

1.3.2.6. To examine infant and young child feeding practices among children 0-23 of age

1.3.2.7. To assess the household food security status

2. Methodology

2.1. Study design and study population

The study was a nation-wide cross-sectional multi-stage cluster sample survey including multiple target groups as follows:

1. Children of both sexes aged less than 6 months (only for some IYCF indicators)
2. Children of both sexes aged 6-59 months (U5)
3. Children of both sexes aged 5-9 years/ Primary school aged children (PSC)
4. Adolescent girls aged 10-14 years (AG)
5. Women of reproductive age (who are non-pregnant and non-lactating between 15-49 years of age) (WRA)
6. Pregnant women (PW) after first trimester of pregnancy (with visible pregnancy)
7. Lactating mothers with infants aged 14 days to 11 months (LW)
8. Adult men aged 15-49 years (MEN)

2.2. Level of representativeness of the results

There were two levels of representativeness of the findings in this survey; some data are representative at the state/regional level while other data only at the national level.

At state/regional level:

- | | |
|---------------------|---|
| a. Children 6-59 mo | Hb, iron, vitamin A, zinc, worm infestation, Anthropometry, Dietary intake (24-hour recall), IYCF (6-23 months) |
| b. Children 5-9 yr | Hb, urinary iodine, worm infestation, anthropometry |
| c. Women 15-49 yr | Hb, Hemoglobinopathies, iron, vitamin A, anthropometry |
| d. Men 15-49 yr | Anthropometry |
| e. Households | Salt iodine content |

At national level:

- | | |
|--------------------|---|
| a. Children 0-6 mo | Infant and young child feeding (IYCF) |
| b. Girls 10-14 yr | Hb, iron, vitamin A, zinc, anthropometry, dietary intake |
| c. Pregnant women | Hb, iron, vitamin A, B1, vitamin D, iodine, nutrient intake |

d. Lactating women	Hb, Iron, vitamin A, B1, vitamin D, nutrient intake
e. Women 15-49 yr	Folate, vitamin B1, urinary sodium
f. Men 15-49 yr	Urinary sodium

2.3. Sample size

The sample size was calculated based on the known prevalence for the indicators if there is previous data, and or if unknown, an assumed on estimated prevalence of 50% for those indicators unless there is previous data.

$$n = \left[\frac{Z_{1-\alpha/2}^2 P (1-P)}{d^2} \right] \times de$$

$Z_{1-\alpha/2}$ = Standard deviation with 95 % confidence interval= 1.96

P = Proportion in the target population estimated to have a particular characteristic

d = Degree of accuracy desired (Absolute Precision) = 5%

de = Design effect = 1.5

n = Estimated Sample Size (for each stratum)

Using the above prevalence estimate formula, at 5% degree of precision, 95% confidence interval (i.e. $Z_{\alpha} = 1.96$), design effect of 1.5 and 3% non-response rate at household level, total sample size come up with 430 infants under 6 months, 572 of 9 year old children, 595 each for 6-59 month old children, adolescent girls, pregnant women, lactating mothers and WRA, and 447 per stratum (State/Region).

The highest sample size required per stratum was 595 and was rounded to 600. Since there are 15 strata (14 states/ regions and Nay Pyi Taw Union Territory), the total sample size became 9,000 for 6-59 month children, 5-9 year children and WRA (Fe, Vit A and Anthropometry), men (Anthropometry).

For national level representative data (0-6 month infants, adolescent girls, pregnant and lactating women, and folate and Vit B1 in WRA), 10% sample size of State/Region level representative data (i.e. N= 900) was decided to obtain a precision of 5%.

There were 30 clusters (EA) per Strata and thus 20 each of 6-59 month children, 5-9 year children, WRA, and men will be recruited from each cluster for the S/R level representative data and 2 each per cluster of adolescent girls, pregnant women and lactating women were recruited for the national level representative data.

Sub-sample (n=900, one adult man and one WRA per cluster) were selected by simple random sampling to get national level representative data for urinary sodium excretion. Sub-sample of WRA (n=900, 2 per cluster) was also selected by simple random sampling for vitamin B1 and folate assessments to get national level representative data for B1 and folate status.

Table 2.3.1: Sample size by Representative Level

Target Group	Max Sample size	Representative level	Per Cluster	Per State/Region	Union (15 S/R)
0-5 month Children	430	National	2	60	900
6-59 month Children	595	State/Region	20	600	9,000
5-9 year children	422	State/Region	20	600	9,000
10-14 year girls	595	National	2	60	900
Women of Reproductive Age (WRA)	595	State/Region	20	600	9,000
Pregnant Women	595	National	2	60	900
Lactating Women	595	National	2	60	900
15-49 year men	447	State/Region	20	600	9,000

2.4. Sampling procedure

1. States/Regions were considered as strata; Enumeration Area (EA) (i.e. the area defined by Department of Population composed of estimated 100 to 150 households, as part of one village tract/ward or combination of small villages) were treated as clusters; and households were the final sampling units in the survey. There are 14 states/ regions in Myanmar and considering Nay Pyi Taw Union Territory, there were 15 strata in total.
2. Multi-stage sampling design was used. In the first stage, EA from all townships had been listed in each state/region. Thirty EA (clusters) were selected from each state/region by population proportionate to size (PPS) method while considering urban rural ratio of 33:67 as in 2014 census. Thus, total clusters for all 15 strata became 450 (urban 148 and rural 302 clusters). Cluster selection was done by the Department of Population.

3. From each selected cluster, 60 households were selected by simple random sampling to get required sample size for all target groups (estimation of the number of households to be selected was based on the table 2.3.2).
4. On the first day of data collection, selected clusters were ground checked to see the number of households present in that cluster and family members in each household.
5. All eligible target groups in the household were included until required sample size was reached for each target group.

Table 2.3.2: Number of households to achieve expected sample size for each target group

Target Group	Required N per Cluster	% of Total Population*	25 HH (110 pop)	50 HH (220 pop)	60 HH (264 pop)
0-5 mo Children	2	0.82	0.9	1.8	2
6-59 mo Children	20	8	8.8	18	21
5-9 year children	20	9.6	10.6	21	25
10-14 year old girls	2	5	5.5	11	13
WRA	20	27.65	30.4	61	73
PW	2	0.82	0.9	1.8	2
LW	2	1.6	1.8	4	4
15-49 year man	20	25.6	28.2	56	68

* Number of HH estimated based on average HH size = 4.4 (The 2014 Myanmar Population and Housing Census. The Union Report. Census Report Volume 2, Department of Population, Ministry of Immigration and Population)

2.5. Study tools and measurements

2.5.1. Questionnaires

On arrival to the household, before conducting any interview, all eligible respondents were explained about the procedures to be conducted with them and written informed consent was obtained. Information on socio-economic characteristics, dietary diversity and food security status of households were interviewed with one of the family members who could answer about the household. Infant and young child feeding (IYCF) questionnaire was used to interview with the mother/caregiver of the children under 2 years of age.

For the households with selected under-five children, the main caregiver of the child was interviewed for the dietary intake of the child using single multiple-pass 24-hour dietary recall questionnaire.

Semi-quantitative food frequency questionnaire (Semi-FFQ) was used for assessment of individual food consumption by interview with the selected 10-14 year girls, pregnant and lactating women (i.e. two per each target group in each cluster).

2.5.2. Anthropometry

All anthropometric measurements were done by trained enumerators using standardized methods (Gibson 2005).

2.5.2.1. Body weight measurement

Body weight (in kg) of the child was measured using electronic digital weighing scale (SECA 874U, precision ± 50 g) with the subject minimally clothed. For children under two years of age, the 2 in 1 function of weighing scale was used with the child holding in the arms of the mother/caretaker/other adult helper. Body weight of subjects was measured twice and both measurements were entered into tablets and average values were taken for analysis.

2.5.2.2. Length or Height measurement

Recumbent length for children under 2 years and height for those ≥ 2 years were measured using Shorr board (Infant, Child and Adult Height and Length measuring Board; precision ± 0.1 cm). Height measurements were taken with the subject on minimal clothing without wearing shoes or hair accessories following the standard protocol (Gibson 2005). Height of subjects was also measured twice and both measurements were entered into tablets and average values were taken for analysis.

Weight for age Z-score (WAZ), length/height for age Z-score (LAZ/HAZ), weight for length/height Z-score (WLZ/WHZ) and BMI for age Z-score (BAZ) were calculated using the WHO New Growth Reference Standard (WHO 2006) for under-five children.

Height for age Z-score (HAZ) and BMI for age Z-score (BAZ) were calculated using the WHO New Growth Reference Standard for 5-9 year old children and adolescent girls (WHO 2008).

For adults (WRA and 15-49 year men), the body-mass -index (BMI) for was calculated as the body weight (in kg) divided by the square of height (in meter).

Mid-Upper Arm Circumference (MUAC) measurement

Mid-upper arm circumference (MUAC) was measured by using non stretch measuring tape (SECA 203). Under-five children were categorized as wasted if MUAC < 12.5 cm, at risk of wasting if MUAC between 12.5 to 13.4cm, moderately wasted if MUAC between 11.5 to 12.4 cm and severely wasted if MUAC < 11.5 cm.

The following table demonstrates the different sample procedures for each target group.

Table 2.5.1: Target group and the indicators

SN	Target	Blood	Stool	Urine	Anthro	Diet
1.	Under-five Children (0-5 month)	-	-	-	-	- IYCF
2.	Under-five Children (6-59 month) (U5)	<ul style="list-style-type: none"> Hb, iron (SF, sTfR), Vit A (RBP), Inflammation (CRP, AGP) Zinc (serum zinc) 	<ul style="list-style-type: none"> Worm 	-	<ul style="list-style-type: none"> Wt Ht MUAC 	<ul style="list-style-type: none"> IYCF (0-23mo) 24-hr recall (6-59 mo)
3.	5 - 9 year old children (PSC)	<ul style="list-style-type: none"> Hb 	<ul style="list-style-type: none"> Worm 	<ul style="list-style-type: none"> Urinary iodine 	<ul style="list-style-type: none"> Wt Ht MUAC 	-
4.	10 – 14 year old girls (AG) (2/ cluster)	<ul style="list-style-type: none"> Hb, iron (SF, sTfR) Vit A (RBP) Inflammation (CRP, AGP) Zinc (serum zinc) 	-	-	<ul style="list-style-type: none"> Wt Ht MUAC 	<ul style="list-style-type: none"> SQ-FFQ
5.	Women Reproductive Age (WRA)	<ul style="list-style-type: none"> Hb, iron (SF, sTfR), Vit A (RBP), Inflammation (CRP, AGP) in all WRA (20/cluster) Serum folate, Whole blood Vit B1 (2/cluster) 	-	<ul style="list-style-type: none"> Na+ excretion in 24 hr Urine 	<ul style="list-style-type: none"> Wt Ht MUAC 	-
6.	Pregnant women (PW) (2/ cluster)	<ul style="list-style-type: none"> Hb, iron (SF, sTfR) Vit A (RBP) Inflammation (CRP, AGP) Vit B1 (Whole blood thiamine) Vit D (Serum Vit D) 	-	<ul style="list-style-type: none"> Urinary iodine 	-	<ul style="list-style-type: none"> SQ-FFQ
7.	Lactating women (LW) (2/ cluster)	<ul style="list-style-type: none"> Hb, iron (SF, sTfR) Vit A (RBP) Inflammation (CRP, AGP) Vit B1 (Whole blood thiamine) Vit D (Serum Vit D) 	-	-	-	<ul style="list-style-type: none"> SQ-FFQ
8.	15-49 year old Men (Men)	-	-	<ul style="list-style-type: none"> Na+ excretion in 24 hr Urine 	<ul style="list-style-type: none"> Wt Ht MUAC 	<ul style="list-style-type: none">
9.	Household	-	-	-	-	<ul style="list-style-type: none"> Dietary Diversity Salt

2.6. Data collection

2.6.1. Team recruitment

There were two types of survey teams involved in the survey: one administrative team and two data collection teams in each state/region.

Each administrative team included 4 team members: 1 Survey Administrator, 2 Survey Coordinators and 1 Laboratory Coordinator.

Each data collection team included 8 team members: 1 Team Leader, 4 Enumerators (for interview and anthropometric measurements), 1 Nurse and 2 Laboratory Technicians.

For Special Area (for non-government controlled area), local coordinator/s from specific ethnic organization or relevant organization and translator/s for interview to translate between Myanmar and local language were recruited.

2.6.2. Pilot Survey

Before training and the actual field work, the pilot survey was conducted between October and November 2016 by the NNC and Northern Shan State nutrition team to practice all field procedures including household visits for interview, anthropometric measurements, collection of blood, urine, stool and salt samples and transportation of those samples to NHL. Revision of the survey instruments were done based on the findings from pilot survey as needed including contingency plan for liquid nitrogen to ensure the biological samples can be stored and transferred to the laboratory at NHL.

2.6.3. Training

Training was conducted in two batches: Administrator Training (Training of administrative teams and data collection team leaders) and Main Training (Training of data collection teams).

Table 2.6.1: Numbers of personnel recruited and training site

Sr.	Type of participants	Per S/R	Total	Remark
	<i>Administrator Training</i>			Venue = Nay Pyi Taw
1.	Survey administrators	1	16	1 per team, Total 16 teams
2.	Survey Coordinators	2	33	2 per team, Total 16 teams Additional one from Shan (east)
3.	Survey Team leaders	2	30	1 per team, Total 30 teams
	<i>Total</i>		78	
	<i>Main Training</i>			Venue = Nay Pyi Taw
1.	Enumerators	8	120	4 per team, Total 30 teams
2.	S/R Lab Technicians	2	30	1 per team, Total 30 teams
3.	Lab Coordinators	1	16	1 per team, Total 16 teams There will be additional Lab coordinators if there is more >1 sub-depot in S/R
	<i>Total</i>		166	
	<i>S/R Advocacy Training</i>			Venue = State/Region
1.	Local Lab Technicians	-	120	Estimate
2.	Nurses	1	30	1 per team, Total 30 teams
	<i>Total</i>		150	

Intensive 10 day training for administrative teams and data collection team leaders was conducted. This training was followed by 14 days (with more practical sessions) training on data collection activities for enumeration teams. These trainings covered the following topics:

About MMFC Survey

- Objectives of the survey
- Importance of the survey
- Roles and responsibilities of the survey team members

Field procedure and data collection

- About MMFC Survey
- Selection of the households and target groups

- Interview using tablet-based questionnaires (background socioeconomic status, program coverage, dietary intake and IYCF practices)
- Methods on weight, height and MUAC measurements
- Collection, preparation, storage and transportation of blood, urine, stool and salt samples
- Cold chain and handling of biochemical samples
- Data entry using mobile application

Supervision and communication during survey

- Management during field visit and data collection period
- Problem solving
- Field Supervision
- Data checking, Data cleaning & Data entry
- Field Practice on data collection procedures

2.6.4. Daily work plan in each cluster

The generic plan of field work in EA/cluster for each survey team and the total workload and sample size for each procedure per cluster are presented in the following two tables. Generally it took one week to visit one cluster (1 day of preparation, 5 working days, 1 day of rest and travel to the next cluster).

Table 2.6.2: Daily work plan in each cluster

Day	Morning	Evening
Day 1	<ul style="list-style-type: none"> ▪ Arrival to cluster ▪ Inform local authorities ▪ Preparation for accommodation ▪ Ground check of households 	<ul style="list-style-type: none"> ▪ Random selection of households ▪ Inform selected households
Day 2	At Household, <ul style="list-style-type: none"> ▪ Interview (Enumerator) ▪ Salt testing by RTK (Enum/Lab Tech) ▪ Provide Urine and stool containers ▪ Provide invitation cards to come to base camp 	At Base-camp, <ul style="list-style-type: none"> ▪ Anthropometry (Enumerator) ▪ Finger prick (5-9yr) for Hb (Enumerator) ▪ Collection of urine samples (UIE, Sodium) ▪ Collection of stool samples
Day 3		
Day 4		
Day 5	<ul style="list-style-type: none"> ▪ Blood collection ▪ Anthropometry 	<ul style="list-style-type: none"> ▪ Transport of samples to Sub-Depot ▪ Anthropometry
Day 6	Anthropometry, urine and stool collection of missing cases	
Day 7	Rest and travel to next cluster	

Table 2.6.3: Total workload and sample size for each procedure per cluster

EA	household	Under-five children	5-9 yr children	15-49yr women	Pregnant women	Lactating women	10-14yr girls	15-49yr men	Total
Total sample size (Union)		9,000	9,000	9,000	900	900	900	9,000	38,700
Sample size per State/Region		600	600	600	60	60	60	600	2,580
Sample size per cluster		20	20	20	2	2	2	20	86
Procedures per cluster									
Venous blood collection		20		20	2	2	2		46
Finger prick (Hb)			20						20
Anthropometry		20	20	20			2	20	82
General household Q*	60								60
Household DDS Q*	60								60
IYCF Practices Q*		15							15
Multiple pass 24-hr dietary recall Q**		2							2
SQ-FFQ					2	2	2		6
Urine Iodine			20		2				22
Urine sodium				1				1	2
Stools		20	20						40

(*) Estimated maximum numbers

(**) Only for children under two years of age

3. Data Entry, analysis and interpretation

3.1. Electronic data collection

Interviews were conducted by using tablets (except interview on 24-hr dietary recall which was done using paper questionnaire) and so data entries were started at field sites through electronic data collection using CommCare software. Data collected in mobile application were submitted online and these data were monitored at (NNC) on daily basis. Necessary feedback was provided to the data collection team on a timely basis.

Household socio-demographic, food security and dietary diversity data were analyzed using STATA software and SPSS software (SPSS, Chicago, IL USA; version 16.0). Anthropometric data were analyzed by WHO Anthro (version 2.0.4) and WHO Anthro-plus (version 1.0.2).

3.2. Sampling weights

The MMFCS sample clusters were selected from 2014 census data prepared by Department of Population. We selected 30 clusters from each of the 15 states/regions by PPS sampling ensuring a self-weighted sample in each state/region. Because we selected the same number of clusters in each state/region their allocation across the different states/region was not proportional to the population in each state /region or to urban and rural areas. Thus we calculated sampling weights for each indicator based the relative population size in each state/region and the response rate of each target group. These weights are required for any analyses using MMFCS data to ensure the survey results are representative at the national level. The weighted counts are used in tables throughout the report unless otherwise noted.

3.3. Data interpretation criteria

3.3.1. Household Wealth Index

Household wealth index was developed based on a range of materials owned by household including television to car together with household characteristics such as wall and floor household materials, sources of drinking water. Principal component analysis was used to provide scores for household and to divide them into quintiles of wealth index of household.

3.3.2. Household dietary diversity

Household dietary diversity score (HDDS) was developed based on FAO guidelines (Kennedy, Ballard et al. 2011). The purpose of this HDDS is to provide an indication of household economic access to food and therefore items that require household resources to obtain such as condiments, sugar and sugary foods and beverages are included in the score. There are altogether 16 food items that were included in the dietary diversity questionnaire. Some food groups of similar category such as cereals and white roots and tubers are combined into single food group and therefore there are final 12 food groups to create HDDS. The HDDS was calculated by summing the number of food groups consumed in the household over the 24-hour recall period. There is no established cut-off for HDDS to indicate adequate or inadequate dietary diversity of household and the mean HDDS is recommended to indicate household dietary diversity status (Swindale and Bilinsky 2006, Kennedy, Ballard et al. 2011). In order to relate

with household food access and household food security, the mean HDDS of wealthiest tertile (HDDS=6) was used as the cut off.

3.3.3. Household food security

Food security status of participating households was assessed using the standardized household food insecurity access scale (HFIAS) questionnaire which consists of a list of 9 specific questions about worry and availability of and accessibility to foods for the household during the previous 30 days (Becquey, Martin-Prevel et al. 2010). It is a continuous measure of the degree of food insecurity (access) in the household and calculated by summing the codes for each frequency of occurrence. The score ranges from 0-27 and if the household reported "often" to all 9 frequency of occurrence questions, the maximum score will be 27 while if the household answered "No" to all questions, the minimum score will be "0".

3.3.4. Anthropometry

Trained enumerators collected duplicate measurements of weight, recumbent length (infants) and height using standardized methods and equipment (Garza, Onyango et al. 2009). A third measurement was taken if the difference between the first two measurements exceeded a pre-determined allowable limit. The technical error of measurement (TEM) and systematic error (bias) was determined for each anthropometrist before collecting the anthropometric data, and if required they were given further training.

Stunting was defined as height for age Z-score (HAZ) <-2SD, moderate stunting as HAZ between -2SD and -3SD and severe stunting as LAZ <-3SD for children 6-59 months and 5-9 years of age. For children 6-59 months of age, wasting was defined as weight for height Z-score (WHZ) <-2SD, moderate wasting as WHZ between -2SD and -3SD, severe wasting as WHZ <-3SD and obesity as BAZ >+2SD; underweight as weight for age Z-score (WAZ) <-2SD, moderate underweight as WAZ between -2SD and -3SD and severe underweight as WAZ<-3SD respectively (WHO 2006).

For children 5-9 years of age and adolescent girls, thinness was defined by the body-mass-index for age Z-score (BAZ) <-2SD, moderate thinness by BAZ between -2 and -3SD and severe thinness by BAZ <-3SD and overweight as BAZ > +1SD respectively (Onis, Onyango et al. 2007, WHO 2008).

The Body Mass Index (BMI) for WRA and 15-49 year men was calculated as kg/m². The BMI cut-off point applied to classify nutritional status of adult men and women is shown in the following table (WHO 2004).

Table 2.5.1: BMI cut-off points for adult participants (WRA and men) (WHO 2004)

Classification	BMI(kg/m ²)	
	WHO cut-off points	Asian Cut-off points
Underweight	<18.50	<18.50
▪ Severe thinness	<16.00	<16.00
▪ Moderate thinness	16.00 - 16.99	16.00 - 16.99
▪ Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
▪ Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
▪ Obese	≥30.00	≥30.00
✓ Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
✓ Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
✓ Obese class III	≥40.00	≥40.00

All anthropometry data was collected using in-field electronic data capture on tablets with routines that immediately calculated Z scores and provided the field team with a warning about extreme values and the need for re-measurement to check for potential errors.

The field team referred children with very low weight-for-height (Z score < -3) to their local health staff for assessment and treatment for severe acute malnutrition, we retained these children in the study.

3.3.5. Anemia

Anemia was defined as Hb concentration <11.0g/dL for children under five years and pregnant women, <11.5g/dL for primary school age children and adolescent girls younger than 12 year, <12.0g/dL for adolescent girls 12 year or older, reproductive age women and lactating women according to the WHO guideline (WHO 2011). It is

recommended that adjustment for altitude is necessary to account for reduction in oxygen saturation of blood (Hurtado et al 1945; CDC 1989) and therefore adjustment to hemoglobin was done.

Table 3.1: Hemoglobin levels to diagnose anemia at sea level (g/dL)

Population	No anemia	Anemia		
		Mild	Moderate	Severe
Children 6 -59 months of age	≥ 11.0	10.0-10.9	7.0-9.9	≤ 7.0
Children 5 -11 years of age	≥ 11.5	11.0-11.4	8.0-10.9	≤ 8.0
Children 12 -14 years of age	≥ 12.0	11.0-11.9	8.0-10.9	≤ 8.0
Non-pregnant women (≥15 years)	≥ 12.0	11.0-11.9	8.0-10.9	≤ 8.0
Pregnant women	≥ 11.0	10.0-10.9	7.0-9.9	≤ 7.0
Men (≥ 15 years)	≥ 13.0	11.0-12.9	8.0-10.9	≤ 8.0

3.3.6. Iodine content in salt and iodine status

Presence of iodine in salt was measure by rapid test kit and countered checked by titration in the laboratory. The salt was defined as iodized salt if iodine content is ≥1ppm and as adequately iodized salt if iodine content is ≥15ppm as defined by the Iodine Global Network.

The WHO interpretive criteria to define iodine status at the population level using spot urine samples include a median urinary iodine concentration (mUIC) <20µg/L as severe iodine deficiency, 20-49µg/L as moderate iodine deficiency, 50-99µg/L as mild iodine deficiency, 100-199µg/L as adequate iodine status, 200-299µg/L as intake above requirement and mUIC ≥300µg/L as excessive intake for 5-9 year children; and mUIC <150µg/L as insufficient iodine intake, 150-249µg/L as adequate iodine intake, 250-499µg/L as intake above requirement and mUIC ≥500µg/L as excessive intake for pregnant women (WHO 2013).

However, it was recently recommended that repeated sub-sample of urine should be collected to account for within-person variation (Zimmermann 2016). However, this was not performed in the current survey so that prevalence estimates of inadequate intakes of iodine for each population sub-group cannot be generated. In MMFCS, iodine intake was assessed by collecting single spot sample of urine from primary school age children (5-9 years of age) and pregnant women and the results presented as the median and inter-quartile range (IQR) of urinary iodine concentration for each target group.

3.3.7. Sodium

Average sodium intake of adult men and WRA as well as the percent of those adults who exceed the WHO recommended daily intake of sodium ($> 2\text{g/day}$) was calculated (WHO 2012).

4. Quality Control

4.1. Quality control during training

There were two times of training: a) Training for survey administrators, survey coordinators and survey team leaders and b) Training for enumerators and lab technicians. NNC (DOPH) led the trainings in coordination with Department of Population (Ministry of Labor, Immigration and Population), Department of Medical Research, National Health Laboratory (Department of Medical Services), Health Management Information System (Department of Public Health) and Department of Fishery (Ministry of Agriculture, Livestock and Irrigation).

To ensure the skills of anthropometrists, anthropometry standardization procedures were done during the trainings until the precision and accuracy, measured by technical error of measurement (TEM) and bias respectively, reached satisfactory level. In addition, field practices (interview, measurements and blood collection) were done during the trainings and any mistakes encountered were identified and corrected properly. Body weight, height and MUAC were measured by the trained enumerators in each team assigned specifically for each measurement.

4.2. Quality control during field work

Research monitoring (RM) team was formed including experts from DMR, NHL, DOPH and related ministries and the RM team and state/region administrative teams conducted supervision visits to the survey teams to observe the interviews, sample collection, anthropometry and doing on-spot check of the tablets and 24-hr recall data forms to provide necessary guidance and supportive supervision to the survey teams.

5. Ethical consideration

Ethical approval for the survey was obtained from the Ethical Review Committee, Department of Medical Research, Ministry of Health and Sports on 31st May 2016. The respondents were explained all the procedures (i.e. interview, blood/urine/stool samples collection and measuring anthropometry) to be done. Written informed consent was obtained for all subjects recruited to participate in the study. For the subjects who completed 18 years of age, informed consent was obtained from them. For under-five children and 5-9 year old children, informed consent was obtained from their mothers/care givers. For subjects between 10-17 years of age, assent was obtained from them in addition to consent from their parents/guardians.

Participants were informed the Hemoglobin results immediately after measurement in the field and those with mild to moderate anemia were provided iron supplementation and referred to the corresponding midwife as needed. For subjects with severe anemia, referral was done to the nearest health facility for necessary treatment.

6. Results

6.1. Household information

6.1.1. Household socio-economic characteristics

Household source of drinking water

The majority of the population resides in rural areas and overall 64.3% of them have access to drinking water within their own premises 59.4% in rural areas and 75.6% in urban areas (**Table 6.1.1.1**).

Tube wells are the main source of drinking water for the general population and half of the population in rural areas relied on the tube wells for their drinking purpose. Purified drinking water, on the other hand, was the main source of drinking water for urban households (53%) followed by tube well (22%).

More than half (66.4%) of households treated the water before drinking. In rural area, 74.7% treated their drinking water but the main method of water treatment was by using a filter (80.9%). Similarly in urban rural areas, 76% of the households used water filters to treat their drinking water, followed by boiling (18.3%).

Sanitation

Use of toilets is important to prevent transmission of communicable diseases. However, in rural areas , 10% of households in rural area did not have a toilet and but only 2.4% in urban areas reported not having their own toilet. Overall, 17.6% of these households shared the toilet. The most common type of toilet in rural areas was a is pit latrine (29.9%) whereas the flush type is was the most common type in urban areas (43.7%) (**Table 6.1.1.1**).

Household housing characteristics and Indoor smoke

Just above half of the households at the union level (54%) have access to electricity with the majority of households in urban areas (88.7%) having electricity, but less than half (40.8%) in rural areas (**Table 6.1.1.2**).

Regarding indoor air pollution, overall 55.6% of the households have a separate room for the kitchen with 56.2% in rural and 54.1% urban areas. However, the majority of the cooking takes place inside the house more commonly in urban areas 75.5 % compared to 63.9% in rural areas. Charcoal or wood was the most common type of cooking fuel in

rural areas but electricity was commonly used for cooking in urban area (72.4%). Use of clean fuels such as gas was still minimal at 5.1% in urban and 1.1% in rural areas.

The materials used in the construction of houses are described in (**Table 6.1.1.2**). In general, the main floor material was wood or planks (51.3%), the main roof material was tin/metal (78%) and the main external wall material was bamboo/palm/trunk (56%).

Household housing asset and Housing wealth index

Table 3 shows the household facilities, means of transport, access to agricultural land and ownership of a bank account. The majority of households in urban areas owned television (81.3%) while less than half (43.7%) of the households in rural areas had access to television. Similarly, mobile phones were more commonly available in urban areas (84.9%) compared to rural areas (64.3%) with 70.1% of households in the country owning a mobile phone (**Table 6.1.1.3**).

Motorbikes were the most common mode of transport for households in both (59.4%) and urban (55.3%) areas, while only 10% of household in urban and 3.8% in rural areas owned a car. About half of households (48%) in rural area owned agricultural land and 56% of them also had livestock. Very few of them in rural area (6.1%) had a bank account as compared to 22.6% in urban area.

Wealth index

Household wealth index was developed based on a range of materials owned by household including television to car together with household characteristics such as wall and floor household materials, sources of drinking water. Principal component analysis was used to provide scores for household and to divide them into quintiles of wealth index of household.

Generally, households in urban area are better off compared to rural area where 40% of urban households were in the wealthiest quintile compared to 7% in rural area. Yangon and Mon were among the top regions with highest wealth index. Mon state also had fewest households among the lowest wealth quintiles while Ayeyarwady and Rakhine had a high percentage of households in the poorest wealth quintile (**Table 6.1.1.4**).

Table 6.1.1.1: Percent distribution of household drinking water, N=27,339 (MMFCS 2017-18)

Background characteristics	Rural			Urban			Total		
	(%)	CI	(n)	(%)	CI	(n)	(%)	CI	N
Main source of drinking water									
Purified drinking water bottle	5.7	[4.2-7.6]	1,113	53.3	[47.1-59.4]	4,086	19	[16.3-22.1]	5,199
Pipe water into dwelling/yard/pot	8.3	[6.5-10.6]	1,637	10.1	[7.8-13.0]	776	8.8	[7.3-10.6]	2,414
Tube well	51.9	[47.0-56.8]	10,218	22	[17.9-26.7]	1,687	43.5	[39.6-47.6]	11,905
Protected well	15.3	[11.5-20.0]	3,004	7.9	[3.9-15.2]	604	13.2	[10.2-17.0]	3,608
Rain water	1.4	[0.8-2.4]	276	0.8	[0.3-1.9]	60	1.2	[0.8-2.0]	336
River/Lakes/Dam/Canal/Irrigation channel	7.1	[4.8-10.6]	1,405	2.2	[0.8-5.5]	165	5.7	[3.9-8.3]	1,570
Other	10.3	[8.2-12.7]	2,021	3.7	[2.2-6.2]	286	8.4	[6.9-10.3]	2,307
Treat the water for drinking									
Treat before drinking	74.7	[71.9-77.3]	14,692	45.3	[40.1-50.5]	3,469	66.4	[63.7-69.1]	18,161
Types of treatment for drinking water									
Boiling	15.6	[13.1-18.5]	2,291	18.3	[14.2-23.2]	633	16.1	[14.1-18.3]	2,924
Add chlorine/purifying tablets	0.3	[0.2-0.5]	45	0.6	[0.3-0.9]	19	0.4	[0.2-0.5]	65
Use filter	80.9	[77.7-83.7]	1,1887	76.6	[71.5-81.0]	2,657	80.1	[77.6-82.4]	14,544
Others	3.2	[1.9-5.2]	468	4.6	[2.1-9.6]	160	3.5	[2.3-5.2]	628
Water source									
Within compound/dwelling	59.8	[56.0-63.6]	11,775	75.6	[70.8-79.8]	5,793	64.3	[61.2-67.2]	17,569
Elsewhere	40.2	[36.4-44.0]	7,900	24.4	[20.2-29.2]	1,871	35.7	[32.8-38.8]	9,770
Toilet type									
No toilet	10.3	[8.5-12.6]	2,035	2.4	[1.4-4.1]	182	8.1	[6.7-9.8]	2,217
Bucket	1.5	[1.1-2.1]	299	1.3	[0.7-2.4]	96	1.4	[1.1-1.9]	395
Hanging toilet	2.4	[1.3-4.3]	474	2.1	[0.5-8.2]	160	2.3	[1.3-4.1]	634
Pit latrine without slab	6.4	[5.4-7.6]	1,260	3.3	[2.4-4.5]	252	5.5	[4.8-6.4]	1,512
Pit latrine with slab	29.9	[27.2-32.9]	5,890	26.2	[22.0-30.9]	2,009	28.9	[26.8-31.1]	7,898
Ventilated improved pit	27.5	[24.8-30.4]	5,419	19.1	[15.9-22.7]	1,461	25.2	[23.1-27.3]	6,880
Flush/pour flush to septic tank	21.6	[18.9-24.5]	4,243	43.7	[38.8-48.8]	3,351	27.8	[25.6-30.1]	7,593
Flush/flush to sewer system	0.3	[0.1-0.7]	55	2	[1.0-3.8]	153	0.8	[0.4-1.3]	208
Total	100.0		19,675	100.0		7,664	100.0		27,339

Values are weighted figures presented in percent, 95% confidence interval unless otherwise mentioned.

Table 6.1.1.2: Percent distribution of household housing characteristics, N=27,339 (MMFCS 2017-18)

Background characteristics	Rural			Urban			Total		
	(%)	CI	(n)	(%)	CI	(n)	(%)	CI	N
Electricity access									
Has electricity	40.8	[36.8-44.8]	80,22	88.7	[85.0-91.6]	6,798	54.2	[50.6-57.8]	14,821
Main material of floor									
Earth/sand	13.3	[11.0-16.0]	2,619	9	[6.3-12.7]	688	12.1	[10.5-13.9]	3,306
Bamboo	18.2	[16.0-20.7]	3,586	6.6	[4.7-9.3]	509	15	[13.2-16.9]	4,094
Wood/Plank	54	[50.6-57.3]	10,618	44.4	[38.9-50.0]	3,402	51.3	[48.7-53.9]	14,020
Parquet/polished wood	0.3	[0.2-0.5]	66	2.8	[1.6-4.9]	218	1	[0.7-1.6]	283
Ceramic tile/mosaic	1.2	[0.9-1.7]	243	4.3	[3.2-5.7]	327	2.1	[1.7-2.6]	570
Cement	12.5	[10.8-14.4]	2,463	31.7	[27.5-36.4]	2,433	17.9	[16.2-19.8]	4,895
Other	0.4	[0.3-0.7]	81	1.2	[0.7-2.0]	89	0.6	[0.4-0.9]	170
Main material of roof									
Cement	0.2	[0.1-0.4]	40	6.5	[3.0-13.6]	498	2	[1.0-4.0]	538
Thatch/Palm leaf/Bamboo	23.2	[20.6-26.0]	4,563	6.1	[4.5-8.1]	465	18.4	[16.5-20.5]	5,028
Wood/Plank	0.3	[0.2-0.5]	61	0.5	[0.3-0.9]	38	0.4	[0.2-0.5]	98
Cardboard	0	[0.0-0.1]	9	0.1	[0.0-0.2]	6	0.1	[0.0-0.1]	16
Tin/metal	75.2	[72.3-77.9]	14,801	86.4	[80.7-90.6]	6,624	78.4	[75.9-80.7]	21,425
Tarpaulin	0.2	[0.1-0.4]	39	0.1	[0.0-0.2]	7	0.2	[0.1-0.3]	46
Other	0.8	[0.4-1.6]	161	0.3	[0.2-0.7]	27	0.7	[0.4-1.2]	188
Main material of external wall									
No wall	0.2	[0.1-0.3]	35	0.1	[0.0-0.2]	7	0.2	[0.1-0.2]	42
Palm/Trunk/Bamboo	62.8	[60.1-65.5]	12,360	41.2	[36.1-46.4]	3,154	56.7	[54.3-59.2]	15,514
Plywood	0.4	[0.3-0.6]	87	1.3	[0.9-2.0]	103	0.7	[0.5-0.9]	191
Cardboard	0	[0.0-0.0]	3	0.1	[0.0-0.2]	5	0	[0.0-0.1]	9
Tin/Metal	0.9	[0.6-1.3]	174	3.3	[2.3-4.5]	250	1.6	[1.2-2.0]	424
Wood/Plank	21.6	[19.3-24.1]	4,253	16.8	[14.1-19.9]	1,291	20.3	[18.6-22.1]	5,543
Cement/Brick	13.3	[11.6-15.1]	2,617	35.4	[30.3-41.0]	2,717	19.5	[17.5-21.7]	5,334
Tarpaulin	0.3	[0.2-0.5]	61	0.5	[0.3-0.8]	40	0.4	[0.3-0.5]	100
Other	0.4	[0.3-0.6]	85	1.3	[0.7-2.2]	98	0.7	[0.5-0.9]	18
Place of cooking									
Inside the house	63.9	[61.2-66.5]	12,577	75.5	[72.0-78.7]	5,785	67.2	[65.2-69.1]	18,362
In separate building	19.8	[17.7-22.1]	3,903	12.3	[10.1-14.9]	942	17.7	[16.2-19.3]	4,845
Outdoors	16	[14.6-17.6]	3,156	12	[10.1-14.2]	919	14.9	[13.8-16.1]	4,075
Others	0.2	[0.1-0.3]	39	0.2	[0.1-0.5]	18	0.2	[0.1-0.3]	57
Kitchen									
Has separate room	56.2	[53.8-58.6]	11,061	54.1	[50.5-57.7]	4,146	55.6	[53.6-57.6]	15,207
Type of cooking fuel (use more than one type)									
Electricity	18.3	[15.1-22.0]	3,597	72.4	[67.7-76.7]	5,552	33.5	[30.1-37.0]	9,149
Gas	1.1	[0.8-1.6]	219	5.1	[3.7-6.9]	389	2.2	[1.8-2.8]	608
Kerosene	2.3	[1.5-3.4]	446	0.5	[0.1-1.7]	37	1.8	[1.2-2.6]	483
Charcoal/Wood	91.1	[88.8-93.0]	17,921	53.8	[49.5-58.2]	4,126	80.6	[78.2-82.9]	22,047
Straw/Grass	0.3	[0.1-0.8]	53	0.2	[0.0-0.9]	16	0.3	[0.1-0.6]	69
None	0	[0.0-0.1]	5	0.3	[0.1-1.1]	25	0.1	[0.0-0.3]	30
Don't know	0	[0.0-0.0]	1	0.1	[0.0-0.2]	5	0	[0.0-0.1]	6
Total	100.0		19,675	100.0		7,664	100.0		27,339

Values are weighted figures presented in percent, 95% confidence interval unless otherwise mentioned.

Table 6.1.1.3: Percent distribution of household housing assets, N=27,339 (MMFCS 2017-18)

Background characteristics	Rural			Urban			Total		
	(%)	CI	(n)	(%)	CI	(n)	(%)	CI	N
Household facilities									
Electricity	40.8	[36.8-44.8]	8022	88.7	[85.0-91.6]	6,798	54.2	[50.6-57.8]	14,821
Radio	21.9	[20.0-23.9]	4310	13.9	[12.0-16.1]	1,067	19.7	[18.2-21.2]	5,378
Television	43.7	[41.0-46.4]	8599	81.3	[78.5-83.8]	6,230	54.2	[51.7-56.8]	14,829
Mobile phone	64.3	[61.8-66.6]	12,646	84.9	[82.7-87.0]	6,511	70.1	[68.1-71.9]	19,157
Land-line phone	2.2	[1.7-2.7]	426	4.6	[3.5-6.2]	356	2.9	[2.4-3.4]	782
Refrigerator	7.4	[6.2-8.9]	1,464	41.5	[36.7-46.5]	3,184	17	[15.0-19.3]	4,647
Wardrobe	51.5	[48.9-54.1]	10,132	72.4	[68.7-75.7]	5,546	57.3	[55.2-59.4]	15,678
Table	76.5	[74.3-78.5]	15,045	74.8	[70.4-78.8]	5,734	76	[74.3-77.6]	20,778
Chair	65.4	[62.7-67.9]	12,858	73.4	[69.4-77.0]	5,623	67.6	[65.5-69.7]	18,481
Watch	35.7	[33.3-38.1]	7,014	45.6	[41.7-49.5]	3,492	38.4	[36.5-40.4]	10,506
Means of transport									
Bicycle	33.1	[30.5-35.7]	6,504	42.2	[38.1-46.5]	3,236	35.6	[33.7-37.7]	9,740
Motorcycle	59.4	[56.9-61.9]	11,693	55.3	[50.1-60.3]	4,236	58.3	[56.3-60.2]	15,929
Car/Truck	3.8	[3.3-4.4]	747	10.8	[8.8-13.3]	830	5.8	[5.0-6.6]	1,577
Boat	6.5	[4.7-9.0]	1,283	0.7	[0.3-1.4]	53	4.9	[3.5-6.7]	1,336
Trishaw	11.9	[10.0-14.1]	2,338	2.1	[1.5-3.0]	164	9.1	[7.7-10.8]	2,501
None	2.1	[1.8-2.6]	418	0.5	[0.3-0.9]	41	1.7	[1.4-2.0]	459
Don't know	0	[0.0-0.1]	9	0	[0.0-0.0]	0	0	[0.0-0.1]	9
Agriculture land									
Own agricultural land	48.0	[45.0 - 51.0]	9,445	9.8	[7.7 - 12.4]	751	37.3	[34.7 - 40.0]	10,196
Own any livestock, herds, other farm animals or poultry									
Own any livestock	56.6	[53.3 - 59.7]	11,127	14.3	[11.8 - 17.4]	1,099	44.7	[41.7 - 47.8]	12,225
Own animals									
Bulls	4.5	[3.2 - 6.4]	890	1.1	[0.3 - 3.8]	84	3.6	[2.5 - 5.0]	974
cows	23.4	[20.7 - 26.4]	4,613	2.7	[2.0 - 3.8]	210	17.6	[15.5 - 20.0]	4,823
horses/donkeys/mules	0.2	[0.1 - 0.3]	37	0.0	[0.0 - 0.1]	3	0.1	[0.1 - 0.2]	39
goats	1.2	[0.9 - 1.6]	233	0.4	[0.3 - 0.6]	31	1.0	[0.7 - 1.3]	264
sheep	0.2	[0.1 - 0.3]	32	0.0	[0.0 - 0.2]	2	0.1	[0.1 - 0.2]	34
pigs	22.4	[19.8 - 25.2]	4,403	5.9	[4.1 - 8.2]	450	17.8	[15.7 - 20.0]	4,853
chicken	36.8	[33.8 - 39.9]	7,241	9.3	[7.3 - 11.8]	711	29.1	[26.6 - 31.7]	7,952
ducks	4.0	[3.4 - 4.8]	790	1.2	[0.9 - 1.7]	94	3.2	[2.8 - 3.8]	885
Any member own bank account									
Own bank account	6.1	[5.2 - 7.1]	1,192	22.6	[19.2 - 26.5]	1,735	10.7	[9.4 - 12.1]	2,927
Total	100.0		19,675	100.0		7,664	100.0		27,339

Values are weighted figures presented in percent, 95% confidence interval unless otherwise mentioned.

Table 6.1.1.4: Percent distribution of household wealth index, N=27,339 (MMFCS 2017-18)

Background character-istics	Household Wealth quintile												Total (N)			
	Lowest			Second			Middle			Fourth				Highest		
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)		%	CI	(n)
State/Region																
Kachin	12.2	[5.7-24.2]	83	16.1	[10.1-24.6]	109	17.5	[14.4-21.2]	119	29.7	[22.8-37.7]	201	24.4	[17.5-32.9]	165	677
Kayah	12.5	[6.8-21.8]	18	14.9	[11.0-19.8]	21	20.3	[16.0-25.5]	29	22.5	[18.0-27.8]	32	29.8	[21.0-40.3]	43	144
Kayin	20.2	[14.2-27.8]	156	21.1	[17.3-25.6]	164	22.4	[18.9-26.2]	173	20.0	[15.8-25.0]	155	16.3	[10.4-24.8]	127	774
Chin	16.5	[8.7-29.2]	38	17.8	[12.6-24.5]	41	32.7	[25.3-41.1]	75	28.1	[20.0-38.0]	64	4.9	[2.7-8.7]	11	229
Sagaing	10.1	[6.4-15.6]	279	28.5	[23.4-34.3]	787	29.8	[26.7-33.2]	823	20.0	[16.1-24.5]	551	11.5	[7.0-18.2]	317	2,757
Tanintharyi	17.4	[12.2-24.3]	124	16.8	[12.7-21.9]	120	22.2	[19.1-25.7]	158	25.2	[19.9-31.2]	179	18.4	[12.4-26.4]	131	712
Bago	29.4	[22.9-36.9]	844	20.2	[17.3-23.5]	582	21.5	[18.7-24.6]	618	17.9	[14.2-22.3]	514	11.0	[7.4-16.0]	315	2,873
Magway	31.0	[24.6-38.3]	717	31.4	[27.7-35.3]	725	19.5	[16.6-22.7]	450	11.0	[8.5-14.2]	255	7.1	[3.8-12.8]	164	2,312
Mandalay	16.7	[12.4-22.1]	557	30.2	[23.9-37.4]	1,004	21.5	[18.4-25.0]	715	15.9	[13.1-19.0]	527	15.7	[9.5-24.8]	523	3,326
Mon	7.3	[4.9-10.8]	78	11.3	[8.8-14.5]	120	17.6	[14.3-21.4]	187	29.2	[25.1-33.6]	310	34.6	[28.0-41.8]	367	1,062
Rakhine	48.4	[40.4-56.5]	560	26.5	[22.8-30.7]	307	13.0	[10.3-16.2]	150	8.0	[5.3-11.9]	92	4.1	[1.5-10.8]	47	1,156
Yangon	11.1	[6.8-17.5]	440	12.2	[9.5-15.6]	487	19.3	[15.8-23.4]	769	19.5	[15.9-23.5]	774	37.9	[28.7-48.2]	1509	3,978
Shan	24.0	[15.7-34.8]	705	16.8	[13.5-20.6]	493	20.0	[16.2-24.5]	588	18.8	[14.7-23.7]	553	20.4	[13.6-29.7]	601	2,939
Ayeyarwady	45.0	[37.4-52.9]	1,684	30.3	[26.4-34.6]	1,136	16.6	[13.3-20.5]	621	5.3	[3.1-8.9]	199	2.7	[1.1-6.9]	102	3,742
Nay Pyi Taw	17.9	[12.1-25.7]	118	22.9	[17.0-30.2]	151	18.4	[15.2-22.1]	121	17.5	[12.7-23.6]	115	23.3	[14.4-35.5]	154	659
Residence																
Rural	29.9	[27.3-32.6]	5,883	27.7	[26.1-29.3]	5,441	21.4	[20.2-22.8]	4,217	13.6	[12.4-14.9]	2,673	7.4	[6.1-8.9]	1,460	19,675
Urban	6.8	[5.1-8.9]	518	10.5	[8.9-12.4]	804	18.0	[16.0-20.2]	1,378	24.1	[22.0-26.4]	1,848	40.6	[35.5-46.0]	3,115	7,664
Total	23.4	[21.3-25.6]	6,401	22.8	[21.4-24.3]	6,246	20.5	[19.4-21.6]	5,595	16.5	[15.4-17.8]	4,521	16.7	[14.7-19.0]	4,575	27,339

Values are weighted figures presented in percent, 95% confidence interval unless otherwise mentioned.

6.1.2. Household dietary diversity

Household dietary diversity score (HDDS) was developed based on FAO guidelines (Kennedy, Ballard et al. 2011). The purpose of this HDDS is to provide an indication of household economic access to food and therefore items that require household resources to obtain them such as condiments, sugar and sugary foods and beverages are included in the score. There are altogether 16 food items that were included in the dietary diversity questionnaire. Some food groups of similar category such as cereals and white roots and tubers are combined into a single food group, so finally 12 food groups were used to create HDDS. The HDDS was calculated by summing the number of food groups consumed in the household over the 24-hour recall period.

There is no established cut-off for HDDS to indicate adequate or inadequate dietary diversity of household and the mean HDDS is recommended to indicate household dietary diversity status (Swindale and Bilinsky 2006, Kennedy, Ballard et al. 2011). In order to relate with household food access and household food security, the mean HDDS of wealthiest tertile (HDDS=6) was used as the cut off.

Table (6.1.2.1) shows that the Bago region had the highest mean household dietary diversity score HDDS of 7.0 and 86% of Bago households consumed more than 6 food groups per day (i.e. HDDS ≥ 6). In contrast, households from Mandalay region and Chin state consumed less variety of foods (HDDS ≥ 6 at 15.4% and 17.7% respectively). The mean household dietary diversity score was higher in urban compared to rural areas 5.8 vs 5.4 respectively. The mean HDDS was also consistent with household wealth index and household food security status with the richest and most food secure household had the highest HDDS.

Table 6.1.2.1.1: Household dietary diversity score by selected background characteristics, N= 27,339 (MMFCS 2017-18)

Background characteristics	HDDS				HDDS<6			HDDS≥6			Total household-holds
	Mean	SD	LCI	UCI	(%)	CI	(n)	(%)	CI	(n)	
State/Region											
Kachin	5.7	3.1	5.4	5.9	52.5	[46.0-58.9]	355	47.5	[41.1-54.0]	322	677
Kayah	5.5	7.1	5.1	5.9	53.0	[44.6-61.3]	76	47.0	[38.7-55.4]	68	144
Kayin	4.8	2.4	4.6	4.9	68.4	[64.5-72.2]	530	31.6	[27.8-35.5]	244	774
Chin	4.2	3.9	4.0	4.5	82.3	[78.0-86.0]	189	17.7	[14.0-22.0]	40	229
Sagaing	5.7	1.3	5.5	5.9	43.5	[37.5-49.7]	1198	56.5	[50.3-62.5]	1,559	2,757
Tanintharyi	5.8	2.8	5.6	6.0	44.3	[39.3-49.4]	315	55.7	[50.6-60.7]	396	712
Bago	7.0	1.1	6.8	7.1	13.6	[10.6-17.3]	391	86.4	[82.7-89.4]	2,482	2,873
Magway	5.0	1.2	4.8	5.2	65.2	[59.8-70.3]	1508	34.8	[29.7-40.2]	804	2,312
Mandalay	4.3	0.9	4.1	4.4	84.6	[81.0-87.5]	2812	15.4	[12.5-19.0]	513	3,326
Mon	6.2	1.9	6.0	6.3	34.9	[30.5-39.6]	370	65.1	[60.4-69.5]	692	1,062
Rakhine	4.9	1.9	4.7	5.2	68.9	[63.0-74.2]	796	31.1	[25.8-37.0]	360	1,156
Yangon	5.8	1.1	5.7	5.9	48.0	[44.4-51.6]	1909	52.0	[48.4-55.6]	2,070	3,978
Shan	5.6	1.1	5.3	5.8	49.4	[41.6-57.1]	1451	50.6	[42.9-58.4]	1,489	2,939
Ayeyarwady	5.8	1.0	5.6	6.0	42.1	[36.7-47.6]	1574	57.9	[52.4-63.3]	2,168	3,742
Nay Pyi Taw	5.0	3.0	4.6	5.4	60.7	[51.0-69.7]	400	39.3	[30.3-49.0]	259	659
Residence											
Rural	5.4	1.5	5.3	5.5	53.0	[50.5-55.5]	10428	47.0	[44.5-49.5]	9,247	19,675
Urban	5.8	2.0	5.7	6.0	45.0	[41.4-48.5]	3446	55.0	[51.5-58.6]	4,218	7,664
Wealth index											
Least	5.1	1.4	5.0	5.2	63.4	[60.1-65.8]	4035	36.6	[34.2-39.9]	2,333	6,368
Second	5.2	1.5	5.1	5.3	57.4	[54.1-59.8]	3648	42.6	[40.2-45.9]	2,710	6,359
Middle	5.6	1.6	5.5	5.7	47.7	[45.8-50.7]	2665	52.3	[49.3-54.2]	2,922	5,587
Fourth	5.8	1.8	5.7	5.9	42.3	[40.9-45.7]	1877	57.7	[54.3-59.1]	2,556	4,433
Highest	6.2	1.9	6.1	6.4	35.9	[32.6-38.5]	1648	64.1	[61.5-67.4]	2,945	4,593

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	HDDS				HDDS<6			HDDS>=6			Total household
	Mean	SD	LCI	UCI	(%)	CI	(n)	(%)	CI	(n)	
Household food security											
Food Secure	5.7	1.6	5.6	5.7	47.0	[45.2-48.9]	8582	53.0	[51.1-54.8]	9,669	18,251
Mildly Food insecure	5.4	1.8	5.3	5.5	53.5	[50.4-56.6]	1696	46.5	[43.4-49.6]	1,475	3,171
Moderately food insecure	5.3	1.8	5.2	5.4	58.9	[56.0-61.7]	2503	41.1	[38.3-44.0]	1,745	4,248
Severely food insecure	5.0	1.6	4.8	5.1	65.5	[61.2-69.6]	1093	34.5	[30.4-38.8]	576	1,668
Total	5.5	1.7	5.5	5.6	50.7	[49.1-52.4]	13874	49.3	[47.6-50.9]	13,465	27,339

HDDS = household dietary diversity score,

Values are weighted figures presented in percent, 95% confidence interval unless otherwise mentioned.

SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval

Table 6.1.2.2: Food groups consumed by ≥50% of households by dietary diversity tertile

Lowest dietary diversity (≤ 4 food groups)	Medium dietary diversity (5 and 6 food groups)	High dietary diversity (≥ 7 food groups)
<ul style="list-style-type: none"> ▪ Cereals ▪ Vegetables 	<ul style="list-style-type: none"> ▪ Cereals ▪ Vegetables ▪ Fish and other seafood ▪ Oils and fats ▪ Spices, condiments and beverages 	<ul style="list-style-type: none"> ▪ Cereals ▪ Vegetables ▪ Fish and other seafood ▪ Oils and fats ▪ Spices, condiments and beverages ▪ Legumes, nuts and seeds ▪ Meat ▪ Fruits ▪ Sweets

Table 6.1.2 shows the food groups which were predominantly consumed at different levels of dietary diversity scores. Food groups consumed by more than 50% of households by tertile of HDDS are presented. The findings show dietary pattern of households at different level of dietary diversity, with cereals and vegetables being the mostly commonly consumed food groups among the households. Meat were only commonly consumed by households having high dietary diversity, therefore households at the lowest to medium dietary diversity were at risk to inadequate intakes of absorbable iron and absorbable zinc which are rich in red meat. In addition, households at the lowest dietary diversity were also at risk to have inadequate zinc intake given lack of any animal source foods consumption in these households.

6.1.3. Household food security status

Food security status of participating households was assessed using the standardized household food insecurity access scale (HFIAS) questionnaire which consists of a list of 9 specific questions about worry and availability of and accessibility to foods for the household during the previous 30 days (Becquey, Martin-Prevel et al. 2010). It is a continuous measure of the degree of food insecurity (access) in the household and calculated by summing the codes for each frequency of occurrence. The score ranges from 0-27 and if the household reported "often" to all 9 frequency of occurrence questions, the maximum score will be 27 while if the household answered "No" to all questions, the minimum score will be "0". The higher the score, Union figure shows that while one-third of households are suffering from food insecurity, percentages of food secure households ranged greatly from more than 80% in Mon (86.0%) and Sagaing(82.8%) to to below 30% in Kayah (21.0%) and Magway (24.4%). Food insecurity was higher in rural compared to urban areas and it is also consistent with the wealth index where the wealthier households were more food secure.

Table 6.1.3.1: Percent distribution of household food security status by selected background characteristics, N= 27,339 (MMFCS 2017-18)

Background characteristics	Food Secure		Mild insecure		Moderate insecure		Severe insecure		Total household holds				
	%	CI	(n)	%	CI	(n)	%	CI		N			
State/Region													
Kachin	58.9	[43.4-72.9]	399	7.7	[5.4-10.8]	52	24.1	[15.8-35.0]	163	9.3	[4.9-16.8]	63	677
Kayah	21.0	[14.4-29.7]	30	14.5	[11.9-17.7]	21	55.2	[47.9-62.3]	79	9.2	[6.6-12.7]	13	144
Kayin	37.2	[32.0-42.7]	288	27.2	[23.2-31.5]	210	32.5	[28.0-37.4]	252	3.1	[1.6-5.7]	24	774
Chin	49.7	[36.5-62.9]	114	15.8	[12.8-19.4]	36	31.4	[20.4-44.9]	72	3.1	[1.8-5.2]	7	229
Sagaing	82.8	[79.8-85.4]	2,282	10.7	[8.3-13.6]	294	5.1	[3.9-6.8]	141	1.4	[0.8-2.5]	40	2,757
Tanintharyi	77.2	[70.7-82.7]	549	9.3	[6.8-12.6]	66	5.6	[4.2-7.4]	40	7.8	[5.5-11.2]	56	712
Bago	57.9	[52.9-62.8]	1,664	11.8	[9.7-14.3]	338	19.0	[15.4-23.3]	547	11.3	[8.6-14.7]	323	2,873
Magway	24.4	[18.9-30.9]	565	18.6	[15.7-21.9]	430	50.2	[41.9-58.4]	1160	6.8	[4.6-9.9]	157	2,312
Mandalay	81.1	[75.4-85.7]	2,696	8.0	[6.2-10.2]	266	6.2	[4.6-8.2]	205	4.8	[3.2-7.1]	159	3,326
Mon	86.0	[81.2-89.8]	914	5.1	[3.5-7.2]	54	6.3	[4.4-8.9]	67	2.6	[1.7-4.1]	28	1,062
Rakhine	58.4	[52.3-64.1]	674	18.1	[14.5-22.2]	209	15.4	[12.0-19.5]	178	8.2	[5.6-11.8]	95	1,156
Yangon	75.5	[70.0-80.2]	3,002	10.8	[8.9-13.1]	430	8.9	[6.9-11.5]	354	4.8	[3.6-6.5]	192	3,978
Shan	60.4	[53.7-66.7]	1,774	9.0	[7.3-11.0]	265	22.7	[18.2-28.0]	667	8.0	[5.4-11.6]	234	2,939
Ayeyarwady	77.5	[71.6-82.5]	2,900	9.5	[7.4-12.2]	357	6.7	[4.7-9.5]	250	6.3	[3.9-9.9]	235	3,742
Nay Pyi Taw	60.4	[55.0-65.4]	398	22.0	[18.7-25.7]	145	11.1	[9.0-13.6]	73	6.5	[4.5-9.5]	43	659
Residence													
Rural	63.6	[61.3-65.9]	12,519	12.1	[11.2-13.1]	2,387	17.7	[16.1-19.5]	3,482	6.5	[5.6-7.6]	1,287	19,675
Urban	74.8	[71.3-78.0]	5,732	10.2	[8.9-11.7]	784	10.0	[8.3-12.0]	766	5.0	[4.0-6.2]	381	7,664

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	Food Secure			Mild insecure			Moderate insecure			Severe insecure			Total household holds
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	N	
Wealth index													
Least	44.1	[41.2-47.9]	2,806	15.3	[13.7-16.7]	973	26.6	[23.7-28.8]	1693	14.1	[12.3-16.2]	896	6,368
Second	63.1	[59.7-65.2]	4,010	13.4	[12.0-14.6]	852	17.2	[15.8-19.7]	1094	6.3	[5.6-7.9]	402	6,359
Middle	71.4	[69.4-73.8]	3,988	11.0	[10.2-12.8]	615	13.7	[11.8-15.0]	765	3.9	[2.9-4.3]	219	5,587
Fourth	76.6	[73.8-78.6]	3,394	10.4	[9.2-11.8]	462	10.6	[9.5-12.5]	469	2.4	[1.8-3.1]	108	4,433
Highest	88.3	[86.3-89.9]	4,053	5.9	[4.9-6.9]	270	4.9	[4.1-6.1]	227	0.9	[0.6-1.3]	42	4,593
Household dietary diversity													
DDS <6	61.9	[59.7-63.9]	8,582	12.2	[11.3-13.2]	1,696	18.0	[16.6-19.6]	2,503	7.9	[6.8-9.1]	1,093	13,874
DDS ≥6	71.8	[69.9-73.7]	9,669	11.0	[10.0-12.0]	1,475	13.0	[11.7-14.3]	1,745	4.3	[3.7-4.9]	576	13,465
Total	66.8	[65.0-68.5]	18,251	11.6	[10.9-12.4]	3,171	15.5	[14.4-16.8]	4,248	6.1	[5.4-6.9]	1,668	27,339

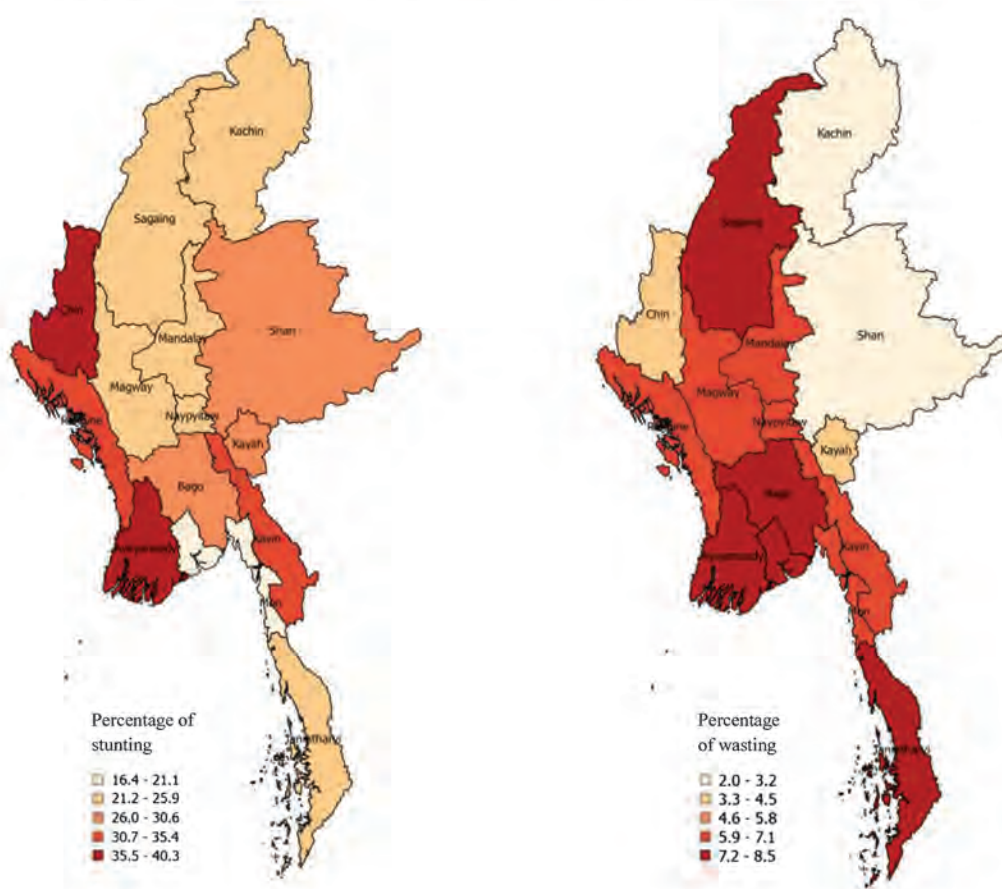
Values are weighted figures presented in percent, 95% confidence interval unless otherwise mentioned.

6.2. Nutritional status of children and adolescents

Stunting among children is a result of linear growth retardation due to poor diets and/or recurrent infections, both of which can also lead to a greater risk for illness and death. Stunting due to long-term nutritional deprivation often causes delayed mental development, poor school performance and reduced intellectual capacity of the child in his/her later life which in turn affects economic productivity at the national level (WHO 2010). Wasting among children is a form of acute undernutrition, usually as a consequence of insufficient food intake or a high incidence of infectious diseases, especially diarrhea. Wasting can in turn impair the immune system functioning leading to increased severity and duration resulting in increased risk of mortality.

6.2.1. Nutritional status of under five year children

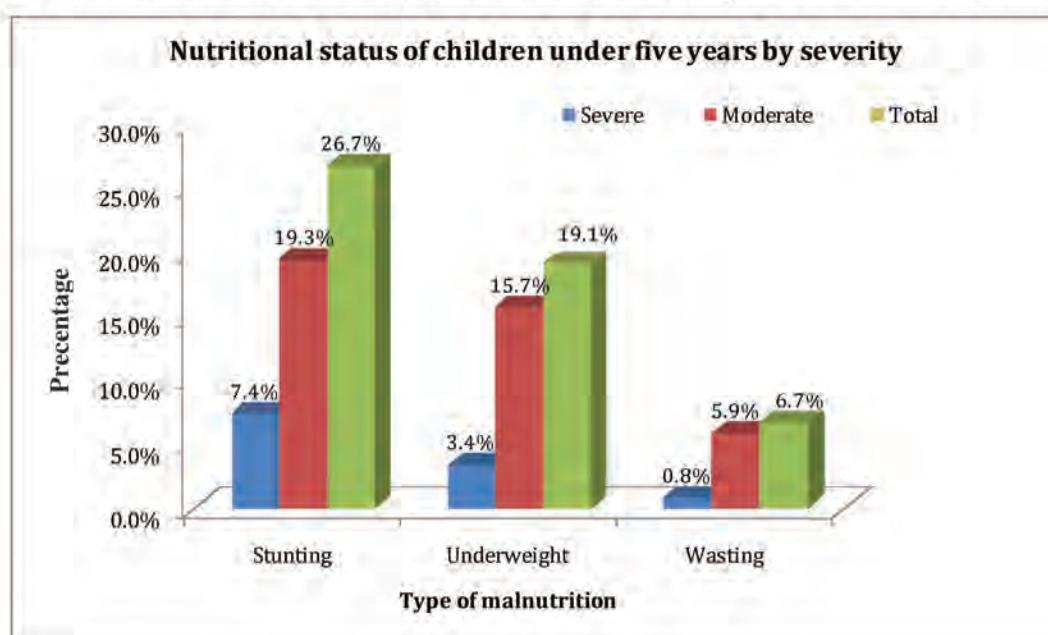
Figure 6.2.1.1: Stunting and wasting among children 6-59 months of age by states/regions



Highlight: One in four children under five years of age were stunted (short for their age) due to chronic undernutrition, 6.7% were wasted (thin for their height) due to acute undernutrition, 19.1% were underweight (thin for their age) and 0.8% were overweight (heavy for their height).

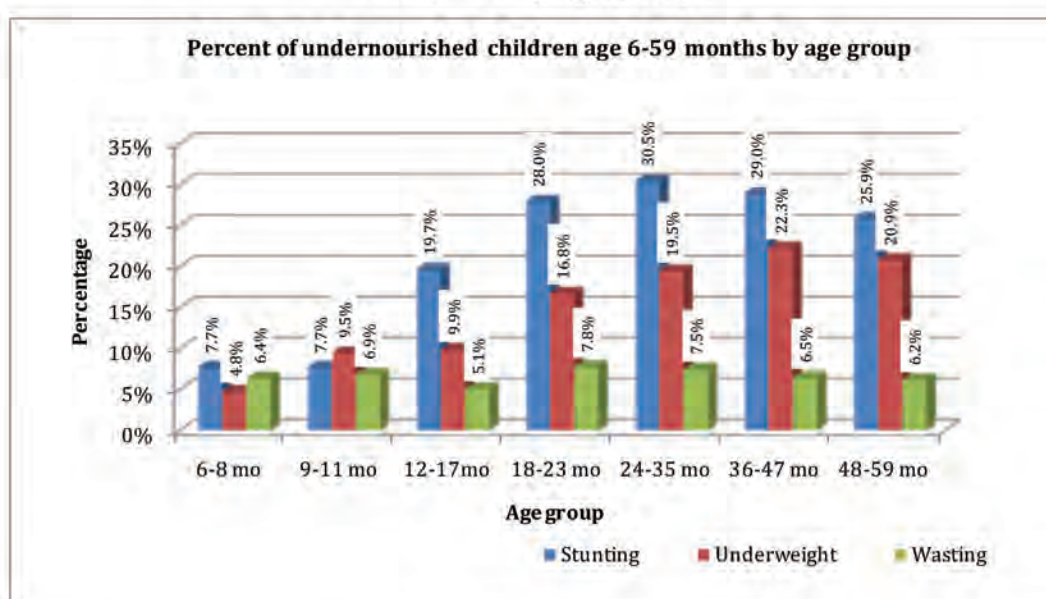
Among children age 6-59 months, 26.7% were stunted (short for their age) while 19.3% were moderately stunted and 7.4% were severely stunted indicating the problem of chronic undernutrition; 6.7% were wasted (thin for their height) while 5.9% were moderately wasted and 0.8% were severely wasted indicating acute undernutrition; 19.1% were underweight (thin for their age) while 15.7% were moderately underweight and 3.4% were severely underweight; and 0.8% were overweight (**Table 6.2.1.1, Fig 6.2.1.3**).

Figure 6.2.1.3: Percent of undernourished children age 6-59 months by severity



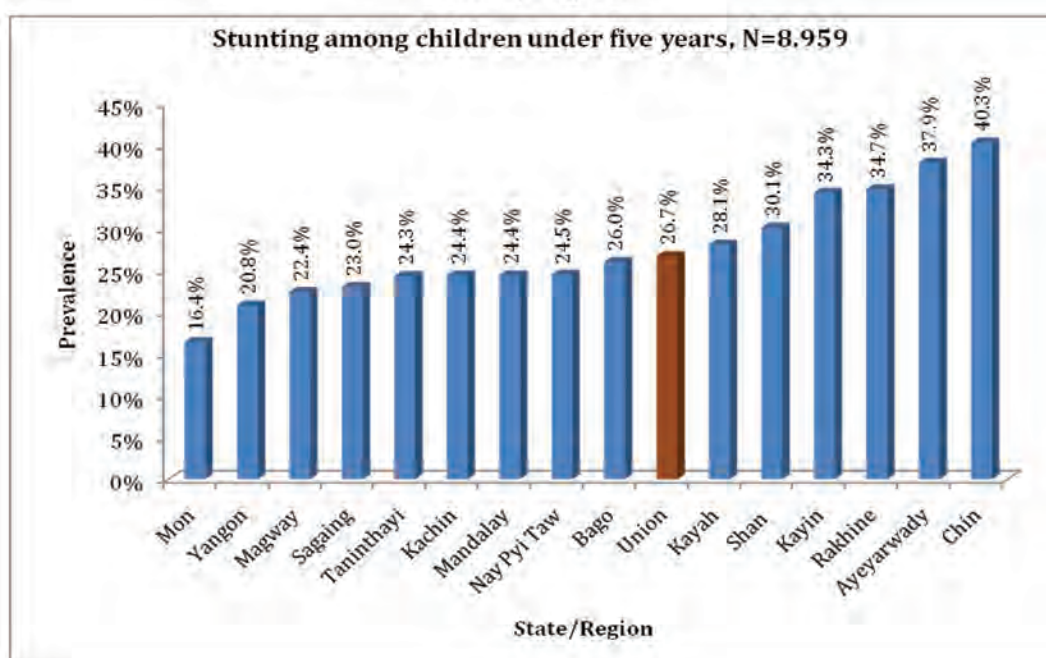
Stunting rate is found to be highest (30.5%) among children 24-35 months of age while wasting is highest (7.8%) among those aged 18-23 months (**Fig 6.2.1.4**) No significant difference was found in prevalence of stunting among boys and girls although more boys were found to be wasted than girls. Higher rate of stunting was found among those households with a lower wealth status and high severity of household food insecurity. It was also noted that the more diversity of food groups the household consumed, the less the rate of stunting among under five years in their household (**Table 6.2.1.2**).

Figure 6.2.1.4: Percent of children age 6-59 months who are undernourished classified by age group



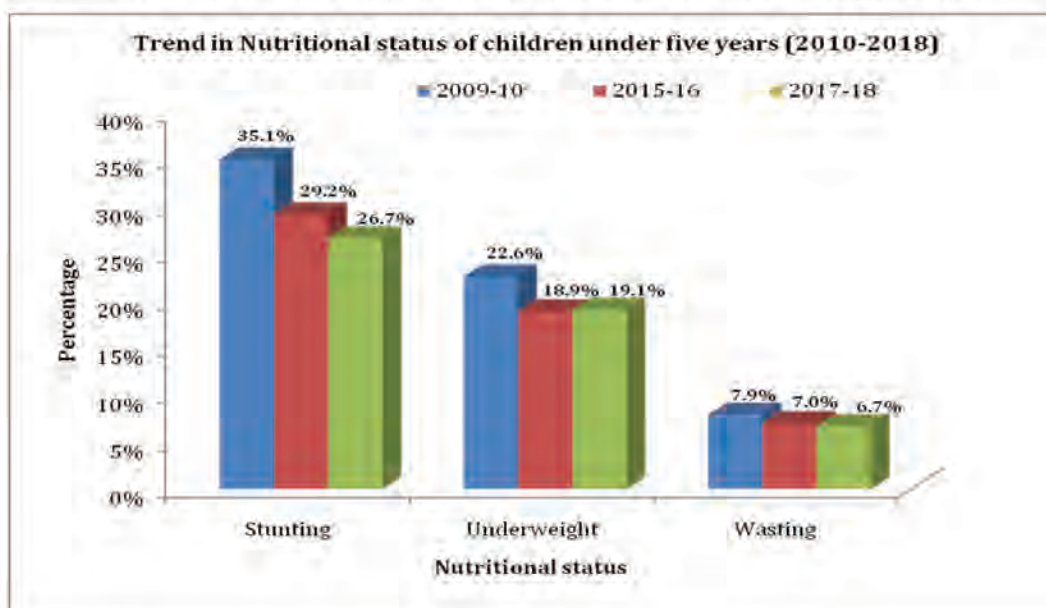
Among states/regions, Chin state was found to have the highest rate of stunting (40.3%) among under five-year children followed by Ayeyarwady region (37.9%), Rakhine state (34.7%) and Kayin state (34.3%) (Table 6.2.1.2, Figure 6.2.5). Ayeyarwady, Bago, Tanintharyi, Sagaing, Yangon regions and Rakhine state have higher rate of wasting among under five-year children than the national level (Table 6.2.1.1, Table 6.2.1.2, Table 6.2.1.3).

Figure 6.2.1.5: Percent of stunting among children age 6-59 months by state/region



Although there has been significant reduction in prevalence of both acute and chronic undernutrition among under five year children from 2010-2018 (Stunting: 35.1% in 2010, 29.2% in 2015 and 26.7% in 2018; and Wasting: 7.9% in 2010, 7% in 2015 and 6.7% in 2018) (MOH and MONPED 2010, MOHS and ICF 2017), the problems still exist as public health significance according to the WHO classification (WHO 2010) (Figure 6.2.1.6).

Figure 6.2.1.6: Trend in Nutritional status of children under five years (2010-2018)



Source:

Multiple Indicator Cluster Survey (2009-2010), N = 15,224 (children 0-59 months)

Myanmar Demographic and Health Survey (2015-2016), N = 4,100 (children 6-59 months)

Myanmar Micronutrient and Food Consumption Survey (Nov 2017-May 2018), N = 8,959 (children 6-59 months)

It was noted that Chin state has been suffering from the highest rate of stunting among under-five children since 2009-10 (58%), 41% in 2015-16 MDHS and 40.3% in 2017-18 MMFCS) of all the states/regions (MOH and MONPED 2010, MOHS and ICF 2017). Stunting, by nature, is a form of chronic undernutrition resulting from sub-optimal infant and young child feeding (IYCF) practices, poor status of growth limiting nutrients (such as iron, iodine, and zinc) among these children and poor maternal nutritional status. The finding of poor dietary diversity at household level in Chin state as identified by HDDS<6 (82.3%) is also telling us that the children from this area might have low level of intake for those growth limiting nutrients. The finding suggests us there is urgent need to enhance the IYCF practices to promote optimal breastfeeding and complementary feeding practices for children under 2 years of age in Chin state.

Table 6.2.1.1: Percentage of children age 6-59 months classified as malnourished according to three anthropometric indices of nutritional status by background characteristics (MMFCS 2017-18)^{1,2}

Background characteristics	Height for age ³ (%)					Weight for height (%)					Weight for age (%)					
	Any stunting	Severe stunting	Mode-rate stunting	Mean Z-score (±SD)	Number of children	Any wasting	Severe wasting	Mode-rate wasting	Over-weight	Mean Z-score (±SD)	Number of children	Any under-weight	Severe under-weight	Mode-rate under-weight	Mean Z-score (±SD)	Number of children
Age in months																
6-8 mo	7.7	4.2	3.60	-0.2±1.4	168	6.4	0.2	6.2	1.4	-0.2±1.2	170	4.8	0.6	4.1	-0.4±1.2	168
9-11 mo	7.7	2.8	4.90	-0.5±1.2	229	6.9	0.5	6.5	3.9	-0.3±1.2	230	9.5	0.4	9.1	-0.6±1.1	230
12-17 mo	19.7	4.8	14.90	-1.0±1.3	715	5.1	1.4	3.7	1.1	-0.5±1.0	714	9.9	1.4	8.5	-0.8±1.0	715
18-23 mo	28.0	8.6	19.50	-1.3±1.3	762	7.8	1.5	6.4	0.4	-0.6±1.0	761	16.8	3.0	13.8	-1.1±0.9	764
24-35 mo	30.5	8.5	22.00	-1.4±1.2	2,254	7.5	0.9	6.7	0.5	-0.6±1.0	2,256	19.5	3.7	15.8	-1.2±1.0	2,258
36-47 mo	29.0	8.5	20.50	-1.4±1.2	2,278	6.5	0.7	5.8	0.8	-0.6±1.0	2,285	22.3	4.6	17.7	-1.3±1.0	2,290
48-59 mo	25.9	6.5	19.40	-1.3±1.2	2,553	6.2	0.6	5.6	0.8	-0.7±0.9	2,546	20.9	3.2	17.7	-1.2±1.0	2,553
Gender																
Male	26.7	7.7	19.0	-1.3±1.3	4,603	7.2	1.0	6.3	1.1	-0.6±1.0	4,605	18.7	3.2	15.5	-1.1±1.0	4,609
Female	26.8	7.2	19.6	-1.3±1.2	4,356	6.1	0.7	5.4	0.5	-0.6±0.9	4,357	19.5	3.6	15.9	-1.2±1.0	4,368
State/Region																
Kachin	24.4	5.1	19.2	-1.2±2.0	220	3.0	0.1	3.0	1.1	-0.4±1.5	219	11.5	1.8	9.7	-0.9±1.6	220
Kayah	28.1	7.3	20.8	-1.3±4.1	47	3.9	1.0	2.8	0.8	-0.3±3.5	47	14.1	2.6	11.5	-1.0±3.6	47
Kayin	34.3	12.9	21.3	-1.5±2.2	255	6.0	1.6	4.3	1.8	-0.5±1.6	255	21.2	6.6	14.6	-1.2±1.8	255
Chin	40.3	12.2	28.2	-1.7±3.6	72	4.1	0.6	3.5	2.0	-0.3±2.8	73	17.2	3.6	13.6	-1.2±3.0	73
Sagaing	23.0	5.9	17.1	-1.2±1.0	909	7.5	1.5	6.0	0.1	-0.7±0.7	904	18.3	2.6	15.6	-1.2±0.8	911
Tanintharyi	24.3	7.0	17.3	-1.2±2.0	231	7.7	1.4	6.3	1.4	-0.7±1.6	232	20.2	3.4	16.8	-1.1±1.7	233
Bago	26.0	5.6	20.4	-1.3±0.9	942	8.5	0.9	7.6	0.2	-0.8±0.7	942	20.8	3.2	17.6	-1.3±0.7	944
Magway	22.4	3.8	18.6	-1.3±0.9	763	6.9	0.1	6.8	0.7	-0.7±0.8	763	18.3	2.2	16.1	-1.2±0.8	763
Mandalay	24.4	4.6	19.7	-1.3±0.8	1,094	6.7	1.1	5.6	1.0	-0.6±0.7	1,096	19.0	2.9	16.2	-1.1±0.7	1,096
Mon	16.4	4.7	11.7	-1.1±1.4	350	6.5	0.6	5.9	1.5	-0.6±1.4	350	15.1	3.0	12.1	-1.0±1.4	350
Rakhine	34.7	14.0	20.7	-1.5±1.8	381	7.0	0.3	6.6	0.7	-0.7±1.2	381	24.2	6.9	17.2	-1.3±1.4	382
Yangon	20.8	5.8	15.0	-1.1±0.8	1,302	7.2	0.2	7.0	0.8	-0.7±0.6	1,300	19.1	2.5	16.6	-1.1±0.7	1,300
Shan	30.1	8.1	22.0	-1.4±1.0	954	2.0	-	2.0	0.5	-0.2±0.7	956	13.4	2.0	11.5	-0.9±0.8	956
Ayeyarwady	37.9	13.8	24.1	-1.6±1.0	1,226	8.5	1.7	6.8	1.1	-0.6±0.8	1,231	23.9	6.0	17.9	-1.3±0.8	1,233
Nay Pyi Taw	24.5	6.7	17.8	-1.3±2.1	212	6.3	1.0	5.2	0.9	-0.7±1.6	213	19.4	3.4	16.0	-1.2±1.7	213
Residence																

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	Height for age ³ (%)					Weight for height (%)					Weight for age (%)					
	Any stunting	Severe stunting	Mode-rate stunting	Mean Z-score (±SD)	Number of children	Any wasting	Severe wasting	Mode-rate wasting	Over-weight	Mean Z-score (±SD)	Number of children	Any under-weight	Severe under-weight	Mode-rate under-weight	Mean Z-score (±SD)	Number of children
Rural	29.0	8.1	20.9	-1.4±1.2	6,484	6.5	0.9	5.6	0.8	-0.6±0.9	6,486	20.0	3.7	16.3	-1.2±1.0	6,498
Urban	20.9	5.7	15.2	-1.1±1.3	2,475	7.1	0.5	6.6	0.8	-0.6±1.1	2,476	16.7	2.5	14.2	-1.1±1.2	2,479
Wealth index																
Least	36.1	11.9	24.2	-1.6±1.2	2,328	6.9	1.1	5.8	0.5	-0.7±0.9	2,331	23.5	4.6	18.9	-1.4±0.9	2,336
Second	29.8	7.7	22.1	-1.4±1.2	2,077	7.2	1.0	6.2	1.0	-0.7±0.9	2,076	22.6	4.2	18.4	-1.2±0.9	2,082
Middle	25.7	6.9	18.9	-1.3±1.2	1,725	7.0	0.9	6.0	0.7	-0.6±1.0	1,729	19.2	3.0	16.2	-1.2±1.0	1,730
Fourth	19.4	3.9	15.5	-1.1±1.3	1,404	6.0	0.5	5.5	0.8	-0.6±1.1	1,400	14.5	2.3	12.1	-1.0±1.1	1,407
Highest	15.5	3.8	11.7	-0.9±1.3	1,425	5.9	0.4	5.5	1.1	-0.5±1.1	1,425	11.2	1.8	9.5	-0.8±1.1	1,423
Household food security status																
Food secure	24.4	6.8	17.6	-1.2±1.2	5,707	6.6	0.8	5.9	0.8	-0.6±0.9	5,706	18.3	3.0	15.2	-1.1±1.0	5,712
Mild insecure	28.7	6.6	22.1	-1.3±1.3	1,113	8.0	1.3	6.8	0.5	-0.6±1.0	1,113	18.9	3.4	15.5	-1.2±1.1	1,117
Mod. insecure	30.1	8.1	22.1	-1.4±1.3	1,479	6.1	0.4	5.8	0.9	-0.6±1.0	1,481	19.6	4.0	15.6	-1.2±1.1	1,483
Severe insecure	36.1	2.8	23.3	-1.6±1.3	660	6.0	1.3	4.7	1.2	-0.7±1.0	662	25.4	5.2	20.2	-1.4±1.0	666
Household dietary diversity																
DDS<6	29.1	8.9	20.2	-1.4±1.3	4,325	7.1	0.8	6.3	0.9	-0.6±1.0	4,329	21.5	4.1	17.5	-1.2±1.1	4,337
DDS>=6	24.5	6.0	18.5	-1.2±1.2	4,634	6.3	0.8	5.4	0.7	-0.6±1.0	4,632	16.8	2.8	14.0	-1.1±1.0	4,640
Total	26.7	7.4	19.3	-1.3±1.2	8,959	6.7	0.8	5.9	0.8	-0.6±1.0	8,961	19.1	3.4	15.7	-1.2±1.0	8,978

1 Values are weighted figures presented in percent unless mentioned otherwise.

2 Any stunting = Height for age Z-score (HAZ) < -2 standard deviation units (SD) from the median of 2006 WHO New Child Growth Standards, Moderate stunting = HAZ between -2SD and -3SD of the median of 2006 WHO New Child Growth Standards, Severe stunting = HAZ < -3SD from the median of 2006 WHO New Child Growth Standards, Any wasting = Weight for height Z-score (WHZ) < -2 standard deviation units (SD) from the median of 2006 WHO New Child Growth Standards, Moderate wasting = WHZ between -2SD and -3SD of the median of 2006 WHO New Child Growth Standards, Severe wasting = WHZ < -3SD from the median of 2006 WHO New Child Growth Standards, Overweight = WHZ > +2SD from the median of 2006 WHO New Child Growth Standards, Any underweight = Weight for age Z-score (WAZ) < -2 standard deviation units (SD) from the median of 2006 WHO New Child Growth Standards, Moderate underweight = WAZ between -2SD and -3SD of the median of 2006 WHO New Child Growth Standards, Severe underweight = WAZ < -3SD from the median of 2006 WHO New Child Growth Standards (WHO 2006).

3 Recumbent length is measured for children under age 2 year; standing height is measured for all other children.

Table 6.2.1.2: Percent distribution of children 6-59 months of age with classification of low height for age by selected background characteristics, N=8,959 (MMFCS 2017-18) ^{1, 2, 3}

Background characteristics	Any stunting			Severe stunting			Moderate stunting			No stunting			Mean HAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Age in months															
6-8 mo	7.7	[4.0-14.6]	13	4.2	[1.6-10.3]	7	3.6	[1.4-9.2]	6	92.3	[85.4-96.0]	155	-0.2	1.4	168
9-11 mo	7.7	[4.4-13.1]	18	2.8	[1.0-8.0]	6	4.9	[2.6-9.1]	11	92.3	[86.9-95.6]	211	-0.5	1.2	229
12-17 mo	19.7	[16.0-24.0]	141	4.8	[3.2-7.2]	34	14.9	[11.8-18.6]	106	80.3	[76.0-84.0]	574	-1.0	1.3	715
18-23 mo	28.0	[23.9-32.6]	214	8.6	[6.5-11.3]	65	19.5	[16.1-23.3]	148	72.0	[67.4-76.1]	549	-1.3	1.3	762
24-35 mo	30.5	[27.9-33.2]	687	8.5	[7.0-10.3]	192	22.0	[19.8-24.2]	495	69.5	[66.8-72.1]	1,567	-1.4	1.2	2,254
36-47 mo	29.0	[26.6-31.6]	661	8.5	[7.1-10.1]	193	20.5	[18.4-22.8]	468	71.0	[68.4-73.4]	1,616	-1.4	1.2	2,278
48-59 mo	25.9	[23.5-28.5]	662	6.5	[5.3-8.0]	166	19.4	[17.5-21.5]	496	74.1	[71.5-76.5]	1,891	-1.3	1.2	2,553
Gender															
Male	26.7	[24.8-28.7]	1,229	7.7	[6.6-8.9]	352	19.0	[17.5-20.6]	876	73.3	[71.3-75.2]	3,374	-1.3	1.3	4,603
Female	26.8	[25.0-28.6]	1,167	7.2	[6.3-8.2]	312	19.6	[18.1-21.2]	854	73.2	[71.4-75.0]	3,189	-1.3	1.2	4,356
State/Region															
Kachin	24.4	[18.3-31.6]	54	5.1	[3.0-8.8]	11	19.2	[14.8-24.7]	42	75.6	[68.4-81.7]	166	-1.2	2.0	220
Kayah	28.1	[22.1-35.0]	13	7.3	[4.2-12.5]	3	20.8	[17.0-25.1]	10	71.9	[65.0-77.9]	34	-1.3	4.1	47
Kayin	34.3	[29.4-39.5]	87	12.9	[10.2-16.2]	33	21.3	[17.9-25.3]	54	65.7	[60.5-70.6]	168	-1.5	2.2	255
Chin	40.3	[33.4-47.6]	29	12.2	[8.6-16.9]	9	28.2	[23.3-33.7]	20	59.7	[52.4-66.6]	43	-1.7	3.6	72
Sagaing	23.0	[19.1-27.4]	209	5.9	[4.1-8.5]	54	17.1	[14.0-20.7]	155	77.0	[72.6-80.9]	699	-1.2	1.0	909
Tanintharyi	24.3	[19.4-29.9]	56	7.0	[4.8-10.1]	16	17.3	[13.8-21.5]	40	75.7	[70.1-80.6]	175	-1.2	2.0	231
Bago	26.0	[22.2-30.2]	245	5.6	[3.9-7.9]	53	20.4	[17.4-23.9]	193	74.0	[69.8-77.8]	697	-1.3	0.9	942
Magway	22.4	[19.0-26.2]	171	3.8	[2.7-5.4]	29	18.6	[15.2-22.5]	142	77.6	[73.8-81.0]	593	-1.3	0.9	763
Mandalay	24.4	[20.7-28.4]	267	4.6	[3.1-6.9]	51	19.7	[16.8-23.0]	216	75.6	[71.6-79.3]	828	-1.3	0.8	1,094
Mon	16.4	[13.2-20.3]	57	4.7	[3.1-7.0]	16	11.7	[9.3-14.7]	41	83.6	[79.7-86.8]	293	-1.1	1.4	350
Rakhine	34.7	[28.4-41.6]	132	14.0	[10.9-17.8]	54	20.7	[16.3-25.8]	79	65.3	[58.4-71.6]	249	-1.5	1.8	381
Yangon	20.8	[17.6-24.6]	271	5.8	[4.1-8.2]	76	15.0	[12.4-18.1]	195	79.2	[75.4-82.4]	1,031	-1.1	0.8	1,302
Shan	30.1	[23.7-37.3]	287	8.1	[5.0-12.9]	77	22.0	[18.0-26.5]	210	69.9	[62.7-76.3]	667	-1.4	1.0	954
Ayeyarwady	37.9	[33.3-42.7]	465	13.8	[10.5-17.8]	169	24.1	[21.2-27.4]	296	62.1	[57.3-66.7]	761	-1.6	1.0	1,226
Nay Pyi Taw	24.5	[20.5-29.0]	52	6.7	[4.9-9.2]	14	17.8	[14.8-21.2]	38	75.5	[71.0-79.5]	160	-1.3	2.1	212

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	Any stunting			Severe stunting			Moderate stunting			No stunting			Mean HAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Rural	29.0	[27.2-30.8]	1,879	8.1	[7.1-9.2]	525	20.9	[19.6-22.2]	1354	71.0	[69.2-72.8]	4,605	-1.4	1.2	6,484
Urban	20.9	[18.8-23.1]	517	5.7	[4.4-7.2]	140	15.2	[13.6-17.0]	377	79.1	[76.9-81.2]	1,958	-1.1	1.3	2,475
Wealth index															
Least	36.1	[33.1-39.2]	839	11.9	[10.0-14.2]	277	24.2	[21.9-26.5]	562	63.9	[60.8-66.9]	1,488	-1.6	1.2	2,328
Second	29.8	[27.0-32.8]	620	7.7	[6.3-9.4]	160	22.1	[19.8-24.7]	460	70.2	[67.2-73.0]	1,458	-1.4	1.2	2,077
Middle	25.7	[23.1-28.5]	443	6.9	[5.4-8.6]	118	18.9	[16.7-21.2]	325	74.3	[71.5-76.9]	1,281	-1.3	1.2	1,725
Fourth	19.4	[17.1-22.0]	272	3.9	[2.9-5.4]	55	15.5	[13.3-17.9]	217	80.6	[78.0-82.9]	1,132	-1.1	1.3	1,404
Highest	15.5	[13.2-18.1]	221	3.8	[2.6-5.5]	54	11.7	[9.9-13.8]	167	84.5	[81.9-86.8]	1,204	-0.9	1.3	1,425
Household food security status															
Food secure	24.4	[22.8-26.1]	1,392	6.8	[5.8-7.9]	388	17.6	[16.3-19.0]	1,005	75.6	[73.9-77.2]	4,314	-1.2	1.2	5,707
Mildly insecure	28.7	[25.6-31.9]	319	6.6	[5.1-8.4]	73	22.1	[19.3-25.2]	246	71.3	[68.1-74.4]	794	-1.3	1.3	1,113
Mod. insecure	30.1	[27.4-33.1]	446	8.1	[6.6-9.9]	120	22.1	[19.6-24.7]	326	69.9	[66.9-72.6]	1,033	-1.4	1.3	1,479
Severe insecure	36.1	[31.3-41.2]	238	12.8	[9.6-16.8]	84	23.3	[19.5-27.6]	154	63.9	[58.8-68.7]	422	-1.6	1.3	660
Household Dietary Diversity															
DDS<6	29.1	[27.1-31.1]	1,258	8.9	[7.7-10.3]	386	20.2	[18.8-21.6]	872	70.9	[68.9-72.9]	3,067	-1.4	1.3	4,325
DDS>=6	24.5	[22.8-26.4]	1,138	6.0	[5.1-7.0]	279	18.5	[17.1-20.0]	859	75.5	[73.6-77.2]	3,497	-1.2	1.2	4,634
Total	26.7	[25.3-28.2]	2,395	7.4	[6.6-8.3]	665	19.3	[18.3-20.4]	1,731	73.3	[71.8-74.7]	6,563	-1.3	1.2	8,959

1 Values are weighted figures expressed in percent, 95% Confidence Interval unless mentioned otherwise.

2 Any stunting = Height for age Z-score (HAZ) < -2 standard deviation units (SD) from the median of 2006 WHO New Child Growth Standards,

Moderate stunting = HAZ between -2SD and -3SD of the median of 2006 WHO New Child Growth Standards,

Severe stunting = HAZ < -3SD from the median of 2006 WHO New Child Growth Standards (WHO 2006).

3 Recumbent length is measured for children under age 2 year; standing height is measured for all other children.

Table 6.2.1.3: Percent distribution of children 6-59 months of age classified by weight for height by selected background characteristics, N=8,961 (MMFCS 2017-18)^{1,2}

Background characteristics	Any wasting			Severe wasting			Moderate wasting			No wasting			Overweight			Mean HAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Age in months																		
6-8 mo	6.4	[3.2-12.5]	11	0.2	[0.0-1.7]	0	6.2	[3.0-12.3]	11	93.6	[87.5-96.8]	159	1.4	[0.4-4.9]	2	-0.2	1.2	170
9-11 mo	6.9	[3.9-12.2]	16	0.5	[0.1-1.9]	1	6.5	[3.5-11.7]	15	93.1	[87.8-96.1]	214	3.9	[1.6-9.3]	9	-0.3	1.2	230
12-17 mo	5.1	[3.4-7.4]	36	1.4	[0.6-3.1]	10	3.7	[2.3-5.8]	26	94.9	[92.6-96.6]	678	1.1	[0.4-2.6]	8	-0.5	1.0	714
18-23 mo	7.8	[5.7-10.7]	60	1.5	[0.7-3.1]	11	6.4	[4.5-8.9]	48	92.2	[89.3-94.3]	701	0.4	[0.1-1.3]	3	-0.6	1.0	761
24-35 mo	7.5	[6.3-9.0]	170	0.9	[0.5-1.5]	20	6.7	[5.4-8.1]	150	92.5	[91.0-93.7]	2,086	0.5	[0.2-0.9]	10	-0.6	1.0	2,256
36-47 mo	6.5	[5.3-7.9]	148	0.7	[0.3-1.3]	15	5.8	[4.7-7.2]	133	93.5	[92.1-94.7]	2,136	0.8	[0.5-1.4]	19	-0.6	1.0	2,285
48-59 mo	6.2	[5.1-7.5]	158	0.6	[0.3-1.2]	15	5.6	[4.6-6.8]	142	93.8	[92.5-94.9]	2,388	0.8	[0.4-1.4]	20	-0.7	0.9	2,546
Gender																		
Male	7.2	[6.3-8.4]	334	1.0	[0.7-1.4]	44	6.3	[5.4-7.3]	290	92.8	[91.6-93.7]	4,271	1.1	[0.8-1.5]	49	-0.6	1.0	4,605
Female	6.1	[5.2-7.1]	265	0.7	[0.4-1.1]	29	5.4	[4.6-6.4]	236	93.9	[92.9-94.8]	4,092	0.5	[0.3-0.8]	22	-0.6	0.9	4,357
State/Region																		
Kachin	3.0	[1.8-5.1]	7	0.1	[0.0-0.7]	0	3.0	[1.7-5.0]	6	97.0	[94.9-98.2]	212	1.1	[0.5-2.4]	2	-0.4	1.5	219
Kayah	3.9	[2.3-6.4]	2	1.0	[0.5-2.2]	0	2.8	[1.7-4.7]	1	96.1	[93.6-97.7]	45	0.8	[0.4-2.0]	0	-0.3	3.5	47
Kayin	6.0	[4.2-8.4]	15	1.6	[0.8-3.1]	4	4.3	[2.8-6.7]	11	94.0	[91.6-95.8]	239	1.8	[0.9-3.7]	5	-0.5	1.6	255
Chin	4.1	[2.6-6.6]	3	0.6	[0.2-1.8]	0	3.5	[2.1-5.8]	3	95.9	[93.4-97.4]	70	2.0	[1.2-3.3]	1	-0.3	2.8	73
Sagaing	7.5	[5.2-10.6]	68	1.5	[0.8-2.8]	13	6.0	[3.9-9.1]	54	92.5	[89.4-94.8]	836	0.1	[0.0-1.0]	1	-0.7	0.7	904
Tanintharyi	7.7	[5.6-10.6]	18	1.4	[0.7-2.9]	3	6.3	[4.5-8.7]	15	92.3	[89.4-94.4]	214	1.4	[0.6-2.9]	3	-0.7	1.6	232
Bago	8.5	[5.9-12.2]	80	0.9	[0.3-2.5]	9	7.6	[5.4-10.5]	71	91.5	[87.8-94.1]	862	0.2	[0.0-1.3]	2	-0.8	0.7	942
Magway	6.9	[4.9-9.8]	53	0.1	[0.0-0.8]	1	6.8	[4.8-9.6]	52	93.1	[90.2-95.1]	710	0.7	[0.2-2.3]	6	-0.7	0.8	763
Mandalay	6.7	[5.0-9.0]	74	1.1	[0.6-2.3]	13	5.6	[4.0-7.7]	61	93.3	[91.0-95.0]	1,022	1.0	[0.5-2.1]	11	-0.6	0.7	1,096
Mon	6.5	[4.6-9.1]	23	0.6	[0.2-1.7]	2	5.9	[4.1-8.4]	21	93.5	[90.9-95.4]	327	1.5	[0.7-3.1]	5	-0.6	1.4	350
Rakhine	7.0	[5.1-9.4]	26	0.3	[0.1-1.3]	1	6.6	[4.9-8.9]	25	93.0	[90.6-94.9]	354	0.7	[0.2-2.2]	3	-0.7	1.2	381
Yangon	7.2	[5.4-9.5]	94	0.2	[0.0-1.2]	2	7.0	[5.2-9.4]	91	92.8	[90.5-94.6]	1,207	0.8	[0.4-1.9]	11	-0.7	0.6	1,300
Shan	2.0	[1.2-3.3]	19	0	0	0	2.0	[1.2-3.3]	19	98.0	[96.7-98.8]	937	0.5	[0.2-1.6]	5	-0.2	0.7	956
Ayeyarwady	8.5	[6.3-11.3]	105	1.7	[0.9-3.3]	21	6.8	[4.9-9.3]	84	91.5	[88.7-93.7]	1,127	1.1	[0.5-2.4]	14	-0.6	0.8	1,231
Nay Pyi Taw	6.3	[4.7-8.3]	13	1.0	[0.4-2.5]	2	5.2	[3.9-7.0]	11	93.7	[91.7-95.3]	199	0.9	[0.4-1.8]	2	-0.7	1.6	213

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	Any wasting			Severe wasting			Moderate wasting			No wasting			Overweight			Mean HAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Residence																		
Rural	6.5	[5.7-7.4]	422	0.9	[0.7-1.3]	60	5.6	[4.9-6.4]	362	93.5	[92.6-94.3]	6,064	0.8	[0.6-1.1]	53	-0.6	0.9	6,486
Urban	7.1	[5.9-8.6]	177	0.5	[0.3-1.0]	13	6.6	[5.4-8.0]	163	92.9	[91.4-94.1]	2,299	0.8	[0.4-1.3]	19	-0.6	1.1	2,476
Wealth index																		
Least	6.9	[5.6-8.5]	161	1.1	[0.6-1.8]	25	5.8	[4.6-7.3]	136	93.1	[91.5-94.4]	2,171	0.5	[0.2-1.1]	12	-0.7	0.9	2,331
Second	7.2	[5.9-8.8]	149	1.0	[0.5-1.8]	21	6.2	[5.0-7.7]	129	92.8	[91.2-94.1]	1,927	1.0	[0.6-1.8]	22	-0.7	0.9	2,076
Middle	7.0	[5.5-8.7]	120	0.9	[0.5-1.7]	16	6.0	[4.8-7.7]	105	93.0	[91.3-94.5]	1,609	0.7	[0.4-1.2]	11	-0.6	1.0	1,729
Fourth	6.0	[4.5-7.9]	84	0.5	[0.2-1.2]	7	5.5	[4.1-7.4]	77	94.0	[92.1-95.5]	1,316	0.8	[0.4-1.6]	12	-0.6	1.1	1,400
Highest	5.9	[4.6-7.5]	84	0.4	[0.2-0.9]	5	5.5	[4.3-7.2]	79	94.1	[92.5-95.4]	1,340	1.1	[0.6-1.9]	15	-0.5	1.1	1,425
Household food security status																		
Food secure	6.6	[5.8-7.6]	378	0.8	[0.5-1.1]	44	5.9	[5.1-6.7]	334	93.4	[92.4-94.2]	5,327	0.8	[0.5-1.1]	44	-0.6	0.9	5,706
Mildly insecure	8.0	[6.2-10.4]	89	1.3	[0.7-2.4]	14	6.8	[5.1-9.0]	75	92.0	[89.6-93.8]	1,024	0.5	[0.2-1.3]	6	-0.6	1.0	1,113
Mod. insecure	6.1	[4.8-7.9]	91	0.4	[0.2-0.8]	5	5.8	[4.5-7.4]	85	93.9	[92.1-95.2]	1,390	0.9	[0.5-1.7]	13	-0.6	1.0	1,481
Severe insecure	6.0	[4.2-8.7]	40	1.3	[0.6-3.0]	9	4.7	[3.1-7.1]	31	94.0	[91.3-95.8]	622	1.2	[0.5-3.1]	8	-0.7	1.0	662
Household Dietary Diversity																		
DDS<6	7.1	[6.2-8.1]	307	0.8	[0.5-1.2]	34	6.3	[5.5-7.3]	273	92.9	[91.9-93.8]	4,022	0.9	[0.6-1.4]	40	-0.6	1.0	4,329
DDS>=6	6.3	[5.3-7.4]	291	0.8	[0.6-1.3]	39	5.4	[4.6-6.4]	252	93.7	[92.6-94.7]	4,341	0.7	[0.5-1.0]	32	-0.6	1.0	4,632
Total	6.7	[6.0-7.4]	599	0.8	[0.6-1.1]	73	5.9	[5.2-6.6]	526	93.3	[92.6-94.0]	8,363	0.8	[0.6-1.1]	72	-0.6	1.0	8,961

1 Values are weighted figures expressed in percent, 95% Confidence Interval unless mentioned otherwise.

2 Any wasting = Weight for height Z-score (WHZ) < -2 standard deviation units (SD) from the median of 2006 WHO New Child Growth Standards (2006).

Moderate wasting = WHZ between -2SD and -3SD of the median of 2006 WHO New Child Growth Standards,

Severe wasting = WHZ < -3SD from the median of 2006 WHO New Child Growth Standards (WHO 2006).

Overweight = WHZ > +2SD from the median of 2006 WHO New Child Growth Standards.

Table 6.2.1.4: Percent distribution of children 6-59 months of age with classification of low weight for age by selected background characteristics, N=8,978 (MMFCS 2017-18) ^{1,2}

Background characteristics	Any underweight			Severe underweight			Moderate underweight			No underweight			Mean HAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Age in months															
6-8 mo	4.8	[2.4-9.4]	8	0.6	[0.2-2.6]	1	4.1	[1.9-8.8]	7	95.2	[90.6-97.6]	160	-0.4	1.2	168
9-11 mo	9.5	[5.7-15.5]	22	0.4	[0.1-2.7]	1	9.1	[5.4-14.9]	21	90.5	[84.5-94.3]	208	-0.6	1.1	230
12-17 mo	9.9	[7.3-13.1]	71	1.4	[0.6-3.0]	10	8.5	[6.1-11.7]	61	90.1	[86.9-92.7]	645	-0.8	1.0	715
18-23 mo	16.8	[13.8-20.4]	129	3.0	[1.8-5.1]	23	13.8	[11.1-17.0]	105	83.2	[79.6-86.2]	636	-1.1	0.9	764
24-35 mo	19.5	[17.4-21.8]	440	3.7	[2.9-4.7]	83	15.8	[14.0-17.9]	357	80.5	[78.2-82.6]	1,818	-1.2	1.0	2,258
36-47 mo	22.3	[20.2-24.6]	511	4.6	[3.6-5.8]	105	17.7	[15.9-19.8]	406	77.7	[75.4-79.8]	1,779	-1.3	1.0	2,290
48-59 mo	20.9	[18.9-23.1]	534	3.2	[2.4-4.2]	81	17.7	[15.9-19.7]	452	79.1	[76.9-81.1]	2,019	-1.2	1.0	2,553
Gender															
Male	18.7	[17.1-20.4]	861	3.2	[2.5-4.0]	146	15.5	[14.2-16.9]	715	81.3	[79.6-82.9]	3,749	-1.1	1.0	4,609
Female	19.5	[18.0-21.1]	853	3.6	[3.0-4.4]	159	15.9	[14.6-17.3]	694	80.5	[78.9-82.0]	3,515	-1.2	1.0	4,368
State/Region															
Kachin	11.5	[8.5-15.4]	25	1.8	[0.9-3.6]	4	9.7	[6.9-13.3]	21	88.5	[84.6-91.5]	195	-0.9	1.6	220
Kayah	14.1	[10.2-19.3]	7	2.6	[1.3-5.1]	1	11.5	[8.5-15.4]	5	85.9	[80.7-89.8]	40	-1.0	3.6	47
Kayin	21.2	[17.2-25.9]	54	6.6	[4.9-8.7]	17	14.6	[11.5-18.4]	37	78.8	[74.1-82.8]	201	-1.2	1.8	255
Chin	17.2	[13.3-22.1]	13	3.6	[2.4-5.4]	3	13.6	[9.9-18.4]	10	82.8	[77.9-86.7]	61	-1.2	3.0	73
Sagaing	18.3	[15.3-21.7]	167	2.6	[1.5-4.6]	24	15.6	[12.8-19.0]	143	81.7	[78.3-84.7]	745	-1.2	0.8	911
Tanintharyi	20.2	[16.9-24.0]	47	3.4	[2.2-5.0]	8	16.8	[14.0-20.1]	39	79.8	[76.0-83.1]	186	-1.1	1.7	233
Bago	20.8	[17.2-24.9]	196	3.2	[1.7-6.0]	30	17.6	[14.4-21.3]	166	79.2	[75.1-82.8]	748	-1.3	0.7	944
Magway	18.3	[14.4-23.0]	140	2.2	[1.2-3.8]	16	16.1	[12.4-20.7]	123	81.7	[77.0-85.6]	624	-1.2	0.8	763
Mandalay	19.0	[15.2-23.5]	209	2.9	[1.6-5.2]	32	16.2	[13.3-19.5]	177	81.0	[76.5-84.8]	887	-1.1	0.7	1,096
Mon	15.1	[12.4-18.3]	53	3.0	[1.8-4.9]	10	12.1	[9.9-14.8]	43	84.9	[81.7-87.6]	297	-1.0	1.4	350
Rakhine	24.2	[20.0-28.9]	92	6.9	[4.8-9.9]	26	17.2	[13.9-21.1]	66	75.8	[71.1-80.0]	290	-1.3	1.4	382
Yangon	19.1	[15.9-22.7]	248	2.5	[1.6-3.9]	33	16.6	[13.8-19.8]	215	80.9	[77.3-84.1]	1,052	-1.1	0.7	1,300
Shan	13.4	[10.6-16.8]	128	2.0	[1.1-3.5]	19	11.5	[9.2-14.2]	110	86.6	[83.2-89.4]	828	-0.9	0.8	956
Ayeyarwady	23.9	[20.1-28.1]	295	6.0	[4.1-8.8]	74	17.9	[15.3-20.8]	220	76.1	[71.9-79.9]	939	-1.3	0.8	1,233
Nay Pyi Taw	19.4	[16.1-23.3]	41	3.4	[2.2-5.1]	7	16.0	[13.2-19.3]	34	80.6	[76.7-83.9]	172	-1.2	1.7	213

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	Any underweight			Severe underweight			Moderate underweight			No underweight			Mean HAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Residence															
Rural	20.0	[18.6-21.5]	1299	3.7	[3.1-4.5]	241	16.3	[15.1-17.5]	1,058	80.0	[78.5-81.4]	5,199	-1.2	1.0	6,498
Urban	16.7	[14.8-18.9]	415	2.5	[1.9-3.4]	63	14.2	[12.6-16.0]	352	83.3	[81.1-85.2]	2,064	-1.1	1.2	2,479
Wealth index															
Least	23.5	[21.2-25.9]	548	4.6	[3.6-5.8]	107	18.9	[17.0-21.0]	442	76.5	[74.1-78.8]	1,788	-1.4	0.9	2,336
Second	22.6	[20.1-25.3]	470	4.2	[3.2-5.5]	88	18.4	[16.3-20.7]	383	77.4	[74.7-79.9]	1,611	-1.2	0.9	2,082
Middle	19.2	[17.0-21.6]	332	3.0	[2.2-4.1]	53	16.2	[14.1-18.5]	280	80.8	[78.4-83.0]	1,398	-1.2	1.0	1,730
Fourth	14.5	[12.5-16.7]	203	2.3	[1.5-3.5]	32	12.1	[10.4-14.2]	171	85.5	[83.3-87.5]	1,203	-1.0	1.1	1,407
Highest	11.2	[9.0-13.9]	160	1.8	[1.1-2.8]	25	9.5	[7.6-11.8]	135	88.8	[86.1-91.0]	1,264	-0.8	1.1	1,423
Household food security status															
Food secure	18.3	[16.8-19.8]	1044	3.0	[2.5-3.7]	173	15.2	[14.1-16.5]	871	81.7	[80.2-83.2]	4,668	-1.1	1.0	5,712
Mildly insecure	18.9	[16.3-21.8]	211	3.4	[2.3-4.9]	38	15.5	[13.2-18.2]	174	81.1	[78.2-83.7]	906	-1.2	1.1	1,117
Mod. insecure	19.6	[17.2-22.1]	290	4.0	[3.0-5.3]	59	15.6	[13.4-17.9]	231	80.4	[77.9-82.8]	1,193	-1.2	1.1	1,483
Severe insecure	25.4	[21.2-30.1]	169	5.2	[3.5-7.5]	34	20.2	[16.6-24.5]	135	74.6	[69.9-78.8]	496	-1.4	1.0	666
Household Dietary Diversity															
DDS<6	21.5	[19.9-23.3]	935	4.1	[3.4-4.8]	176	17.5	[16.1-19.0]	759	78.5	[76.7-80.1]	3,403	-1.2	1.1	4,337
DDS>=6	16.8	[15.3-18.4]	780	2.8	[2.2-3.6]	129	14.0	[12.8-15.4]	651	83.2	[81.6-84.7]	3,861	-1.1	1.0	4,640
Total	19.1	[17.9-20.3]	1714	3.4	[2.9-4.0]	304	15.7	[14.7-16.7]	1,410	80.9	[79.7-82.1]	7,264	-1.2	1.0	8,978

1 Values are weighted figures expressed in percent, 95% Confidence Interval unless mentioned otherwise.

2 Any underweight = Weight for age Z-score (WAZ) < -2 standard deviation units (SD) from the median of 2006 WHO New Child Growth Standards,

Moderate underweight = WAZ between -2SD and -3SD of the median of 2006 WHO New Child Growth Standards,

Severe underweight = WAZ < -3SD from the median of 2006 WHO New Child Growth Standards (WHO 2006).

6.2.2. Nutritional status of 5-9 year children

Highlight: One in five children (22%) 5-9 years of age was stunted (short for their age), 14.6% were thin for their height, and 0.9% were overweight (heavy for their height).

Among primary school age children, 22.1% were stunted (short for their age) while 17.9% were moderately stunted and 4.2% were severely stunted (**Table 6.2.2.1**); 14.6% of these children were thin (i.e., thin for their height), 12.7% had moderately thin, 2% had severely thin, and 3.3% were overweight (heavy for their height) (**Table 6.2.2.2**).

Boys and girls had similar rate of stunting however, boys had a higher rate of thinness than girls. A higher rate of stunting among primary school age children was found among those from households with a lower level of wealth status and with a more severe level of household food insecurity (**Table 6.2.2.1**).

Stunting among primary school age children was also found to be highest in Chin state (36.6%) followed by Kayin state (33.9%), Rakhine state (29.3%) and Ayeyarwady region (28.3%) (**Table 6.2.2.1, Figure 6.2.2.1**). Bago, Ayeyarwady, Yangon, Magway, Tanintharyi regions, Rakhine and Mon states had higher rate of thinness among primary school age children than the national level (**Table 6.2.2.2**). Together these results indicate that in Chin, Rakhine and Kayin states and Ayeyarwady and Tanintharyi regions children under 10 years of age were suffering from both acute and chronic undernutrition, emphasizing the need to enhance the nutrition interventions in those areas.

Figure 6.2.2.1: Percent of stunting among children age 5-9 years by state/region

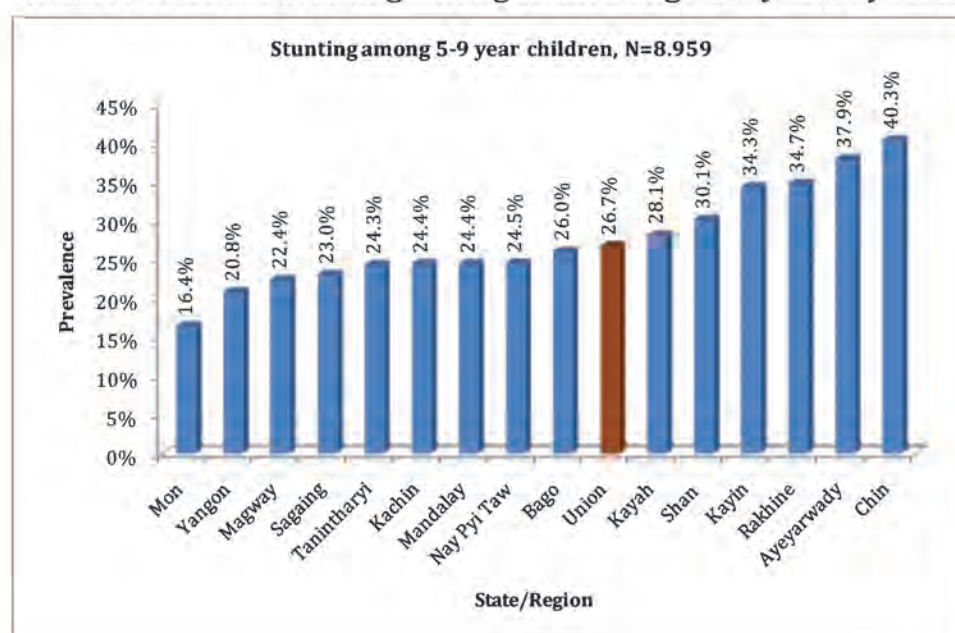


Table 6.2.2.1: Percent distribution of 5-9 year old children with classification of low height for age by selected background characteristics, N=9,000 (MMFCS 2017-18) ^{1, 2}

Background characteristics	Any stunting			Severe stunting			Moderate stunting			No stunting			Mean HAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Gender															
Male	22.7	[21.0-24.6]	1,027	4.4	[3.7-5.2]	198	18.4	[16.8-20.1]	829	77.3	[75.4-79.0]	3,487	-1.2	1.1	4,513
Female	21.5	[19.7-23.4]	965	4.1	[3.3-4.9]	183	17.4	[15.9-19.1]	782	78.5	[76.6-80.3]	3,522	-1.2	1.1	4,486
State/Region															
Kachin	18.7	[14.9-23.1]	41	1.8	[0.9-3.3]	4	16.9	[13.0-21.7]	37	81.3	[76.9-85.1]	178	-1.1	1.7	219
Kayah	24.8	[18.3-32.7]	12	6.1	[2.6-13.3]	3	18.8	[15.3-22.9]	9	75.2	[67.3-81.7]	36	-1.4	3.6	48
Kayin	33.9	[27.8-40.6]	87	9.2	[6.4-13.1]	24	24.7	[20.1-30.0]	64	66.1	[59.4-72.2]	170	-1.5	1.7	258
Chin	36.6	[31.0-42.6]	27	8.5	[6.4-11.2]	6	28.1	[23.4-33.4]	21	63.4	[57.4-69.0]	47	-1.6	3.4	74
Sagaing	17.0	[13.5-21.1]	155	3.7	[2.4-5.9]	34	13.2	[10.6-16.5]	121	83.0	[78.9-86.5]	756	-1.1	0.8	910
Tanintharyi	25.8	[20.0-32.6]	60	6.0	[3.5-9.9]	14	19.8	[15.9-24.4]	46	74.2	[67.4-80.0]	173	-1.4	1.7	233
Bago	22.7	[18.4-27.7]	216	4.2	[2.8-6.3]	40	18.5	[14.8-22.7]	176	77.3	[72.3-81.6]	736	-1.3	0.8	952
Magway	18.5	[15.5-22.1]	143	3.6	[2.5-5.2]	28	14.9	[12.4-17.9]	115	81.5	[77.9-84.5]	626	-1.2	0.9	769
Mandalay	21.0	[17.2-25.4]	231	2.8	[1.8-4.3]	31	18.1	[14.5-22.5]	200	79.0	[74.6-82.8]	871	-1.1	0.8	1,102
Mon	17.4	[14.2-21.0]	61	2.5	[1.5-4.2]	9	14.9	[12.4-17.9]	52	82.6	[79.0-85.8]	289	-1.1	1.3	350
Rakhine	29.3	[24.6-34.5]	111	6.9	[4.9-9.7]	26	22.4	[18.5-26.9]	85	70.7	[65.5-75.4]	267	-1.4	1.4	378
Yangon	16.2	[12.7-20.4]	213	2.0	[1.0-4.1]	26	14.2	[11.1-17.9]	187	83.8	[79.6-87.3]	1,105	-1.0	0.7	1,318
Shan	25.6	[19.7-32.6]	243	5.5	[3.2-9.5]	53	20.1	[15.7-25.3]	191	74.4	[67.4-80.3]	705	-1.3	0.9	948
Ayeyarwady	28.3	[23.9-33.2]	349	6.1	[4.4-8.5]	75	22.2	[17.9-27.2]	274	71.7	[66.8-76.1]	883	-1.3	0.8	1,232
Nay Pyi Taw	20.9	[17.3-25.0]	44	3.7	[2.3-6.0]	8	17.1	[14.3-20.4]	36	79.1	[75.0-82.7]	166	-1.1	1.9	209
Residence															
Rural	24.1	[22.4-26.0]	1,566	4.7	[4.0-5.5]	303	19.5	[17.9-21.1]	1,264	75.9	[74.0-77.6]	4,928	-1.3	1.0	6,494
Urban	17.0	[15.1-19.0]	425	3.1	[2.4-4.1]	78.0	13.9	[12.2-15.7]	347	83.0	[81.0-84.9]	2,080	-1.0	1.2	2,506
Wealth index															
Least	32.3	[29.3-35.5]	727	7.5	[6.1-9.2]	168	24.8	[22.2-27.7]	558	67.7	[64.5-70.7]	1,523	-1.5	1.0	2,250
Second	24.1	[21.6-26.7]	507	5.0	[3.8-6.6]	106	19.1	[16.9-21.4]	401	75.9	[73.3-78.4]	1,598	-1.3	1.0	2,105
Middle	19.4	[17.1-21.9]	349	2.5	[1.8-3.4]	45	16.9	[14.8-19.3]	304	80.6	[78.1-82.9]	1,450	-1.1	1.0	1,799
Fourth	15.6	[13.2-18.4]	224	2.2	[1.3-3.5]	31	13.5	[11.2-16.0]	193	84.4	[81.6-86.8]	1,210	-1.0	1.1	1,434
Highest	13.1	[11.3-15.2]	185	2.2	[1.4-3.4]	30	11	[9.3-12.8]	155	86.9	[84.8-88.7]	1,227	-0.8	1.2	1,412

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	Any stunting			Severe stunting			Moderate stunting			No stunting			Mean HAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Household food security status															
Food secure	19.9	[18.3-21.6]	1,137	3.1	[2.5-3.8]	179	16.8	[15.3-18.3]	958	80.1	[78.4-81.7]	4,578	-1.1	1.0	5,715
Mildly insecure	24.8	[21.3-28.8]	269	6.2	[4.6-8.4]	67	18.6	[15.6-22.0]	202	75.2	[71.2-78.7]	814	-1.3	1.1	1,083
Mod. insecure	25.4	[22.5-28.6]	395	6.2	[4.8-7.9]	96	19.2	[16.9-21.8]	299	74.6	[71.4-77.5]	1,159	-1.4	1.2	1,554
Severe insecure	29.4	[24.9-34.4]	191	5.9	[4.1-8.3]	38	23.6	[19.7-27.9]	153	70.6	[65.6-75.1]	457	-1.4	1.1	648
Household Dietary Diversity															
DDS<6	5.0	[23.0-27.1]	1,099	5.1	[4.3-6.1]	225	19.9	[18.3-21.6]	874	75.0	[72.9-77.0]	3,298	-1.3	1.1	4,398
DDS>=6	19.4	[17.7-21.2]	892	3.4	[2.7-4.1]	155	16.0	[14.3-17.8]	737	80.6	[78.8-82.3]	3,710	-1.1	1.0	4,602
Total	22.1	[20.7-23.6]	1,991	4.2	[3.7-4.9]	380	17.9	[16.7-19.2]	1,611	77.9	[76.4-79.3]	7,008	-1.2	1.1	9,000

1 Values are weighted figures expressed in percent, 95% Confidence Interval unless mentioned otherwise.

2 Any stunting = Height for age Z-score (HAZ) < -2 standard deviation units (SD) from the median of 2007 WHO Growth Reference Standard,

Moderate stunting = HAZ between -2SD and -3SD of the median of 2007 WHO Growth Reference Standard,

Severe stunting = HAZ < -3SD from the median of 2007 WHO Growth Reference Standard (WHO 2008).

Tabl6.2.2.2: Percent distribution of 5-9 year old children with classification of low body-mass-index (BMI) for age by selected background characteristics, N=8,985 (MMFCS 2017-18) ^{1, 2}

Background characteristics	Any thinness			Severe thinness			Moderate thinness			Normal BMI for age			Overweight			Mean BAZ	(SD)	Total number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Gender																		
Male	15.7	[14.3-17.3]	708	2.1	[1.7-2.7]	95	13.6	[12.3-15.1]	613	83.3	[81.8-84.8]	3,753	3.3	[2.7-4.1]	151	-1.0	1.0	4,504
Female	13.6	[12.2-15.0]	608	1.8	[1.4-2.4]	80	11.8	[10.5-13.1]	527	85.6	[84.1-86.9]	3,834	3.2	[2.6-3.9]	144	-1.0	1.0	4,481
State/Region																		
Kachin	5.0	[3.2-7.9]	11	0.7	[0.3-2.0]	2	4.3	[2.6-7.0]	9	93.5	[90.5-95.6]	204	4.9	[3.4-7.1]	11	-0.6	1.6	218
Kayah	6.5	[4.4-9.4]	3	0.8	[0.4-1.9]	0	5.6	[3.9-8.1]	3	92.4	[89.2-94.7]	44	3.9	[2.6-5.7]	2	-0.6	3.5	47
Kayin	6.7	[4.7-9.6]	17	0.8	[0.4-1.8]	2	5.9	[4.0-8.7]	15	92.1	[89.0-94.4]	236	4.4	[3.2-6.2]	11	-0.7	1.5	256
Chin	5.2	[3.3-8.4]	4	1.1	[0.4-3.2]	1	4.1	[2.6-6.4]	3	94.2	[90.8-96.4]	68	2.2	[1.4-3.6]	2	-0.7	2.4	73
Sagaing	14.0	[10.9-18.0]	128	0.9	[0.4-2.2]	9	13.1	[10.1-16.9]	119	85.3	[81.4-88.6]	777	3.4	[1.9-5.9]	31	-1.0	0.8	910
Tanintharyi	15.3	[12.6-18.4]	36	2.1	[1.3-3.4]	5	13.1	[10.9-15.7]	31	83.9	[80.7-86.6]	195	2.6	[1.4-4.6]	6	-1.1	1.6	233
Bago	19.1	[15.6-23.3]	183	2.3	[1.5-3.7]	22	16.8	[13.7-20.4]	160	80.2	[75.9-83.9]	766	2.9	[1.8-4.6]	28	-1.2	0.8	955
Magway	17.7	[14.1-22.0]	136	3.1	[1.9-5.0]	24	14.6	[11.9-17.9]	112	82.1	[77.8-85.7]	630	1.8	[1.0-3.3]	14	-1.2	0.8	767
Mandalay	12.6	[9.7-16.2]	139	2.1	[1.1-3.7]	23	10.6	[7.9-14.0]	116	87.0	[83.3-90.1]	955	2.2	[1.3-3.7]	24	-1.0	0.7	1,097
Mon	15.3	[11.4-20.2]	53	3.0	[1.2-7.2]	11	12.3	[9.8-15.4]	43	82.8	[77.4-87.1]	289	3.2	[1.9-5.4]	11	-1.0	1.4	349
Rakhine	18.6	[15.3-22.3]	70	2.7	[1.6-4.4]	10	15.9	[13.0-19.3]	60	80.6	[76.9-83.9]	303	1.7	[0.9-3.0]	6	-1.2	1.2	376
Yangon	18.1	[15.7-20.7]	238	2.5	[1.4-4.4]	33	15.6	[13.3-18.1]	204	80.1	[77.4-82.5]	1,052	5.7	[3.9-8.3]	75	-1.0	0.8	1,314
Shan	4.5	[3.0-6.8]	43	0.4	[0.1-1.4]	3	4.2	[2.7-6.4]	40	94.7	[92.5-96.3]	901	4.5	[3.1-6.6]	43	-0.5	0.7	952
Ayeyarwady	18.8	[15.4-22.7]	231	2.3	[1.3-3.9]	28	16.5	[13.3-20.2]	203	80.2	[76.1-83.8]	985	1.9	[0.9-4.0]	24	-1.2	0.7	1,228
Nay Pyi Taw	12.3	[9.6-15.5]	26	1.5	[0.7-3.1]	3	10.7	[8.2-13.9]	22	87.1	[83.8-89.7]	182	3.5	[2.2-5.5]	7	-1.0	1.7	209
Residence																		
Rural	14.7	[13.5-16.1]	957	1.8	[1.4-2.2]	115	13.0	[11.8-14.2]	842	84.7	[83.3-86.0]	5,496	2.3	[1.9-2.8]	150	-1.0	0.9	6,488
Urban	14.4	[12.7-16.2]	359	2.4	[1.7-3.4]	61	11.9	[10.4-13.6]	298	83.8	[81.9-85.5]	2,091	5.8	[4.6-7.3]	145	-0.9	1.3	2,496
Wealth index																		
Least	15.7	[13.5-18.1]	353	1.8	[1.2-2.8]	41	13.8	[11.9-16.0]	311	83.9	[81.4-86.0]	1,889	1.7	[1.2-2.4]	38	-1.1	0.9	2,252
Second	15.6	[13.7-17.8]	329	2.0	[1.3-3.0]	42	13.6	[11.7-15.7]	287	84.0	[81.7-86.0]	1,769	1.3	[0.8-2.2]	28	-1.1	0.9	2,107
Middle	15.3	[13.1-17.7]	274	2.1	[1.4-3.3]	38	13.1	[11.2-15.3]	235	84.2	[81.8-86.3]	1,510	2.9	[2.1-4.0]	52	-1.0	1.0	1,793
Fourth	13.5	[11.2-16.2]	192	1.9	[1.2-3.0]	28	11.5	[9.5-14.0]	165	85.6	[82.8-88.0]	1,222	4.1	[3.0-5.5]	58	-0.9	1.1	1,427
Highest	12.0	[10.1-14.1]	168	1.8	[1.2-2.9]	26	10.1	[8.5-12.0]	142	85.2	[82.9-87.2]	1,197	8.5	[6.6-10.9]	119	-0.7	1.3	1,406

Background characteristics	Any thinness			Severe thinness			Moderate thinness			Normal BMI for age			Overweight			Mean BAZ (SD)	Total number of children	
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Household food security status																		
Food secure	14.8	[13.5-16.2]	843	1.9	[1.5-2.5]	111	12.8	[11.6-14.2]	732	84.0	[82.6-85.3]	4,788	3.9	[3.3-4.7]	225	-1.0	1.0	5,699
Mildly insecure	14.4	[11.9-17.3]	156	2.2	[1.4-3.4]	24	12.2	[9.8-15.1]	132	85.2	[82.3-87.7]	920	2.5	[1.5-4.0]	27	-1.1	1.0	1,080
Mod. insecure	13.9	[11.9-16.1]	216	1.7	[1.1-2.8]	27	12.2	[10.4-14.3]	189	85.7	[83.4-87.7]	1,332	1.9	[1.3-2.8]	30	-1.0	1.1	1,554
Severe insecure	15.5	[12.0-19.9]	101	2.2	[1.1-4.1]	14	13.4	[10.1-17.5]	87	84.2	[79.8-87.7]	548	2.1	[1.1-3.9]	13	-1.1	1.0	651
Household Dietary Diversity																		
DDS<6	13.6	[12.2-15.0]	597	2.0	[1.5-2.7]	90	11.5	[10.3-12.9]	508	85.8	[84.4-87.2]	3,774	2.4	[1.9-3.0]	103	-1.0	1.0	4,396
DDS>=6	15.7	[14.3-17.2]	719	1.9	[1.4-2.5]	86	13.8	[12.5-15.1]	633	83.1	[81.6-84.5]	3,813	4.2	[3.4-5.1]	191	-1.0	1.0	4,588
Total	14.6	[13.6-15.7]	1,316	2.0	[1.6-2.4]	176	12.7	[11.8-13.7]	1,140	84.4	[83.3-85.5]	7,587	3.3	[2.8-3.8]	295	-1.0	1.0	8,985

1 Values are weighted figures expressed in percent, 95% Confidence Interval unless mentioned otherwise.

2 Any thinness = Body-mass-index (BMI) for age Z-score (BAZ) < -2 standard deviation units (SD) from the median of 2007 WHO Growth Reference Standard,

Moderate thinness = BAZ between -2SD and -3SD of the median of 2007 WHO Growth Reference Standard,

Severe thinness = BAZ < -3SD from the median of 2007 WHO Growth Reference Standard,

Overweight = BAZ > +2SD from the median of 2007 WHO Growth Reference Standard (WHO 2008).

6.2.3. Nutritional status of adolescent girls

Highlight: One in four adolescent girls (24%) was stunted (short for their age) and nearly one in five of these girls (19%) were thin for their height, and 0.9% were overweight (heavy for their height).

Overall, 24.2% of adolescent girls were stunted (short for their age) while 18.8% were moderately stunted and 5.5% were severely stunted; BMI for age results showed 18.8% of these girls were thin (thin for their height), 14.4% had moderate thinness, 4.4% had severe thinness, and only 5.2% had overweight (heavy for their height) **(Table 6.2.3.1)**.

Girls from rural areas were more stunted than those from urban areas; the rate of both stunting and thinness were found to be highest in the poorest households (stunting 38.1% and thinness 25.7%) and severely food insecure households (stunting 40.4% and thinness 32%) as compared to those living in wealthier households (stunting 7.7% and thinness 13.3%) and food secure households (stunting 22.4% and thinness 15.4%). The poorest adolescent nutritional status was found in Ayeyarwady region (stunting 48.5% and thinness 34%) **(Table 6.2.3.1)**. Ayeyarwady region, Kayin and Chin states and Tanintharyi region had high prevalence of adolescent stunting among states/regions **(Figure 6.2.3.1)**.

Figure 6.2.3.1: Stunting among adolescent girls by state/region

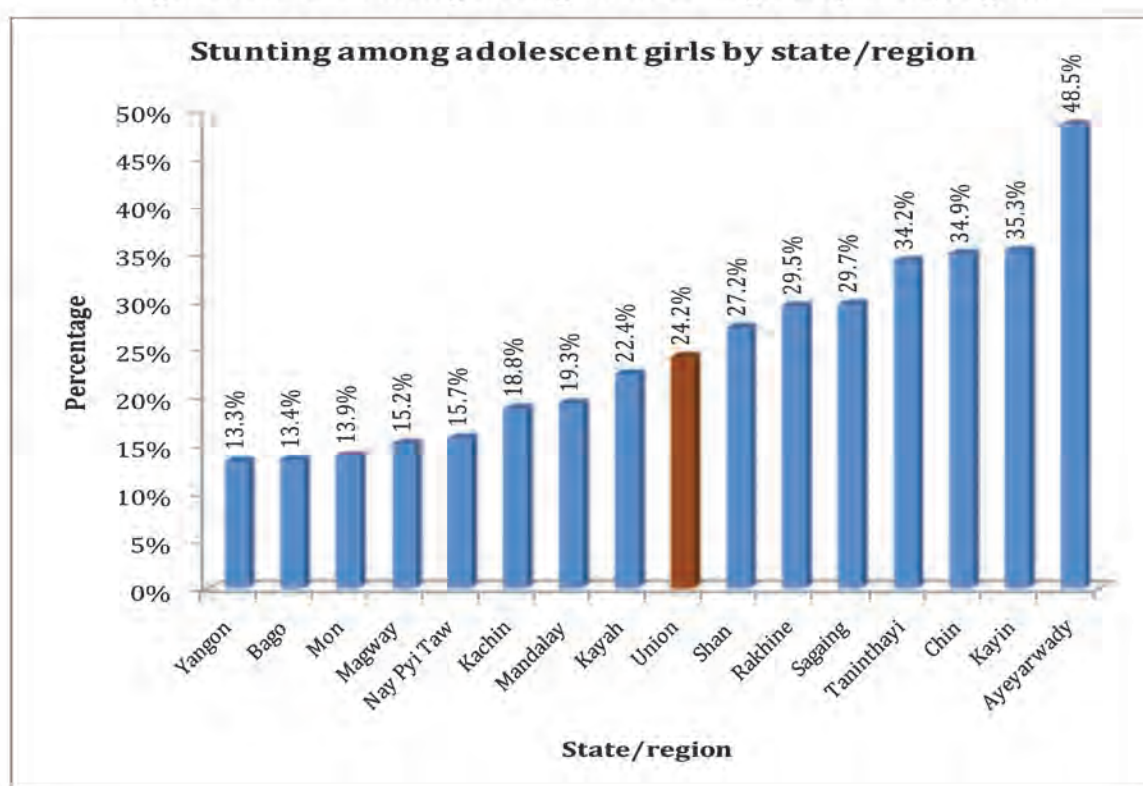


Table 6.2.3.1: Percent distribution of adolescent girls (10-14 years) classified by low height for age and by selected background characteristics, N=919 (MMFCS 2017-18) ^{1,2}

Background characteristics	Any stunting			Severe stunting			Moderate stunting			No stunting			Mean HAZ	(SD)	Total number of girls
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
State/Region															
Kachin	18.8	[10.5-31.5]	4	7.5	[2.6-20.0]	2	11.3	[4.9-24.0]	3	81.2	[68.5-89.5]	18	-1.2	1.7	22
Kayah	22.4	[11.5-39.1]	1	4.1	[1.0-14.8]	0	18.3	[8.2-36.0]	1	77.6	[60.9-88.5]	4	-1.2	3.7	5
Kayin	35.3	[22.7-50.3]	9	10.4	[4.9-20.7]	3	24.9	[13.7-41.0]	7	64.7	[49.7-77.3]	17	-1.6	1.6	27
Chin	34.9	[21.1-51.9]	2	12.8	[4.8-30.2]	1	22.1	[11.8-37.6]	1	65.1	[48.1-78.9]	4	-1.7	3.5	7
Sagaing	29.7	[19.6-42.2]	28	5.3	[1.8-15.1]	5	24.3	[15.4-36.3]	23	70.3	[57.8-80.4]	67	-1.4	0.9	96
Tanintharyi	34.2	[23.6-46.7]	8	3.6	[0.9-13.2]	1	30.6	[20.0-43.8]	7	65.8	[53.3-76.4]	16	-1.6	1.6	24
Bago	13.4	[7.1-24.0]	13	0.0	0	0	13.4	[7.1-24.0]	13	86.6	[76.0-92.9]	84	-1.2	0.6	98
Magway	15.2	[7.6-27.9]	12	3.6	[0.9-13.4]	3	11.5	[4.9-24.5]	9	84.9	[72.1-92.4]	70	-1.2	0.7	82
Mandalay	19.3	[10.0-34.1]	22	6.4	[2.4-16.0]	7	13.0	[5.8-26.6]	15	80.7	[65.9-90.0]	93	-1.2	0.9	115
Mon	13.9	[6.2-28.3]	5	1.0	[0.1-6.9]	0	12.9	[5.4-27.7]	5	86.1	[71.7-93.8]	32	-1.0	1.3	37
Rakhine	29.5	[20.3-40.7]	10	8.9	[3.9-19.1]	3	20.6	[12.1-32.9]	7	70.5	[59.3-79.7]	24	-1.4	1.4	33
Yangon	13.3	[7.1-23.6]	18	3.3	[0.8-12.4]	5	10.0	[4.7-20.0]	14	86.7	[76.4-92.9]	119	-0.9	0.7	137
Shan	27.2	[16.1-42.2]	27	3.8	[1.0-14.0]	4	23.4	[12.7-39.1]	23	72.8	[57.8-83.9]	72	-1.3	0.8	99
Ayeyarwady	48.5	[33.3-63.9]	58	12.9	[5.8-26.3]	15	35.5	[22.7-50.9]	43	51.5	[36.1-66.7]	62	-1.7	0.8	120
Nay Pyi Taw	15.7	[8.6-27.1]	3	6.5	[2.2-18.0]	1	9.2	[4.0-19.7]	2	84.3	[72.9-91.4]	15	-1.2	2.1	18
Residence															
Rural	27.3	[22.8-32.2]	187	6.1	[4.1-8.9]	42	21.2	[17.2-25.8]	145	72.8	[67.8-77.2]	499	-1.4	1.0	686
Urban	15.3	[10.8-21.2]	36	3.6	[1.5-8.4]	8	11.6	[7.7-17.2]	27	84.7	[78.8-89.2]	198	-1.0	1.3	233
Wealth index															
Least	38.1	[28.8-48.4]	73	9.7	[5.1-17.7]	19	28.4	[20.1-38.5]	55	61.9	[51.6-71.2]	119	-1.7	0.9	192
Second	32.9	[25.2-41.6]	71	7.8	[4.4-13.5]	17	25.1	[18.0-33.8]	54	67.1	[58.4-74.8]	146	-1.5	1.0	217
Middle	18.4	[12.2-26.8]	34	1.6	[0.4-6.9]	3	16.7	[10.9-24.9]	31	81.6	[73.2-87.8]	152	-1.2	0.9	187
Fourth	17.9	[11.9-26.0]	33	4.8	[1.9-11.2]	9	13.2	[8.2-20.5]	24	82.1	[74.0-88.1]	152	-1.1	1.2	185
Highest	7.7	[3.8-15.0]	11	2.0	[0.7-5.9]	3	5.7	[2.3-13.1]	8	92.3	[85.0-96.2]	128	-0.7	1.2	139

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	Any stunting			Severe stunting			Moderate stunting			No stunting			Mean HAZ	(SD)	Total number of girls
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Household food security status															
Food secure	22.4	[18.2-27.2]	131	5.1	[3.2-7.9]	30	17.3	[13.6-21.8]	101	77.6	[72.8-81.8]	453	-1.2	-1.2	584
Mildly insecure	25.6	[16.4-37.6]	25	4.5	[1.3-14.7]	4	21.1	[12.8-32.6]	21	74.4	[62.4-83.6]	73	-1.3	-1.3	98
Mod. insecure	23.9	[17.1-32.4]	42	4.9	[2.3-10.2]	9	19.1	[12.8-27.4]	34	76.1	[67.6-82.9]	134	-1.3	-1.3	177
Severe insecure	40.4	[25.8-56.9]	25	12.5	[5.0-27.9]	8	28.0	[16.6-43.1]	17	59.6	[43.1-74.2]	37	-1.7	-1.7	62
Household Dietary Diversity															
DDS<6	25.3	[20.6-30.7]	114	7.5	[4.9-11.1]	34	17.9	[13.9-22.7]	80	74.7	[69.3-79.4]	336	-1.3	-1.3	450
DDS>=6	23.1	[18.5-28.4]	109	3.5	[1.9-6.5]	17	19.6	[15.2-24.8]	92	76.9	[71.6-81.5]	361	-1.3	-1.3	470
Total	24.2	[20.7-28.1]	223	5.5	[3.8-7.8]	50	18.8	[15.6-22.4]	172	75.8	[71.9-79.3]	697	-1.3	1.1	919

1 Values are weighted figures expressed in percent, 95% Confidence Interval unless mentioned otherwise.

2 Any stunting = Height for age Z-score (HAZ) < -2 standard deviation units (SD) from the median of 2007 WHO Growth Reference Standard,

Moderate stunting = HAZ between -2SD and -3SD of the median of 2007 WHO Growth Reference Standard,

Severe stunting = HAZ < -3SD from the median of 2007 WHO Growth Reference Standard (WHO 2008)

Table 6.2.3.2: Percent distribution of adolescent girls (10-14 years) classified by low body-mass-index (BMI) for age and by selected background characteristics, N=918 (MMFCS 2017-18) ^{1,2}

Background characteristics	Body-mass-index (BMI) for age												Total number of girls					
	Any thinness			Severe thinness			Moderate thinness			Normal BMI for age				Overweight	Mean BAZ (SD)			
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)						
State/Region																		
Kachin	10.4	[3.7-18.4]	2	2.9	[0.4,17.8]	1	7.5	[2.6,20.0]	2	89.6	[76.6,95.8]	20	6.6	[2.0-19.7]	2	-0.9	1.7	22
Kayah	4.1	[0.8-12.5]	0.2	2.0	[0.3,13.3]	0.1	2.0	[0.3,13.3]	0.1	93.9	[83.0,98.0]	5	6.1	[1.4-23.0]	0	-0.6	3.8	5
Kayin	3.1	[0.8-12.6]	1	0.0	0.0	0	3.1	[0.8,12.0]	1	96.9	[88.0,99.2]	26	5.6	[1.8-15.7]	2	-0.7	1.4	26
Chin	5.5	[4.8-20.3]	0.4	0.6	[0.1,4.4]	0.04	4.9	[1.6,14.3]	0.3	94.5	[85.4,98.0]	6	0.6	[0.1-4.4]	0	-0.8	2.5	7
Sagaing	20.8	[11.7-32.0]	20	5.3	[1.8,15.1]	5	15.5	[7.9,28.1]	15	78.0	[65.1,87.1]	74	4.2	[1.3-12.6]	4	-1.1	1.0	96
Tanintharyi	25.2	[14.8-39.0]	6	6.3	[2.4,15.6]	2	18.9	[9.3,34.6]	5	73.0	[58.7,83.7]	18	5.0	[1.6-14.3]	1	-0.9	2.0	24
Bago	24.2	[15.4-37.8]	24	7.0	[2.9,16.1]	7	17.2	[9.1,30.1]	17	75.8	[63.0,85.2]	74	3.0	[0.7-11.7]	3	-1.0	0.9	98
Magway	19.4	[11.3-29.2]	16	1.8	[0.3,12.0]	1	17.6	[10.4,28.3]	14	80.6	[69.9,88.1]	66	4.8	[1.5-14.1]	4	-1.2	0.9	82
Mandalay	17.0	[9.8-27.8]	19	2.0	[0.3,13.0]	2	15.0	[8.1,26.1]	17	83.0	[71.8,90.4]	94	2.0	[0.3-13.0]	2	-0.8	0.7	113
Mon	14.1	[5.9-21.8]	5	0.0	0.0	0	14.1	[7.2,25.7]	5	85.9	[74.3,92.8]	32	7.3	[2.9-17.3]	3	-0.8	1.5	37
Rakhine	17.1	[9.0-28.8]	6	5.3	[1.7,15.0]	2	11.8	[5.2,24.6]	4	81.8	[69.4,89.9]	27	7.0	[2.6-17.7]	2	-1.1	1.5	33
Yangon	13.4	[7.1-23.6]	18	5.0	[1.6,14.3]	7	8.3	[3.6,18.1]	11	86.6	[76.3,92.9]	119	5.0	[1.6-14.3]	7	-0.7	0.8	137
Shan	12.9	[6.4-25.7]	13	4.9	[1.6,14.4]	5	7.9	[3.3,17.8]	8	86.0	[73.1,93.3]	86	7.9	[3.3-17.8]	8	-0.7	1.0	100
Ayeyarwady	34.0	[21.8-43.6]	41	7.4	[2.9,17.7]	9	26.6	[17.3,38.6]	32	62.3	[51.1,72.3]	75	6.3	[2.3-16.0]	8	-1.3	0.9	120
Nay Pyi Taw	7.0	[3.7-18.4]	1	2.2	[0.3,14.0]	0.1	4.8	[1.6,13.4]	1	90.8	[75.7,96.9]	17	12.7	[6.2-24.0]	2	-0.7	2.2	18
Residence																		
Rural	20.9	[14.1-20.1]	143	4.9	[3.1,7.6]	34	16.0	[12.7,19.8]	109	78.4	[74.3,81.9]	536	4.7	[3.1-7.1]	32	-1.0	1.1	683
Urban	12.8	[8.6-15.6]	30	3.1	[1.3,7.0]	7	9.7	[6.1,15.0]	23	86.1	[80.0,90.5]	202	6.5	[3.7-11.1]	15	-0.7	1.4	234
Wealth index																		
Least	25.7	[14.2-27.2]	49	4.6	[1.9,10.8]	9	21.1	[14.3,30.0]	40	73.2	[64.3,80.5]	141	1.7	[0.4-6.8]	3	-1.4	1.0	192
Second	22.8	[14.5-26.1]	49	4.5	[1.9,10.0]	10	18.4	[12.8,25.7]	39	76.9	[68.8,83.5]	165	4.4	[2.1-9.1]	10	-1.0	1.1	214
Middle	15.3	[9.3-19.5]	29	2.9	[1.0,8.1]	5	12.5	[7.6,19.7]	23	82.3	[74.4,88.1]	155	5.7	[2.8-11.4]	11	-0.8	1.2	188
Fourth	14.7	[8.7-18.0]	27	4.6	[1.9,10.9]	9	10.1	[5.8,16.8]	19	85.3	[76.8,91.1]	158	7.3	[3.7-13.7]	14	-0.7	1.3	185
Highest	13.3	[6.9-15.9]	19	6.1	[2.6,13.7]	9	7.2	[3.5,14.1]	10	86.1	[77.9,91.6]	120	7.5	[3.8-14.2]	10	-0.7	1.4	139

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	Body-mass-index (BMI) for age												Total number of girls					
	Any thinness			Severe thinness			Moderate thinness			Normal BMI for age				Overweight	Mean BAZ (SD)			
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)						
Household food security status																		
Food secure	15.4	[11.1-16.9]	90	4.5	[2.8-7.4]	26	10.8	[7.9-14.7]	63	83.5	[79.2-87.1]	486	6.5	[4.4-9.5]	38	-0.8	1.2	582
Mildly insecure	19.5	[8.3-21.8]	19	5.7	[1.9-15.5]	6	13.8	[7.2-25.0]	14	80.5	[68.6-88.6]	79	3.5	[1.1-10.9]	4	-1.0	1.2	98
Mod. insecure	25.1	[13.2-23.9]	44	4.6	[1.9-11.0]	8	20.4	[13.9-29.0]	36	74.9	[66.2-81.9]	132	1.7	[0.5-5.3]	3	-1.1	1.2	177
Severe insecure	32.0	[11.8-31.0]	20	1.0	[0.1-7.2]	1	30.9	[19.0-46.1]	19	65.5	[50.7-77.8]	40	5.0	[1.4-16.0]	3	-1.1	1.3	62
Household Dietary Diversity																		
DDS<6	20.1	[11.4-17.6]	90	4.8	[2.6-8.5]	21	15.3	[11.6-20.0]	68	79.6	[74.6-83.9]	356	5.2	[3.1-8.7]	23	-0.9	1.2	447
DDS>=6	17.6	[13.0-19.6]	83	4.1	[2.4-6.9]	19	13.4	[10.1-17.7]	63	81.0	[76.4-84.9]	381	5.1	[3.2-7.9]	24	-0.9	1.2	471
Total	18.8	[13.0-17.5]	173	4.4	[3.0-6.5]	41	14.4	[11.7-17.4]	132	80.3	[77.0-83.3]	737	5.2	[3.7-7.2]	47	-0.9	1.2	918

1 Values are weighted figures expressed in percent, 95% Confidence Interval unless mentioned otherwise.

2 Any thinness = Body-mass-index (BMI) for age Z-score (BAZ) < -2 standard deviation units (SD) from the median of 2007 WHO Growth Reference Standard,

Moderate thinness = BAZ between -2SD and -3SD of the median of 2007 WHO Growth Reference Standard,

Severe thinness = BAZ < -3SD from the median of 2007 WHO Growth Reference Standard,

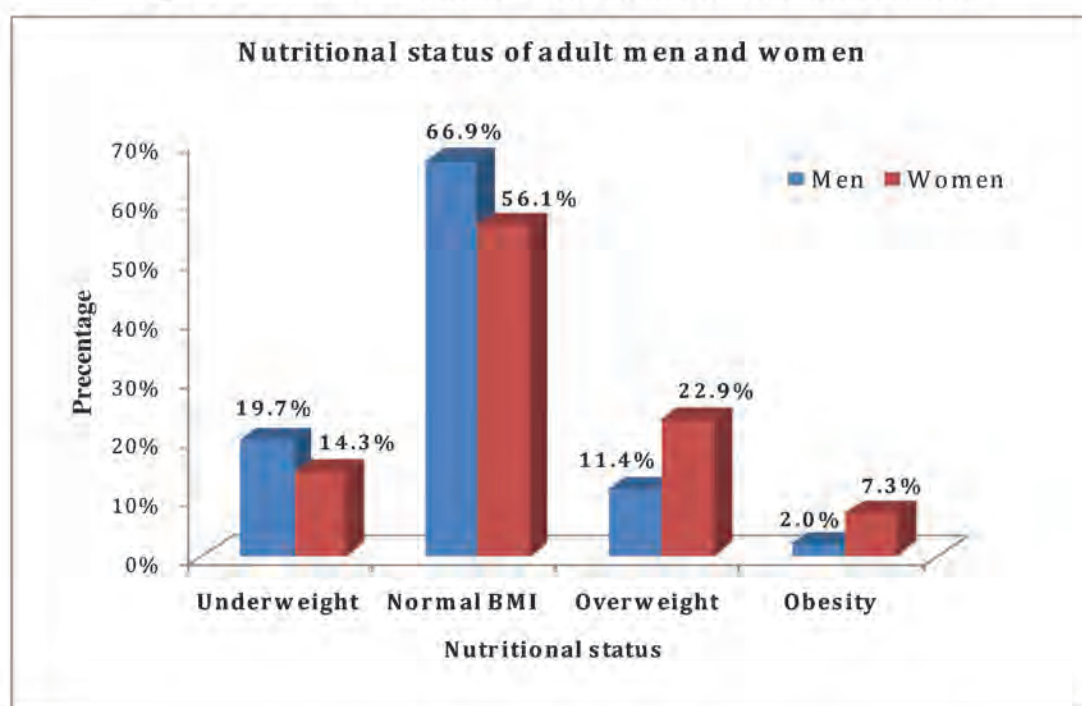
Overweight = BAZ > +2SD from the median of 2007 WHO Growth Reference Standard (WHO 2008).

6.3. Nutritional status of adults

6.3.1. Nutritional status of reproductive age women and adult men

Almost one in five (19.7%) adult men between the age of 15-49 years were underweight according to the WHO BMI classification (WHO 2004), while 11.4% them were overweight and only 2% were obese. In contrast, women had a lower prevalence of underweight (14.3%) but a higher prevalence of overweight (22.9%) and obesity (7.3%) (Table 6.3.1.1, Figure 6.3.1.1, Figure 6.3.1.2).

Figure 6.3.1.1: Nutritional status of adult men and women



Higher rates of overweight and obesity were found in both men and women from households with a higher wealth status. The highest rates of overweight (30.5% in women and 16.7% in men) and obesity (10.8% in women and 4% in men) were found in Yangon region. The finding is not surprising in view of the increased access to fast foods in that area, and emphasizes the need to enhance the health education of people living in Yangon region for the risk of diet-related non-communicable diseases due to unhealthy eating pattern and lifestyle. In general, rate of overweight in both men and women increased with age (Figure 6.3.1.3).

Figure 6.3.1.2: Nutritional status classification among adult men and reproductive age women

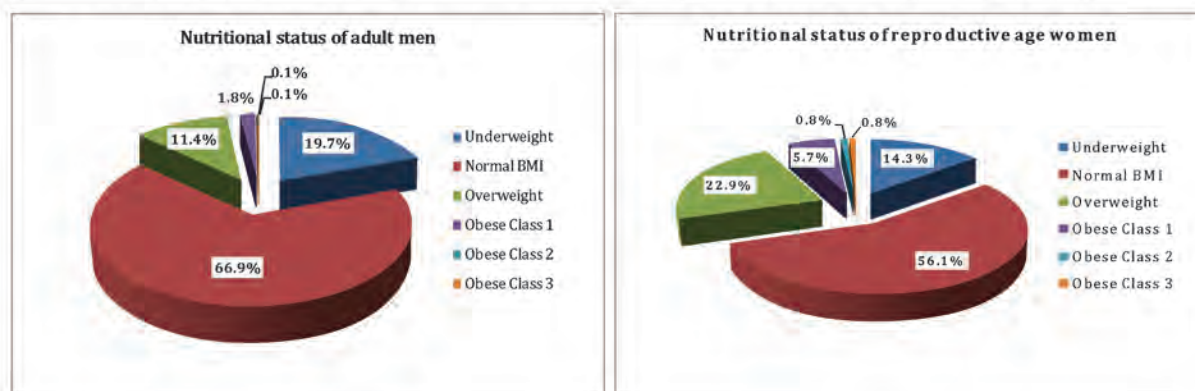


Figure 6.3.1.3: Nutritional status classification among adult men and reproductive age women by age group

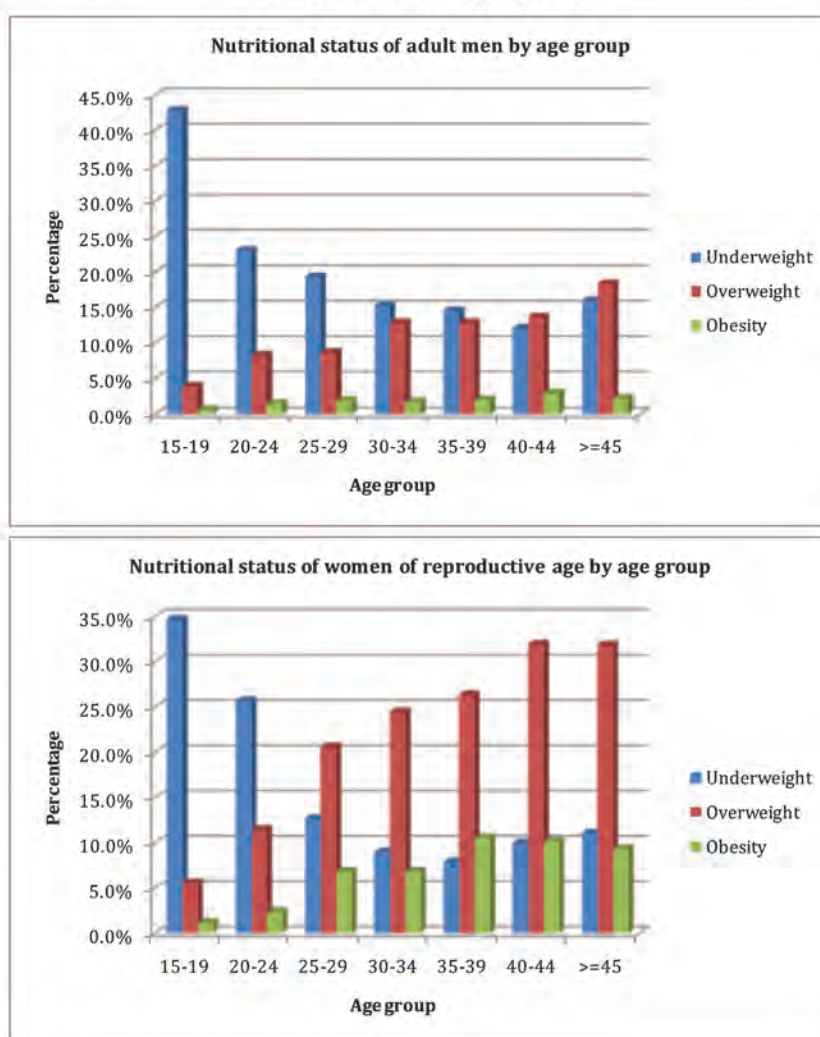


Table 6.3.1.1: Percent distribution of women of reproductive age (15-49 years) classified by Body-mass-index (BMI) and by selected background characteristics, N= 9,027 (MMFCS 2017-18) ^{1, 2}

Background characteristics	BMI Classification by WHO															Total N			
	Underweight			Normal			Overweight			Obese I			Obese II				Obese III	Mean BMI	(SD)
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)				
Age in year																			
15-19	34.7	[31.1-38.5]	327	58.5	[54.7-62.1]	551	5.6	[4.0-7.6]	52	0.6	[0.3-1.5]	6	0.3	[0.1-0.9]	3	1.7	0.7	942	
20-24	25.7	[22.1-29.6]	255	60.3	[56.3-64.3]	600	11.5	[9.3-14.1]	115	2.0	[1.2-3.4]	20	0.2	[0.1-1.0]	2	1.9	0.7	994	
25-29	12.7	[10.5-15.4]	166	60.5	[57.0-64.0]	789	20.6	[17.9-23.7]	269	4.7	[3.3-6.6]	61	1.1	[0.6-2.1]	14	2.2	0.8	1,304	
30-34	9.0	[7.4-10.9]	153	60.2	[57.2-63.1]	1,023	24.5	[22.1-27.1]	416	5.5	[4.2-7.2]	94	0.7	[0.4-1.2]	11	2.3	0.7	1,700	
35-39	7.9	[6.4-9.8]	133	55.7	[52.6-58.8]	934	26.4	[23.7-29.2]	442	8.8	[6.8-11.2]	147	0.9	[0.5-1.7]	15	2.4	0.8	1,676	
40-44	10.0	[8.1-12.4]	140	48.3	[44.8-51.8]	674	32.0	[28.7-35.5]	447	8.4	[6.8-10.4]	117	0.9	[0.5-1.7]	13	2.4	0.8	1,396	
>=45	11.1	[8.9-13.7]	112	48.6	[44.4-52.7]	493	31.9	[28.4-35.6]	324	7.0	[5.2-9.4]	71	1.2	[0.6-2.6]	13	2.4	0.8	1,015	
State/Region																			
Kachin	10.4	[7.6-14.0]	23	62.5	[57.1-67.6]	139	22.0	[18.0-26.7]	49	3.9	[2.5-6.0]	9	0.9	[0.4-2.3]	2	2.2	1.2	223	
Kayah	11.3	[8.1-15.6]	5	64.4	[58.3-70.1]	30	19.3	[14.9-24.5]	9	4.3	[2.3-7.8]	2	0.7	[0.3-1.8]	0	2.2	2.6	46	
Kayin	13.3	[10.6-16.6]	34	58.8	[52.4-64.9]	152	20.8	[16.7-25.5]	54	5.8	[4.1-8.0]	15	1.0	[0.4-2.4]	3	2.2	1.2	259	
Chin	8.4	[5.8-12.0]	6	74.1	[68.5-79.0]	54	15.0	[11.2-19.8]	11	1.9	[1.0-3.7]	1	0.6	[0.2-1.8]	0	2.1	1.7	73	
Sagaing	15.7	[12.5-19.6]	144	56.8	[52.7-60.8]	520	21.7	[18.1-25.9]	199	5.0	[3.6-7.0]	46	0.5	[0.2-1.5]	5	2.2	0.6	915	
Tanintharyi	12.2	[10.2-14.4]	29	56.5	[50.9-61.9]	135	22.8	[19.4-26.6]	54	7.2	[4.8-10.8]	17	1.0	[0.5-2.1]	2	2.3	1.3	238	
Bago	14.8	[12.3-17.8]	142	58.1	[54.2-61.8]	556	21.0	[17.2-25.4]	201	5.0	[3.7-6.8]	48	0.5	[0.2-1.6]	5	2.2	0.6	957	
Magway	20.6	[16.6-25.3]	157	58.5	[54.2-62.6]	445	18.3	[15.2-21.8]	139	2.1	[1.2-3.7]	16	0.4	[0.1-1.4]	3	2.0	0.6	761	
Mandalay	14.0	[10.7-18.1]	152	54.4	[50.1-58.7]	592	24.8	[20.4-29.9]	270	5.1	[3.4-7.6]	55	1.2	[0.6-2.3]	13	2.3	0.6	1,087	
Mon	14.7	[11.5-18.7]	51	47.5	[44.1-50.8]	165	28.7	[24.8-32.9]	100	7.7	[5.6-10.6]	27	1.4	[0.7-2.6]	5	2.3	1.2	348	
Rakhine	19.9	[16.5-23.8]	75	61.0	[55.4-66.3]	228	16.2	[12.3-21.1]	61	2.6	[1.5-4.2]	10	0.2	[0.0-1.2]	1	2.0	0.9	374	
Yangon	11.9	[9.9-14.1]	156	47.2	[42.5-52.0]	622	30.5	[26.4-35.0]	402	9.2	[6.5-12.7]	121	0.8	[0.4-1.9]	11	2.4	0.6	1,316	
Shan	7.7	[5.4-10.9]	76	58.7	[53.2-64.1]	578	24.5	[20.3-29.3]	241	7.4	[5.2-10.4]	73	1.6	[0.9-3.0]	16	2.4	0.6	984	
Ayeyarwady	16.4	[13.5-19.9]	206	58.8	[53.8-63.5]	735	18.7	[15.3-22.6]	234	5.4	[3.6-8.1]	68	0.3	[0.1-1.2]	4	2.2	0.6	1,251	
Nay Pyi Taw	15.8	[12.8-19.3]	31	58.6	[53.0-64.0]	115	21.1	[16.8-26.2]	41	4.0	[2.5-6.2]	8	0.5	[0.2-1.4]	1	2.1	1.3	196	

MMFCS (National Nutrition Centre, DoPH, MoHS)

Table 6.3.1.2: Percent distribution of adult men (15-49 years) classified by Body-mass-index (BMI) and by selected background characteristics, N= 9,022 (MMFCS 2017-18) ^{1, 2}

Background characteristics	BMI Classification by WHO															Mean BMI	(SD)	Total N			
	Underweight			Normal			Overweight			Obese I			Obese II						Obese III		
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)				%	CI	(n)
Age in year																					
15-19	42.9	[39.3-46.6]	482	52.5	[48.8-56.1]	589	3.9	[2.5-5.9]	43	0.7	[0.3-1.7]	8	0.0	[0.0-0.3]	0	0.0	[0.0-0.2]	0	1.6	0.6	1,123
20-24	23.1	[19.9-26.7]	245	67.1	[63.2-70.7]	712	8.3	[6.5-10.5]	88	1.5	[0.8-2.7]	16	0.1	[0.0-0.5]	1	0.0	0.0	0	1.9	0.6	1,061
25-29	19.4	[16.9-22.1]	255	69.9	[66.7-72.9]	921	8.7	[7.0-10.8]	115	1.6	[0.9-2.6]	21	0.3	[0.1-0.9]	4	0.1	[0.0-0.9]	2	1.9	0.6	1,317
30-34	15.3	[13.1-17.7]	244	70.0	[67.0-72.8]	1,118	12.9	[10.8-15.4]	207	1.6	[1.0-2.8]	26	0.1	[0.0-0.6]	2	0.1	[0.0-0.6]	1	2.0	0.6	1,598
35-39	14.6	[12.4-17.1]	236	70.4	[67.4-73.2]	1,136	12.9	[10.8-15.2]	208	1.9	[1.2-2.9]	31	0.1	[0.0-0.3]	2	0.1	[0.0-0.6]	2	2.0	0.6	1,615
40-44	12.1	[9.9-14.8]	156	71.1	[68.0-74.0]	918	13.7	[11.6-16.2]	177	2.8	[1.9-4.2]	37	0.1	[0.0-0.8]	2	0.1	[0.0-0.4]	1	2.1	0.6	1,291
>=45	16.0	[13.1-19.4]	163	63.3	[59.3-67.1]	643	18.4	[15.6-21.6]	187	2.1	[1.2-3.5]	21	0.0	0.0	0	0.2	[0.0-1.5]	2	2.1	0.7	1,016
State/Region																					
Kachin	13.1	[10.1-16.9]	30	72.4	[67.5-76.7]	163	11.8	[9.1-15.2]	27	2.7	[1.6-4.4]	6	0.0	0.0	0	0.0	0.0	0	2.0	1.0	225
Kayah	13.0	[10.4-16.2]	6	75.3	[70.6-79.5]	35	9.3	[6.7-12.7]	4	2.4	[1.4-4.0]	1	0.0	0.0	0	0.0	0.0	0	2.0	2.0	46
Kayin	10.9	[8.7-13.6]	28	79.0	[74.6-82.8]	204	8.9	[6.5-11.9]	23	1.0	[0.4-2.6]	3	0.2	[0.0-1.3]	0	0.0	0.0	0	2.0	0.8	259
Chin	13.6	[10.6-17.3]	10	78.4	[74.4-82.0]	56	6.7	[4.8-9.2]	5	1.3	[0.6-3.0]	1	0.0	0.0	0	0.0	0.0	0	2.0	1.4	72
Sagaing	17.5	[14.4-21.0]	161	71.5	[67.6-75.1]	657	10.1	[7.9-12.8]	92	0.6	[0.2-1.6]	6	0.2	[0.0-1.2]	2	0.2	[0.0-1.2]	2	2.0	0.5	919
Tanintharyi	17.0	[14.4-19.9]	40	69.9	[65.8-73.6]	163	11.2	[8.6-14.4]	26	1.3	[0.6-2.9]	3	0.3	[0.1-1.3]	1	0.3	[0.1-1.3]	1	2.0	1.0	234
Bago	22.7	[19.4-26.4]	219	67.3	[63.1-71.3]	648	8.9	[6.6-11.9]	86	0.9	[0.3-2.3]	8	0.2	[0.0-1.3]	2	0.0	0.0	0	1.9	0.5	962
Magway	28.2	[22.8-34.3]	214	59.2	[54.1-64.2]	449	11.3	[8.5-14.9]	85	1.3	[0.7-2.5]	10	0.0	0.0	0	0.0	0.0	0	1.9	0.6	758
Mandalay	22.3	[18.5-26.8]	247	63.1	[58.8-67.2]	698	13.1	[10.4-16.3]	145	1.2	[0.6-2.6]	14	0.1	[0.0-0.9]	1	0.1	[0.0-0.9]	1	1.9	0.5	1,107
Mon	18.9	[15.7-22.5]	67	63.5	[59.8-67.1]	225	14.1	[11.3-17.3]	50	2.6	[1.6-4.2]	9	0.9	[0.4-2.0]	3	0.0	0.0	0	2.0	0.9	355
Rakhine	19.1	[15.2-23.9]	75	69.6	[64.4-74.3]	271	9.6	[6.8-13.4]	37	1.5	[0.6-3.4]	6	0.0	0.0	0	0.2	[0.0-1.2]	1	1.9	0.8	389
Yangon	22.7	[19.0-26.8]	298	56.6	[51.3-61.8]	744	16.7	[13.1-21.1]	219	3.8	[2.3-6.3]	50	0.0	0.0	0	0.2	[0.0-1.2]	2	2.0	0.5	1,314
Shan	10.5	[7.9-13.9]	100	74.1	[69.8-78.0]	704	11.9	[9.3-15.2]	113	3.1	[1.8-5.2]	29	0.1	[0.0-1.0]	1	0.2	[0.0-1.3]	2	2.1	0.5	950
Ayeyarwady	19.1	[15.0-24.0]	236	72.4	[67.1-77.2]	896	7.7	[5.8-10.2]	96	0.7	[0.3-2.0]	9	0.0	0.0	0	0.0	0.0	0	1.9	0.4	1,238
Nay Pyi Taw	26.3	[21.7-31.6]	52	63.3	[58.8-67.5]	124	8.7	[6.6-11.4]	17	1.5	[0.7-3.0]	3	0.0	0.0	0	0.2	[0.0-1.4]	0	1.9	1.1	196

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	BMI Classification by WHO															Mean BMI	(SD)	Total N			
	Underweight			Normal			Overweight			Obese I			Obese II						Obese III		
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)				%	CI	(n)
Residence																					
Rural	19.1	[17.5-20.7]	1,245	69.9	[68.2-71.5]	4,565	9.6	[8.6-10.6]	626	1.3	[0.9-1.8]	84	0.1	[0.0-0.2]	7	0.1	[0.0-0.2]	5	1.9	0.6	6,531
Urban	21.5	[19.3-23.9]	536	59.2	[56.3-61.9]	1,473	16.0	[14.0-18.4]	400	3.0	[2.2-4.1]	74	0.2	[0.1-0.4]	4	0.2	[0.0-0.6]	4	2.0	0.8	2,491
Wealth index																					
Least	22.9	[20.1-25.9]	433	71.0	[67.9-73.8]	1,344	5.4	[4.1-7.0]	102	0.8	[0.4-1.5]	15	0.0	[0.0-0.2]	1	0.0	0.0	0	1.8	0.5	1,894
Second	22.0	[19.5-24.6]	452	69.1	[66.1-72.0]	1,423	8.4	[6.9-10.2]	173	0.5	[0.2-1.1]	10	0.0	[0.0-0.2]	0	0.0	0.0	0	1.9	0.5	2,058
Middle	18.5	[16.3-21.0]	356	69.2	[66.2-71.9]	1,328	11.2	[9.5-13.2]	216	0.8	[0.4-1.6]	16	0.2	[0.0-0.7]	3	0.1	[0.0-0.6]	2	2.0	0.6	1,921
Fourth	18.3	[16.0-20.8]	288	66.4	[63.3-69.3]	1,042	13.0	[11.2-15.1]	204	1.9	[1.3-2.9]	30	0.2	[0.1-0.6]	3	0.2	[0.1-0.7]	3	2.0	0.7	1,570
Highest	16.0	[13.5-18.8]	253	57.1	[53.3-60.8]	901	21.0	[18.1-24.1]	331	5.5	[4.0-7.5]	87	0.2	[0.1-0.5]	3	0.3	[0.1-0.9]	4	2.2	0.9	1,578
Household food security status																					
Food secure	18.8	[17.4-20.3]	1,135	66.1	[64.3-67.9]	3,993	12.8	[11.6-14.1]	774	2.0	[1.6-2.6]	122	0.1	[0.1-0.3]	8	0.1	[0.0-0.3]	7	2.0	0.6	6,040
Mild insecure	19.2	[16.2-22.7]	200	68.6	[64.6-72.3]	712	11.1	[8.6-14.1]	115	1.0	[0.5-2.1]	10	0.2	[0.0-0.8]	2	0.0	0.0	0	1.9	0.6	1,038
Mod. insecure	23.3	[20.3-26.5]	325	68.1	[65.0-71.1]	952	6.9	[5.3-8.9]	96	1.5	[0.9-2.6]	21	0.0	[0.0-0.2]	0	0.1	[0.0-0.9]	2	1.9	0.7	1,397
Severe insecure	22.1	[17.9-27.1]	121	69.7	[64.1-74.7]	381	7.3	[4.6-11.3]	40	0.8	[0.3-2.2]	5	0.1	[0.0-0.6]	0	0.0	0.0	0	1.9	0.6	547
Household Dietary Diversity																					
DDS<6	20.5	[18.8-22.4]	902	67.5	[65.5-69.5]	2,967	10.4	[9.2-11.7]	457	1.4	[1.0-1.9]	61	0.1	[0.0-0.2]	3	0.0	[0.0-0.2]	2	1.9	0.6	4,392
DDS>=6	19.0	[17.5-20.6]	879	66.3	[64.4-68.2]	3,072	12.3	[11.0-13.6]	568	2.1	[1.6-2.7]	97	0.1	[0.1-0.3]	7	0.2	[0.1-0.4]	7	2.0	0.6	4,630
Total	19.7	[13.5-18.8]	1,781	66.9	[53.3-60.8]	6,038	11.4	[18.1-24.1]	1,025	1.8	[4.0-7.5]	158	0.1	[0.1-0.5]	10	0.1	[0.1-0.9]	9	2.0	0.6	9,022

1 Values are weighted figures expressed in percent, 95% Confidence Interval unless mentioned otherwise.

2 Nutritional status are defined according to the WHO BMI classification (WHO 2004)

Underweight = Body-mass-index (BMI) < 18.5kg/m²

Moderate thinness = BMI between 18.5kg/m² and 24.99kg/m²

Overweight (Pre-obese) = BMI between 25.0kg/m² and 29.99kg/m²

Obese (Class I) = BMI between 30.0kg/m² and 34.99kg/m²

Obese (Class II) = BMI between 35.0kg/m² and 39.99kg/m²

Obese (Class III) = BMI between ≥40.0kg/m²

Anemia among different target groups

Highlight:

- Highest rate of anemia (51.1%) was found in primary school age children.
- One in three children 6-59 months of age (35.6%) had anemia.
- One in two primary school age children 5-9 years of age (51.1%) had anemia.
- One in three adolescent girls 10-14 years of age (29.8%) had anemia.
- Two in five pregnant women (40%) had anemia.
- More than one third of lactating mothers (35.4%) had anemia.
- One in three reproductive age women 15-49 years of age (30.3%) had anemia.

Figure 6.4.1: Percent of anemia among different target groups

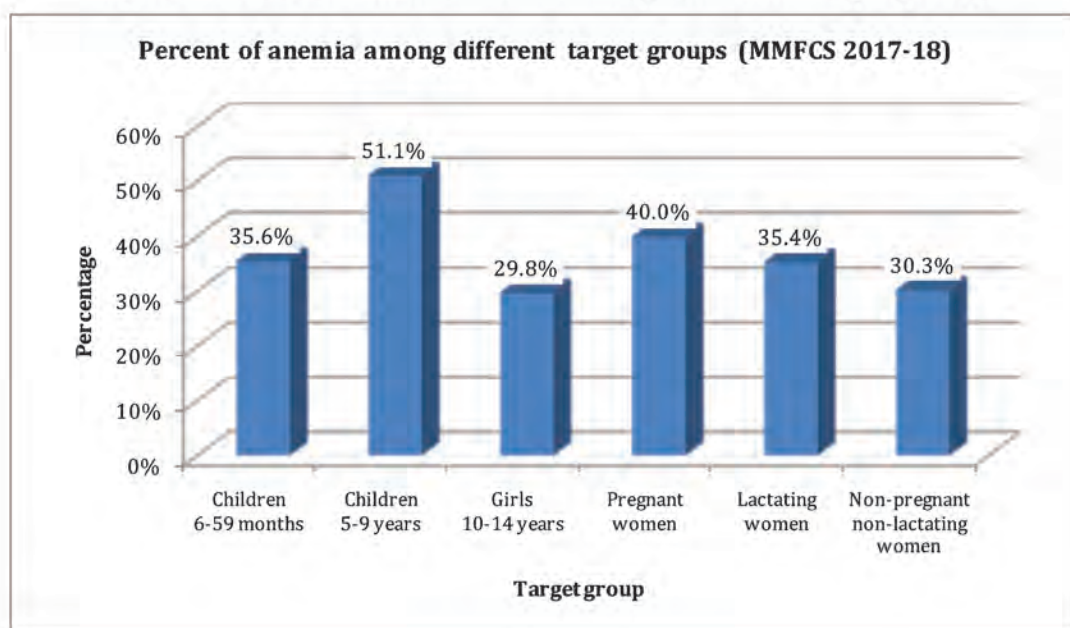
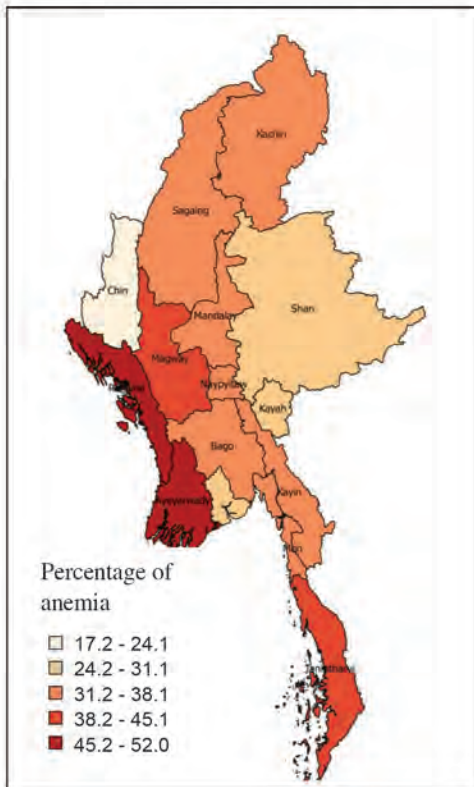
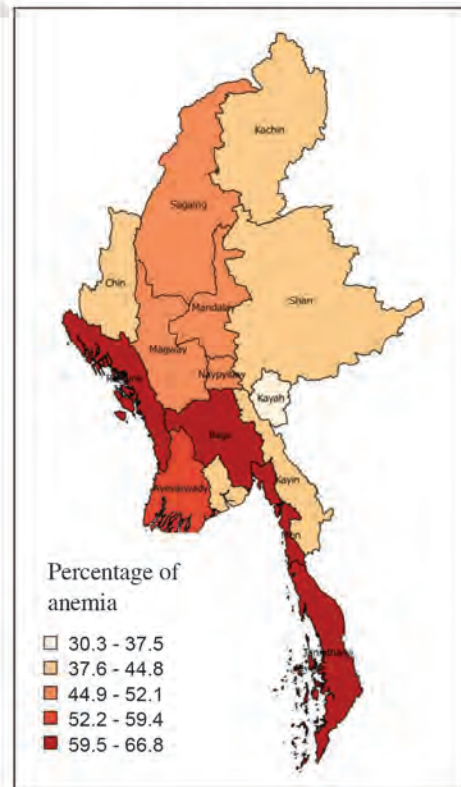


Figure 6.4.2: Anemia among different groups by state/region

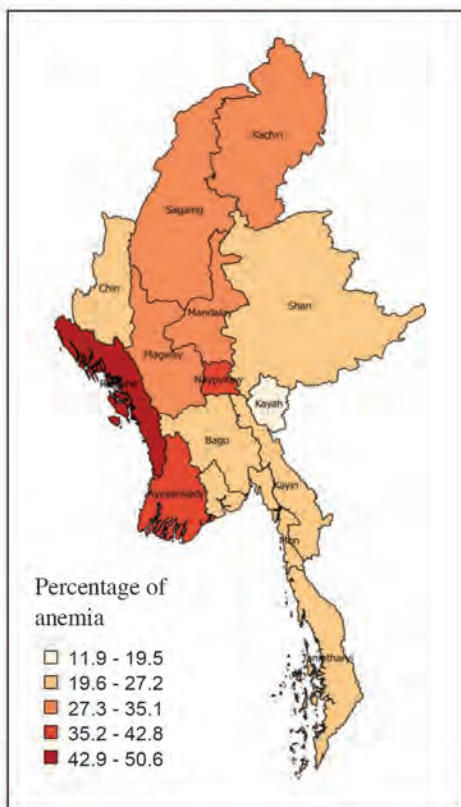
**Anemia among children
6-59 months by state/region**



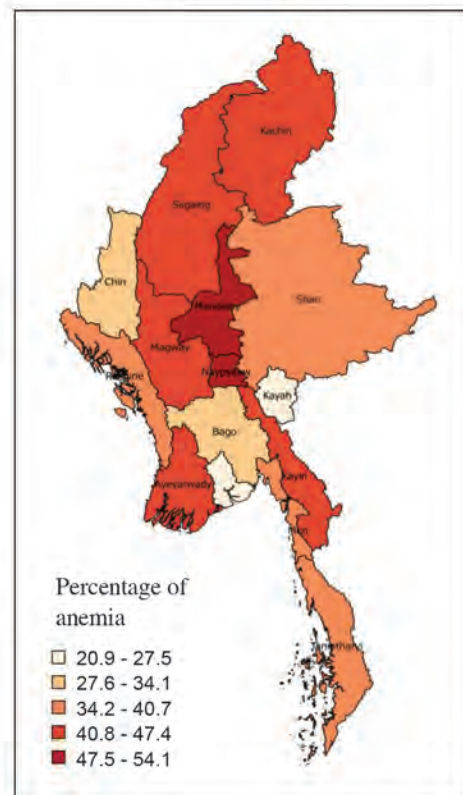
**Anemia among children
5-9 years by state/region**



**Anemia among adolescent girls
10-14 years of age by state/region**



**Anemia among pregnant women
by state/region**



6.4. Anemia in children and adolescents

Anemia is found when the number and size of red blood cells (RBC), or the hemoglobin concentration, falls below an established cut-off value, consequently impairing the capacity of the blood to transport oxygen around the body. Anemia is an indicator of both poor nutrition and poor health (WHO 2014). A person's RBC requirement varies with his/her age, gender, residential elevation above sea level (altitude), smoking behaviour, and different stages of pregnancy. Although iron deficiency is thought to be the most common cause of anemia, other nutritional deficiencies (including folate, vitamin B12 and vitamin A), acute and chronic inflammation, parasitic infections, and inherited or acquired blood disorders, can all cause anemia (WHO 2005). The population groups which are most vulnerable to anemia include children under 5 years of age, adolescents, women of reproductive age (15–49 years), and pregnant women.

6.4.1. Anemia in children 6-59 months of age

Generally, 35.6% of children 6-59 months of age (6-59 months) had anemia, of whom 21.9% mild anemia, 13.1% moderate anemia and 0.5% severe anemia. Highest prevalence of anemia was found in children younger than 2 years of age (highest at 9-11 months of age with 67.3%) and ranged from 22.4% to 37.7% in those between 24-59 months of age (**Figure 6.4.1.1**). Households with least wealth status and severe food insecurity had the highest rate of anemia among children. Children 6-59 months of age from Rakhine state had highest rate of anemia (52%) followed by those from Ayeyarwady region (46%) and Tanintharyi region (45%) (**Table 6.4.1.1, Figure 6.4.1.2**). Anemia among children 6-59 months of age found to be reduced as compared to 2015-16 DHS (58%) (MOHS and ICF 2017), although the problem still remains of public health significance as defined by WHO (WHO 2011).

Figure 6.4.1.1: Anemia among children 6-59 months of age by age group

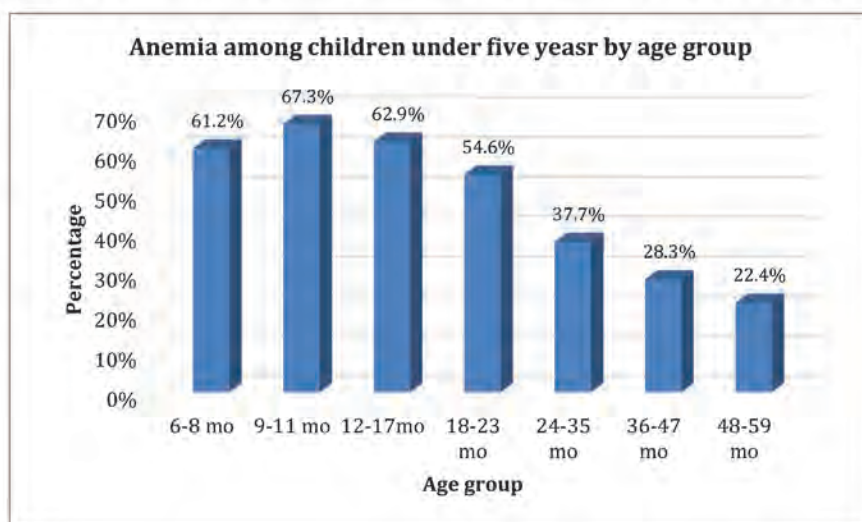


Figure 6.4.1.2: Anemia among children 6-59 months of age by state/region

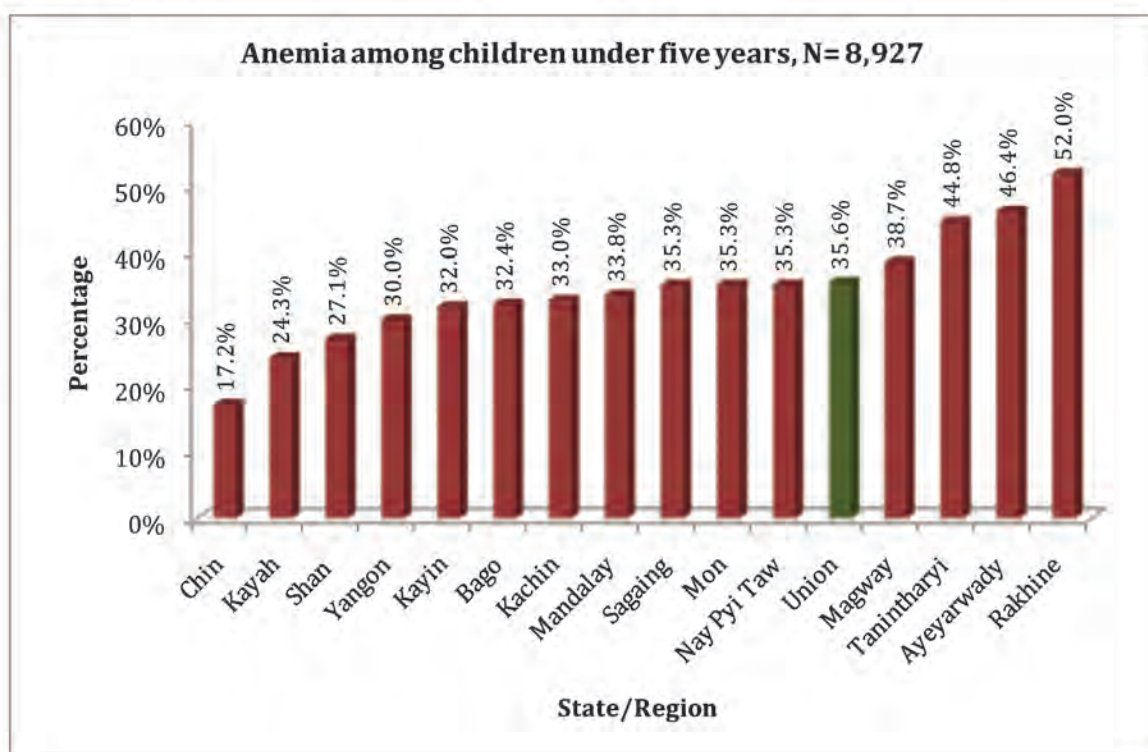


Table 6.4.1.1: Percent distribution of children under 5 years old classified by anemia and by selected background characteristics, N=8,927 (MMFCS 2017-18) ^{1,2}

Background characteristics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL) (SD)	Number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)		
Age in months																	
6-8 mo	61.2	[51.6-70.1]	102	1.0	[0.1-7.0]	2	34.8	[27.3-43.1]	58	25.4	[18.7-33.7]	43	38.8	[29.9-48.4]	65	10.5	1.4
9-11 mo	67.3	[59.3-74.3]	153	2.2	[0.7-6.6]	5	30.6	[23.8-38.4]	70	34.5	[27.1-42.7]	79	32.7	[25.7-40.7]	75	10.3	1.4
12-17 mo	62.9	[58.0-67.6]	447	1.8	[0.9-3.4]	12	34.7	[30.3-39.3]	247	26.5	[22.5-30.9]	188	37.1	[32.4-42.0]	264	10.5	1.5
18-23 mo	54.6	[50.2-58.8]	412	1.0	[0.5-2.2]	8	27.0	[22.9-31.5]	204	26.6	[22.7-30.8]	201	45.4	[41.2-49.8]	343	10.7	1.4
24-35 mo	37.7	[35.0-40.5]	846	0.4	[0.2-0.8]	9	12.3	[10.7-14.1]	276	25.0	[22.8-27.4]	561	62.3	[59.5-65.0]	1,400	11.3	1.3
36-47 mo	28.3	[26.1-30.6]	644	0.2	[0.1-0.7]	5	7.9	[6.6-9.3]	179	20.2	[18.2-22.4]	460	71.7	[69.4-73.9]	1,630	11.6	1.2
48-59 mo	22.4	[20.3-24.6]	570	0.1	[0.0-0.4]	4	5.5	[4.4-6.8]	140	16.7	[14.9-18.7]	426	77.6	[75.4-79.7]	1,977	11.8	1.3
Gender																	
Male	37.0	[35.1-39.0]	1691	0.6	[0.4-1.0]	28	15.0	[13.6-16.5]	686	21.4	[20.0-22.8]	978	63.0	[61.0-64.9]	2,877	11.3	1.4
Female	34.0	[32.2-35.9]	1484	0.4	[0.2-0.8]	17	11.2	[10.1-12.4]	487	22.5	[21.0-24.1]	980	66.0	[64.1-67.8]	2,876	11.4	1.3
State/Region																	
Kachin	33.0	[27.3-39.4]	74	1.2	[0.3-3.9]	3	11.9	[8.6-16.3]	27	20.0	[16.8-23.6]	45	67.0	[60.6-72.7]	151	11.4	2.5
Kayah	24.3	[20.4-28.8]	12	0.3	[0.1-1.0]	0	8.8	[6.9-11.1]	4	15.3	[12.3-18.7]	7	75.7	[71.2-79.6]	36	11.8	5.0
Kayin	32.0	[25.6-39.1]	82	0.1	[0.0-1.0]	0	11.3	[8.8-14.5]	29	20.6	[16.1-25.9]	53	68.0	[60.9-74.4]	175	11.5	2.0
Chin	17.2	[12.8-22.7]	13	0.0	0.0	0	4.5	[2.9-6.9]	3	12.7	[9.3-17.2]	10	82.8	[77.3-87.2]	62	12.0	3.2
Sagaing	35.3	[30.8-40.0]	320	0.3	[0.1-1.4]	3	10.3	[7.8-13.5]	94	24.6	[20.8-28.8]	223	64.7	[60.0-69.2]	588	11.3	1.0
Tanintharyi	44.8	[39.4-50.3]	105	0.2	[0.0-1.3]	0	17.9	[14.0-22.5]	42	26.7	[22.1-31.9]	63	55.2	[49.7-60.6]	129	11.0	2.2
Bago	32.4	[27.0-38.3]	307	0.2	[0.0-1.3]	2	15.0	[11.7-19.0]	142	17.2	[13.6-21.5]	163	67.6	[61.7-73.0]	641	11.4	1.1
Magway	38.7	[32.5-45.3]	298	1.4	[0.7-2.9]	11	15.4	[11.3-20.7]	118	21.9	[18.7-25.4]	168	61.3	[54.7-67.5]	471	11.2	1.3
Mandalay	33.8	[29.6-38.4]	369	0.3	[0.1-1.0]	3	13.5	[11.2-16.2]	147	20.1	[17.2-23.3]	219	66.2	[61.6-70.4]	722	11.3	1.0
Mon	35.3	[31.3-39.6]	121	0.3	[0.1-1.4]	1	7.1	[5.1-9.7]	24	28.0	[24.0-32.3]	96	64.7	[60.4-68.7]	222	11.3	1.3
Rakhine	52.0	[46.5-57.4]	195	0.9	[0.3-2.3]	3	23.4	[19.2-28.1]	88	27.8	[23.6-32.3]	104	48.0	[42.6-53.5]	180	10.8	1.8
Yangon	30.0	[26.1-34.2]	390	0.3	[0.1-1.3]	4	9.0	[6.6-12.2]	118	20.6	[17.7-23.8]	268	70.0	[65.8-73.9]	911	11.5	0.8
Shan	27.1	[23.0-31.7]	253	0.2	[0.0-1.3]	2	9.1	[6.6-12.5]	85	17.8	[15.1-20.8]	166	72.9	[68.3-77.0]	679	11.8	1.1
Ayeyarwady	46.4	[41.3-51.6]	561	0.9	[0.3-2.5]	11	18.7	[16.0-21.9]	227	26.7	[22.9-30.9]	323	53.6	[48.4-58.7]	648	11.0	1.0
Nay Pyi Taw	35.3	[30.5-40.5]	75	0.2	[0.0-1.3]	0	11.7	[8.7-15.5]	25	23.4	[20.1-27.1]	50	64.7	[59.5-69.5]	138	11.4	2.4

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL) (SD)	Number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)		
Residence																	
Rural	36.2	[34.2-38.1]	2,344	0.5	[0.3-0.8]	31	14.0	[12.8-15.3]	908	21.7	[20.3-23.1]	1,406	63.8	[61.9-65.8]	4,138	11.3	1.3
Urban	33.9	[31.2-36.8]	830	0.5	[0.3-1.1]	13	10.8	[9.3-12.6]	265	22.6	[20.7-24.5]	552	66.1	[63.2-68.8]	1,615	11.4	1.5
Wealth index																	
Least	40.1	[37.0-43.2]	929	0.8	[0.5-1.4]	19	17.1	[15.2-19.3]	398	22.1	[20.0-24.4]	513	59.9	[56.8-63.0]	1,390	11.2	1.3
Second	35.6	[32.8-38.5]	740	0.3	[0.1-0.8]	6	14.0	[12.1-16.1]	291	21.3	[19.2-23.6]	444	64.4	[61.5-67.2]	1,340	11.3	1.3
Middle	34.9	[31.9-37.9]	601	0.8	[0.4-1.5]	13	12.0	[10.2-14.0]	206	22.2	[19.8-24.7]	382	65.1	[62.1-68.1]	1,123	11.4	1.4
Fourth	31.6	[28.7-34.7]	440	0.3	[0.1-0.9]	4	11.0	[9.1-13.2]	153	20.3	[18.0-22.9]	283	68.4	[65.3-71.3]	953	11.5	1.4
Highest	32.8	[29.8-36.0]	464	0.2	[0.0-0.6]	2	8.9	[7.2-10.9]	125	23.8	[21.3-26.5]	336	67.2	[64.0-70.2]	948	11.5	1.4
Household food security status																	
Food secure	34.1	[32.4-35.9]	1,937	0.3	[0.2-0.6]	20	12.5	[11.4-13.7]	708	21.3	[20.0-22.6]	1,210	65.9	[64.1-67.6]	3,738	11.4	1.3
Mild insecure	38.0	[34.5-41.7]	423	0.3	[0.1-1.2]	4	14.3	[11.9-17.0]	159	23.4	[20.6-26.5]	261	62.0	[58.3-65.5]	690	11.2	1.4
Mod. insecure	35.8	[32.5-39.3]	531	1.1	[0.6-1.9]	16	13.6	[11.4-16.1]	202	21.2	[18.6-23.9]	314	64.2	[60.7-67.5]	952	11.3	1.5
Severe insecure	43.2	[38.2-48.3]	283	0.7	[0.2-2.2]	5	16.0	[12.7-19.8]	105	26.5	[22.4-31.0]	174	56.8	[51.7-61.8]	372	11.2	1.5
Household Dietary Diversity																	
DDS<6	36.0	[33.9-38.1]	1,551	0.5	[0.3-0.9]	23	12.9	[11.6-14.2]	555	22.6	[21.1-24.2]	974	64.0	[61.9-66.1]	2,760	11.3	1.4
DDS>=6	35.2	[33.1-37.3]	1,624	0.5	[0.3-0.8]	22	13.4	[12.0-14.9]	618	21.3	[19.8-23.0]	984	64.8	[62.7-66.9]	2,993	11.4	1.4
Total	35.6	[34.0-37.1]	3,175	0.5	[0.3-0.7]	44	13.1	[12.2-14.2]	1,173	21.9	[20.8-23.1]	1,958	64.4	[62.9-66.0]	5,753	11.3	1.4
																8,927	

1 Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

2 Anemia classification based on hemoglobin (Hb) concentration (WHO 2011)

Any anemia = Hb<11g/dL, No anemia = Hb≥11g/dL, Mild anemia = Hb 10-10.9g/dL, Moderate anemia = Hb 7-9.9g/dL, Severe anemia = Hb<7g/dL

6.4.2. Anemia in primary school age children

One in two (51.1%) primary school age children (between 5-9 years of age) had anemia while 15.4% had mild anemia, 34.6% had moderate anemia and 1.1% had severe anemia (**Table 6.4.2.1**). School age children from rural areas had a higher rate of all forms of anemia than those from urban areas (**Figure 6.4.2.1**). School age children who are living in households with lowest wealth status and severe food insecurity had the highest rate of anemia (55.2% and 59.1%) than those living in wealthier and food secure households. The children from Tanintharyi region had the highest rate of anemia (67%) followed by Rakhine state (65%) and Mon state (64%) (**Figure 6.4.2.2**).

Figure 6.4.2.1: Anemia among primary school age children by residence and severity

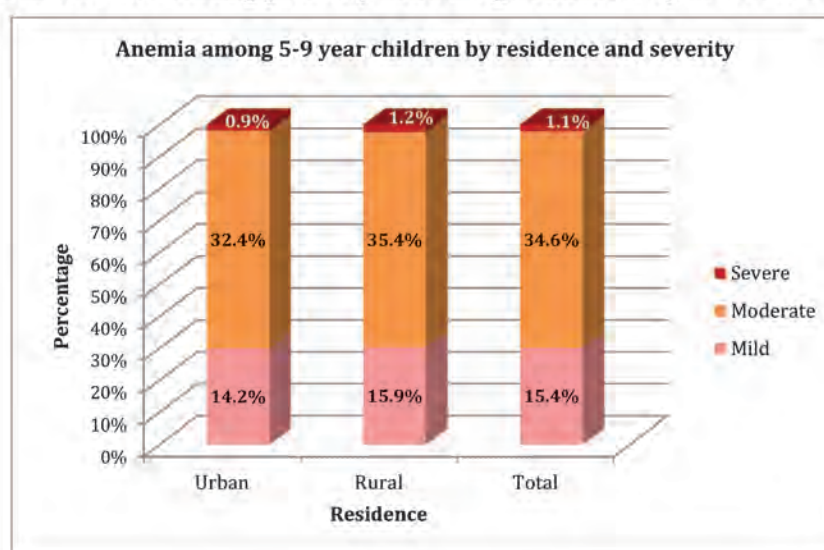


Figure 6.4.2.2: Anemia among primary school age children by state/region

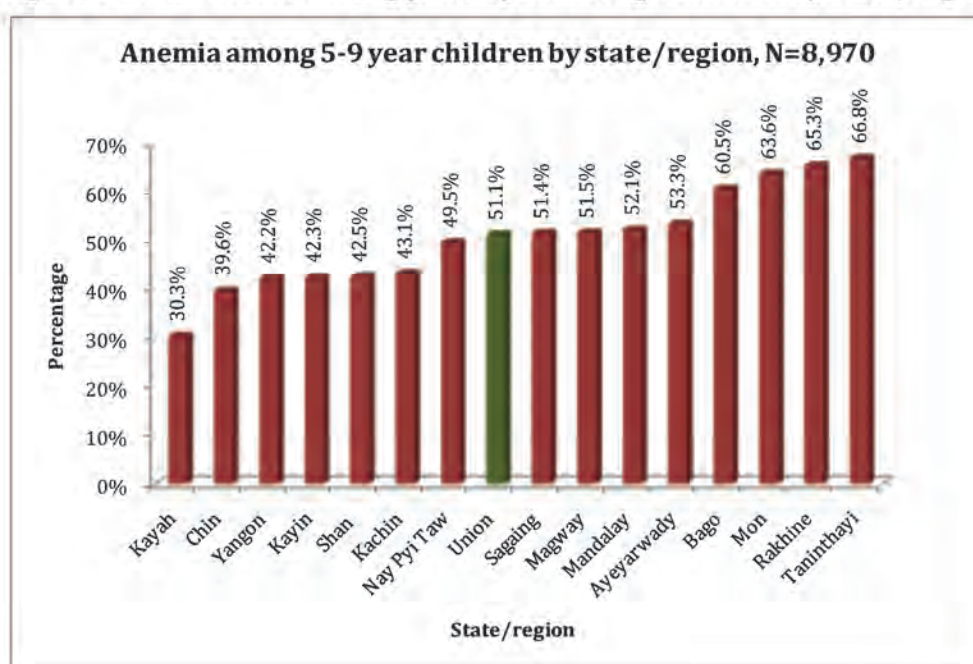


Table 6.4.2.1: Percent distribution of primary school age children (5-9 years) classified by anemia, and by selected background characteristics, N=8,970 (MMFCS 2017-18) ^{1,2}

Background characteristics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL)	(SD)	Number of children
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Gender																		
Male	51.5	[49.1-53.9]	2,317	1.4	[0.9-2.1]	61	35.1	[33.0-37.3]	1,578	15.1	[13.7-16.6]	678	48.5	[46.1-50.9]	2,182	11.4	1.4	4,499
Female	50.8	[48.4-53.1]	2,270	0.9	[0.6-1.4]	40	34.1	[32.0-36.3]	1,524	15.8	[14.4-17.2]	706	49.2	[46.9-51.6]	2,202	11.4	1.3	4,471
State/region																		
Kachin	43.1	[37.2-49.2]	96	0.1	[0.0-0.7]	0	29.1	[23.2-35.8]	65	13.9	[11.4-17.0]	31	56.9	[50.8-62.8]	127	11.6	2.1	222
Kayah	30.3	[25.4-35.6]	14	0.2	[0.0-1.4]	0	18.5	[14.9-22.7]	9	11.6	[9.1-14.6]	5	69.7	[64.4-74.6]	33	12.1	4.5	47
Kayin	42.3	[36.2-48.7]	108	0.4	[0.1-1.4]	1	29.0	[24.0-34.6]	74	13.0	[9.9-16.9]	33	57.7	[51.3-63.8]	147	11.6	1.9	254
Chin	39.6	[32.5-47.2]	30	1.2	[0.5-2.9]	1	26.4	[20.7-33.0]	20	12.1	[9.8-14.8]	9	60.4	[52.8-67.5]	46	11.8	4.1	75
Sagaing	51.4	[44.8-58.0]	466	0.7	[0.3-1.7]	6	34.8	[29.1-40.9]	316	15.9	[13.2-19.1]	145	48.6	[42.0-55.2]	441	11.4	1.1	908
Tanintharyi	66.8	[62.0-71.3]	157	2.5	[1.4-4.4]	6	50.9	[45.1-56.7]	119	13.4	[10.9-16.4]	31	33.2	[28.7-38.0]	78	10.8	2.4	234
Bago	60.5	[55.2-65.5]	569	2.4	[1.0-5.4]	22	43.0	[37.2-49.1]	405	15.1	[11.8-19.0]	142	39.5	[34.5-44.8]	372	11.0	1.1	941
Magway	51.5	[45.8-57.1]	392	0.2	[0.0-1.3]	1	34.3	[29.3-39.7]	261	16.9	[14.0-20.4]	129	48.5	[42.9-54.2]	369	11.4	1.1	761
Mandalay	52.1	[46.0-58.1]	566	0.5	[0.1-1.4]	5	36.9	[31.0-43.2]	401	14.7	[11.4-18.7]	160	47.9	[41.9-54.0]	521	11.4	1.0	1,087
Mon	63.6	[56.0-70.5]	222	2.0	[0.9-4.4]	7	41.0	[33.8-48.7]	144	20.5	[16.6-25.0]	72	36.4	[29.5-44.0]	127	11.1	1.6	350
Rakhine	65.3	[59.2-71.0]	245	1.0	[0.5-2.1]	4	44.2	[38.3-50.3]	166	20.0	[17.1-23.4]	75	34.7	[29.0-40.8]	130	11.0	1.6	376
Yangon	42.2	[37.1-47.4]	552	0.7	[0.2-2.1]	9	27.2	[23.1-31.7]	356	14.3	[11.5-17.6]	187	57.8	[52.6-62.9]	758	11.6	0.9	1,310
Shan	42.5	[36.2-49.1]	409	0.1	[0.0-1.0]	1	24.2	[18.9-30.5]	233	18.2	[15.1-21.8]	175	57.5	[50.9-63.8]	553	11.7	0.9	963
Ayeyarwady	53.3	[46.3-60.1]	654	2.8	[1.5-5.1]	35	37.6	[31.6-44.0]	462	12.8	[10.2-16.1]	158	46.7	[39.9-53.7]	574	11.3	1.1	1,229
Nay Pyi Taw	49.5	[44.6-54.5]	106	1.0	[0.4-2.3]	2	34.0	[29.2-39.1]	73	14.6	[11.0-19.0]	31	50.5	[45.5-55.4]	108	11.5	2.3	214
Residence																		
Rural	52.5	[50.1-55.0]	3,399	1.2	[0.8-1.8]	78	35.4	[33.2-37.8]	2,293	15.9	[14.6-17.2]	1,027	47.5	[45.0-49.9]	3,070	11.3	1.3	6,469
Urban	47.5	[44.2-50.8]	1,188	0.9	[0.5-1.6]	22	32.4	[29.4-35.5]	810	14.2	[12.7-15.9]	356	52.5	[49.2-55.8]	1,313	11.5	1.5	2,501

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL)	(SD)	Number of child-ren
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Wealth index																		
Least	55.2	[51.4-59.0]	1,238	2.0	[1.2-3.4]	45	38.5	[35.0-42.1]	863	14.7	[12.9-16.8]	330	44.8	[41.0-48.6]	1,003	11.2	1.3	2,242
Second	52.4	[49.2-55.6]	1,099	1.1	[0.6-1.9]	23	35.4	[32.1-38.8]	742	15.9	[14.1-17.9]	334	47.6	[44.4-50.8]	998	11.4	1.3	2,097
Middle	51.7	[48.5-54.8]	926	1.0	[0.6-1.8]	19	35.1	[31.9-38.4]	628	15.6	[13.5-17.9]	279	48.3	[45.2-51.5]	866	11.4	1.4	1,792
Fourth	47.7	[44.4-51.0]	683	0.6	[0.3-1.2]	9	32.0	[29.0-35.1]	457	15.1	[12.9-17.7]	217	52.3	[49.0-55.6]	748	11.5	1.4	1,431
Highest	45.5	[41.7-49.3]	641	0.4	[0.2-0.9]	6	29.2	[26.1-32.6]	412	15.8	[13.5-18.5]	223	54.5	[50.7-58.3]	768	11.6	1.4	1,409
Household food security status																		
Food secure	50.0	[47.7-52.4]	2,851	1.0	[0.7-1.4]	58	34.3	[32.1-36.5]	1,954	14.7	[13.6-16.0]	840	50.0	[47.6-52.3]	2,846	11.4	1.3	5,697
Mild insecure	50.1	[46.6-53.6]	540	1.4	[0.7-2.6]	15	32.7	[29.3-36.4]	352	16.1	[13.7-18.7]	173	49.9	[46.4-53.4]	537	11.4	1.5	1,076
Mod. insecure	52.5	[48.9-56.1]	814	0.7	[0.4-1.4]	11	35.4	[32.2-38.7]	548	16.4	[14.3-18.7]	254	47.5	[43.9-51.1]	736	11.3	1.4	1,550
Severe insecure	59.1	[53.9-64.1]	382	2.7	[1.3-5.3]	17	38.5	[33.4-43.8]	249	17.9	[14.7-21.6]	116	40.9	[35.9-46.1]	265	11.2	1.5	647
Household Dietary Diversity																		
DDS<6	50.8	[48.2-53.3]	2,226	1.1	[0.7-1.6]	48	35.2	[32.8-37.6]	1,543	14.5	[13.1-16.0]	635	49.2	[46.7-51.8]	2,158	11.4	1.4	4,384
DDS>=6	51.5	[49.1-53.9]	2,361	1.2	[0.8-1.7]	53	34.0	[31.8-36.3]	1,560	16.3	[14.9-17.8]	748	48.5	[46.1-50.9]	2,225	11.4	1.3	4,586
Total	51.1	[49.2-53.1]	4,587	1.1	[0.8-1.5]	101	34.6	[32.8-36.4]	3,103	15.4	[14.4-16.5]	1,383	48.9	[46.9-50.8]	4,383	11.4	1.4	8,970

1 Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

2 Anemia classification based on hemoglobin (Hb) concentration (WHO 2011)

Any anemia = Hb <11.5g/dL

No anemia = Hb ≥11.5g/dL

Mild anemia = Hb 11-11.4g/dL

Moderate anemia = Hb 8-10.9g/dL

Severe anemia = Hb <8g/dL

6.4.3. Anemia in adolescent girls

MMFCS showed that 29.8% of adolescent girls (between 10-14 years of age) had anemia of whom 21.6% had mild anemia, 7.9% had moderate anemia and only 0.3% had severe anemia. Adolescent girls living in households with poor wealth status and severe food insecurity had highest rate of anemia (39.1% and 40.3%) compared to those living in wealthier and food secure households as noted earlier for primary school age children. The adolescent girls from Rakhine state had the highest rate of anemia (50.6%) followed by Ayeyarwady region (42.2%) and Nay Pyi Taw (40.6%) (Table 6.4.3.1, Figure 6.4.3.1).

Figure 6.4.3.1: Anemia among adolescent girls by state/region

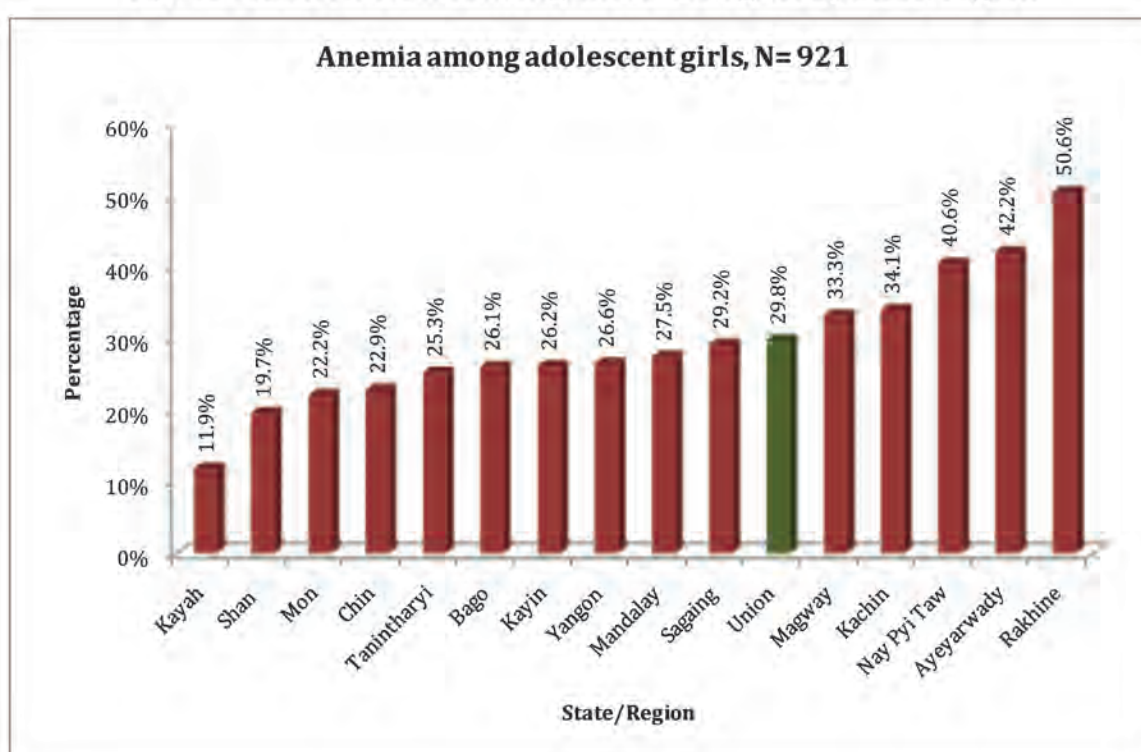


Table 6.4.3.1: Percent distribution of adolescent girls (10-14 years) classified by anemia, and by selected background characteristics, N=921 (MMFCS 2017-18) ^{1, 2}

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL)	(SD)	Number of girls
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
State/region																		
Kachin	34.1	[20.1-51.4]	8	0.0	0.0	0	13.1	[4.8-31.3]	3	20.9	[10.3-37.8]	5	65.9	[48.6-79.9]	15	12.4	1.9	23
Kayah	11.9	[5.8-22.7]	1	0.0	0.0	0	1.1	[0.1-7.8]	0	10.7	[5.3-20.4]	1	88.1	[77.3-94.2]	4	13.5	3.8	5
Kayin	26.2	[15.4-40.8]	7	3.6	[0.9-13.4]	1	8.5	[3.7-18.6]	2	14.0	[7.5-24.6]	4	73.8	[59.2-84.6]	20	12.5	2.1	27
Chin	22.9	[12.6-38.0]	2	0.0	0.0	0	3.2	[0.6-14.7]	0	19.7	[11.3-32.2]	1	77.1	[62.0-87.4]	5	12.9	3.2	7
Sagaing	29.2	[20.0-40.5]	28	0.0	0.0	0	7.8	[3.3-17.3]	7	21.4	[13.7-31.9]	20	70.8	[59.5-80.0]	68	12.5	1.0	95
Tanintharyi	25.3	[15.6-38.1]	6	0.0	0.0	0	10.4	[4.6-21.7]	3	14.9	[8.3-25.3]	4	74.7	[61.9-84.4]	18	12.5	2.1	24
Bago	26.1	[15.7-40.1]	25	0.0	0.0	0	9.7	[3.7-23.1]	9	16.4	[8.3-29.9]	16	73.9	[59.9-84.3]	72	12.8	1.0	98
Magway	33.3	[22.3-46.4]	27	1.2	[0.2-8.2]	1	12.8	[5.8-25.9]	10	19.3	[11.3-31.1]	16	66.7	[53.6-77.7]	55	12.2	1.1	82
Mandalay	27.5	[17.1-41.1]	32	0.0	0.0	0	6.2	[2.6-14.2]	7	21.3	[11.6-35.8]	25	72.5	[58.9-82.9]	84	12.6	0.8	115
Mon	22.2	[12.6-36.1]	8	1.0	[0.1-6.9]	0	5.4	[1.7-15.9]	2	15.9	[8.8-26.9]	6	77.8	[63.9-87.4]	29	12.5	1.4	37
Rakhine	50.6	[37.0-64.1]	17	1.8	[0.2-11.7]	1	17.1	[9.2-29.6]	6	31.8	[21.6-44.0]	11	49.4	[35.9-63.0]	17	12.0	1.9	33
Yangon	26.6	[16.9-39.3]	36	0.0	0.0	0	1.7	[0.2-11.1]	2	25.0	[15.4-37.8]	34	73.4	[60.7-83.1]	100	13.0	1.0	137
Shan	19.7	[10.4-34.1]	20	0.0	0.0	0	6.1	[2.2-15.3]	6	13.6	[7.2-24.3]	14	80.3	[65.9-89.6]	80	13.1	1.0	100
Ayeyarwady	42.2	[30.6-54.7]	50	0.0	0.0	0	9.2	[4.0-19.8]	11	32.9	[22.6-45.3]	39	57.8	[45.3-69.4]	69	12.5	1.0	120
Nay Pyi Taw	40.6	[27.6-55.0]	7	0.0	0.0	0	16.6	[9.3-27.9]	3	24.0	[13.8-38.4]	4	59.4	[45.0-72.4]	11	12.1	2.5	18
Residence																		
Rural	29.3	[24.9-34.0]	201	0.2	[0.1-0.7]	2	7.7	[5.5-10.7]	53	21.4	[17.6-25.7]	147	70.7	[66.0-75.1]	485	12.7	1.2	686
Urban	31.3	[25.1-38.4]	74	0.6	[0.1-2.6]	1	8.5	[5.4-13.1]	20	22.3	[16.5-29.3]	52	68.7	[61.6-74.9]	161	12.6	1.6	235
Wealth index																		
Least	39.1	[30.7-48.3]	75	0.3	[0.0-2.2]	1	10.7	[6.0-18.4]	20	28.1	[21.0-36.5]	54	60.9	[51.7-69.3]	117	12.5	1.2	192
Second	29.6	[22.5-37.7]	64	0.2	[0.0-1.6]	0	7.2	[4.0-12.6]	16	22.1	[16.1-29.6]	48	70.4	[62.3-77.5]	153	12.5	1.1	217
Middle	26.0	[18.1-35.7]	49	0.5	[0.1-3.6]	1	7.2	[3.6-13.7]	14	18.2	[11.4-27.8]	34	74.0	[64.3-81.9]	139	12.7	1.4	188
Fourth	28.4	[20.8-37.4]	53	0.3	[0.0-1.9]	0	7.5	[4.1-13.4]	14	20.6	[14.5-28.5]	38	71.6	[62.6-79.2]	133	12.7	1.5	185
Highest	24.4	[16.1-35.2]	34	0.3	[0.0-1.9]	0	6.5	[3.5-11.8]	9	17.7	[10.3-28.7]	25	75.6	[64.8-83.9]	105	12.9	1.6	139

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL)	Number of girls
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)		
Household food security status																	
Food secure	27.8	[23.2-32.9]	163	0.1	[0.0-0.4]	0	7.0	[5.0-9.7]	41	20.7	[16.6-25.6]	121	72.2	[67.1-76.8]	422	12.7	1.3
Mild insecure	33.0	[22.8-45.1]	32	1.0	[0.3-3.9]	1	11.0	[5.2-22.0]	11	21.0	[12.8-32.3]	20	67.0	[54.9-77.2]	65	12.4	1.3
Mod. insecure	31.0	[23.6-39.7]	55	0.9	[0.2-3.7]	2	11.5	[6.9-18.4]	20	18.7	[12.5-26.9]	33	69.0	[60.3-76.4]	122	12.6	1.6
Severe insecure	40.3	[25.0-57.8]	25	0.0	0.0	0	1.0	[0.1-6.7]	1	39.3	[24.1-57.0]	24	59.7	[42.2-75.0]	37	12.5	1.2
Household Dietary Diversity																	
DDS<6	31.6	[26.3-37.5]	142	0.6	[0.2-1.6]	3	6.1	[4.1-9.2]	28	24.9	[20.1-30.5]	112	68.4	[62.5-73.7]	308	12.6	1.3
DDS≥6	28.1	[23.2-33.5]	132	0.1	[0.0-0.6]	0	9.6	[6.6-13.6]	45	18.4	[14.4-23.3]	87	71.9	[66.5-76.8]	339	12.7	1.4
Total	29.8	[26.2-33.7]	275	0.3	[0.1-0.8]	3	7.9	[6.0-10.3]	73	21.6	[18.4-25.2]	199	70.2	[66.3-73.8]	646	12.6	1.4

1 Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

2 Anemia classification based on hemoglobin (Hb) concentration (WHO 2011)

Girls 10-11 years of age

Any anemia = Hb <11.5g/dL
 No anemia = Hb ≥11.5g/dL
 Mild anemia = Hb 11-11.4g/dL
 Moderate anemia = Hb 8-10.9g/dL
 Severe anemia = Hb <8g/dL

Girls 12-14 years of age

Any anemia = Hb <12g/dL
 No anemia = Hb ≥12g/dL
 Mild anemia = Hb 11-11.9g/dL
 Moderate anemia = Hb 8-10.9g/dL
 Severe anemia = Hb <8g/dL

6.5. Anemia in women

6.5.1. Anemia in pregnant women

In general, 40% of pregnant women had anemia while 23.9% had mild anemia, 15.3% had moderate anemia and 0.8% had severe anemia. Pregnant women younger than 20 years of age and older than 40 years of age were found have higher rates of anemia compared to those between 20-39 years of age. The women living in rural areas had a higher prevalence of anemia than those from urban areas. Pregnant women living in households with poor wealth status and severe food insecurity had the highest rate of anemia (42.9% and 43.7%) than those living in wealthier and food secure households (29.9% and 40.1%) (**Table 6.5.1.1**). Nay Pyi Taw Union Territory had the highest rate of anemia in pregnant women followed by Mandalay and Kachin state (**Figure 6.5.1.1**).

Figure 6.5.1.1: Anemia among pregnant women by state/region

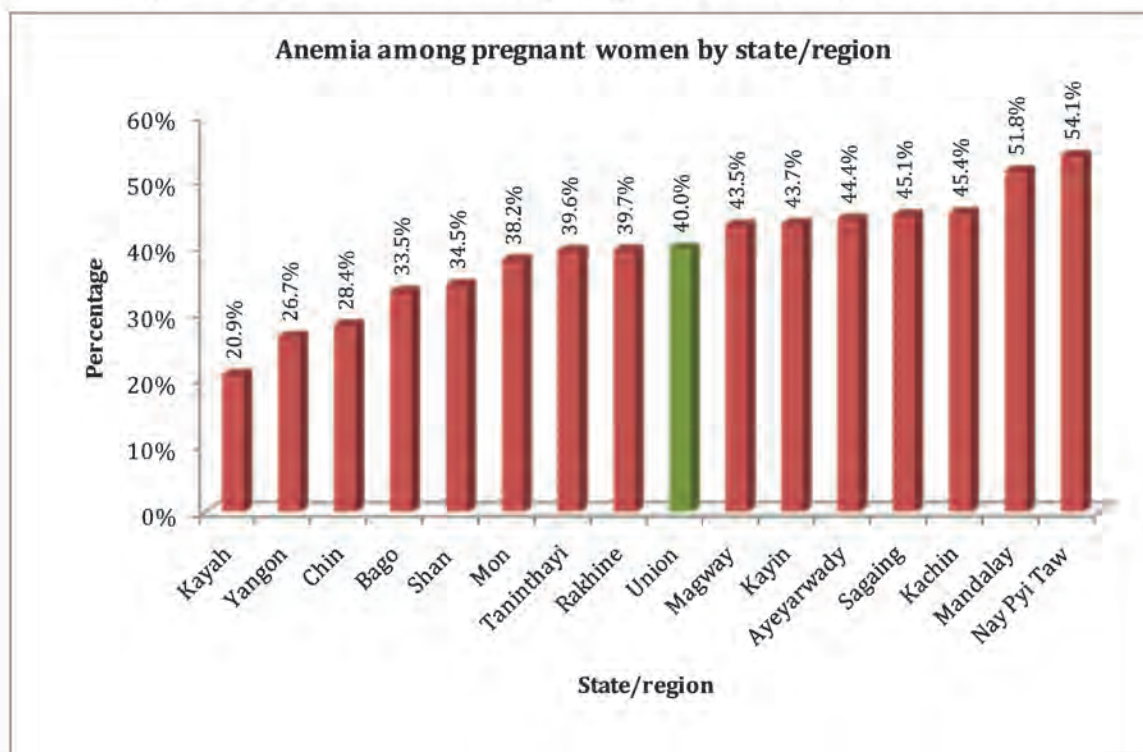


Table 6.5.1.1: Percent distribution of pregnant women classified by anemia, and by selected background characteristics, N=898 (MMFCS 2017-18) ^{1,2}

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL, SD)	Number of women
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)		
Age in years																	
15-19	49.2	[34.5-64.1]	24	0.0	0.0	0	24.3	[13.9-39.0]	12	24.9	[12.7-43.1]	12	50.8	[35.9-65.5]	24	11.2	1.7
20-24	39.6	[32.1-47.5]	92	1.5	[0.4-5.9]	3	19.7	[13.8-27.2]	46	18.4	[13.0-25.5]	43	60.4	[52.5-67.9]	140	11.1	1.5
25-29	34.6	[27.6-42.3]	81	0.5	[0.1-2.1]	1	10.6	[6.6-16.6]	25	23.4	[17.5-30.6]	55	65.4	[57.7-72.4]	153	11.4	1.4
30-34	39.2	[31.1-47.9]	85	1.2	[0.2-6.1]	3	12.4	[8.0-18.6]	27	25.7	[18.9-33.9]	56	60.8	[52.1-68.9]	132	11.2	1.4
35-39	43.4	[33.7-53.6]	58	0.3	[0.0-2.0]	0	15.5	[9.3-24.8]	21	27.6	[19.3-37.8]	37	56.6	[46.4-66.3]	76	11.2	1.4
40-44	56.6	[34.8-76.1]	17	0.0	0.0	0	23.1	[10.5-43.4]	7	33.5	[16.8-55.7]	10	43.4	[23.9-65.2]	13	10.9	1.1
≥45	100.0	0.0	2	0.0	0.0	0	0.0	0.0	0	100.0	0.0	2	0.0	0.0	0	10.1	0.1
State/region																	
Kachin	45.4	[30.5-61.1]	10	0.0	0.0	0	11.2	[5.3-22.2]	2	34.2	[22.8-47.7]	8	54.6	[38.9-69.5]	12	11.4	2.4
Kayah	20.9	[11.7-34.4]	1	0.0	0.0	0	5.2	[1.6-15.3]	0	15.7	[8.8-26.3]	1	79.1	[65.6-88.3]	4	11.8	4.4
Kayin	43.7	[29.5-59.0]	11	0.0	0.0	0	22.7	[13.2-36.2]	6	21.0	[12.4-33.4]	5	56.3	[41.0-70.5]	14	11.1	2.6
Chin	28.4	[17.9-41.8]	2	0.0	0.0	0	8.7	[3.5-20.1]	1	19.7	[10.3-34.5]	1	71.6	[58.2-82.1]	5	11.8	3.7
Sagaing	45.1	[31.6-59.4]	41	1.4	[0.2-9.5]	1	13.5	[7.2-23.9]	12	30.2	[20.5-42.1]	28	54.9	[40.6-68.4]	50	11.0	1.0
Tanintharyi	39.6	[27.7-52.8]	9	0.0	0.0	0	16.7	[9.7-27.2]	4	22.9	[13.3-36.6]	5	60.4	[47.2-72.3]	14	11.2	2.0
Bago	33.5	[22.0-47.3]	32	0.0	0.0	0	12.1	[4.8-27.4]	12	21.4	[12.4-34.4]	20	66.5	[52.7-78.0]	64	11.3	0.8
Magway	43.5	[29.4-58.7]	33	0.0	0.0	0	14.9	[7.2-28.4]	11	28.6	[18.5-41.4]	22	56.5	[41.3-70.6]	43	11.1	1.0
Mandalay	51.8	[41.7-61.8]	57	0.0	0.0	0	16.7	[8.4-30.5]	18	35.1	[26.0-45.4]	39	48.2	[38.2-58.3]	53	10.9	0.9
Mon	38.2	[26.0-52.2]	13	2.1	[0.3-13.9]	1	13.9	[7.2-25.0]	5	22.2	[13.6-34.2]	8	61.8	[47.8-74.0]	22	11.0	1.9
Rakhine	39.7	[26.5-54.6]	14	0.0	0.0	0	19.9	[10.0-35.6]	7	19.9	[11.3-32.4]	7	60.3	[45.4-73.5]	22	11.0	1.5
Yangon	26.7	[17.0-39.3]	34	1.7	[0.2-11.1]	2	10.0	[4.7-20.0]	13	15.0	[7.7-27.3]	19	73.3	[60.7-83.0]	94	11.6	1.0
Shan	34.5	[23.8-47.1]	33	0.0	0.0	0	25.3	[16.7-36.3]	24	9.2	[4.2-19.0]	9	65.5	[52.9-76.2]	62	11.4	1.3
Ayeyarwady	44.4	[32.7-56.8]	55	1.7	[0.2-11.5]	2	12.7	[5.6-26.4]	16	30.0	[20.3-41.9]	37	55.6	[43.2-67.3]	69	11.3	1.1
Nay Pyi Taw	54.1	[41.7-66.1]	11	5.5	[1.8-15.5]	1	25.2	[15.7-38.0]	5	23.4	[13.3-37.9]	5	45.9	[33.9-58.3]	10	10.5	3.7
Residence																	
Rural	41.7	[37.4-46.2]	272	0.6	[0.2-1.9]	4	15.6	[12.3-19.7]	102	25.5	[21.9-29.5]	166	58.3	[53.8-62.6]	380	11.2	1.3
Urban	35.4	[27.5-44.1]	87	1.4	[0.3-5.6]	3	14.2	[9.5-20.7]	35	19.8	[14.1-26.9]	49	64.6	[55.9-72.5]	159	11.4	1.6

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL)	Number of women
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)		
Wealth index																	
Least	42.9	[34.5-51.7]	92	0.2	[0.0-1.3]	0	20.1	[13.3-29.2]	43	22.6	[16.1-30.7]	49	57.1	[48.3-65.5]	123	11.1	1.4
Second	49.2	[40.3-58.2]	89	1.4	[0.3-7.2]	3	20.0	[13.7-28.3]	36	27.8	[20.2-36.8]	50	50.8	[41.8-59.7]	92	11.0	1.3
Middle	37.0	[29.2-45.6]	73	1.7	[0.4-7.1]	3	12.2	[7.8-18.5]	24	23.0	[16.6-31.0]	45	63.0	[54.4-70.8]	124	11.3	1.3
Fourth	38.4	[30.0-47.6]	62	0.7	[0.2-3.0]	1	9.6	[5.5-16.0]	15	28.2	[20.9-36.8]	46	61.6	[52.4-70.0]	100	11.2	1.4
Highest	29.9	[21.5-40.0]	43	0.0	0.0	0	12.5	[7.3-20.7]	18	17.4	[11.2-26.1]	25	70.1	[60.0-78.5]	101	11.7	1.6
Household food security status																	
Food secure	40.1	[35.4-44.9]	240	0.8	[0.3-2.4]	5	13.0	[10.1-16.7]	78	26.3	[22.2-30.8]	157	59.9	[55.1-64.6]	359	11.3	1.3
Mild insecure	47.1	[35.9-58.6]	51	0.0	0.0	0	23.3	[15.3-34.0]	25	23.7	[15.3-34.8]	26	52.9	[41.4-64.1]	58	11.0	1.4
Mod. insecure	32.3	[23.0-43.2]	44	0.0	0.0	0	14.9	[8.4-25.0]	20	17.4	[11.3-25.8]	23	67.7	[56.8-77.0]	91	11.2	1.3
Severe insecure	43.7	[27.9-61.0]	24	4.6	[0.8-21.4]	3	24.5	[12.5-42.5]	13	14.7	[6.5-29.7]	8	56.3	[39.0-72.1]	31	11.1	2.2
Household Dietary Diversity																	
DDS<6	40.5	[35.2-46.1]	169	1.0	[0.3-3.3]	4	16.6	[12.7-21.5]	70	22.9	[18.5-27.9]	96	59.5	[53.9-64.8]	249	11.2	1.5
DDS>=6	39.5	[34.3-45.0]	190	0.7	[0.2-2.7]	3	14.0	[10.4-18.7]	67	24.8	[20.4-29.8]	119	60.5	[55.0-65.7]	290	11.3	1.3
Total	40.0	[36.1-44.0]	359	0.8	[0.3-2.0]	7	15.3	[12.4-18.6]	137	23.9	[20.8-27.3]	215	60.0	[56.0-63.9]	539	11.2	1.4

1 Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

2 Anemia classification based on hemoglobin (Hb) concentration (WHO 2011)

Any anemia = Hb <11g/dL

No anemia = Hb ≥11g/dL

Mild anemia = Hb 10-10.9g/dL

Moderate anemia = Hb 7-9.9g/dL

Severe anemia = Hb <7g/dL

6.5.2. Anemia in lactating women

Overall, 35.4% of lactating women had anemia while 21.1% had mild anemia, 12.9% had moderate anemia and 1.4% had severe anemia. Lactating mothers from households with poor wealth status and severe food insecurity had the highest rate of anemia (43.8% and 40%) compared to those living in wealthier and food secure households (32.6% and 35.1%). The mothers living in rural areas had a higher prevalence (38%) of anemia than those from urban areas (28%). Lactating women who were older than 40 years of age had the highest prevalence (51%) of anemia compared to other age groups (Table 6.5.2.1). Rate of anemia among lactating women was highest in Tanintharyi region followed by Bago region and Kachin state (Figure 6.5.2.1).

Figure 6.5.2.1: Anemia among lactating women by state/region

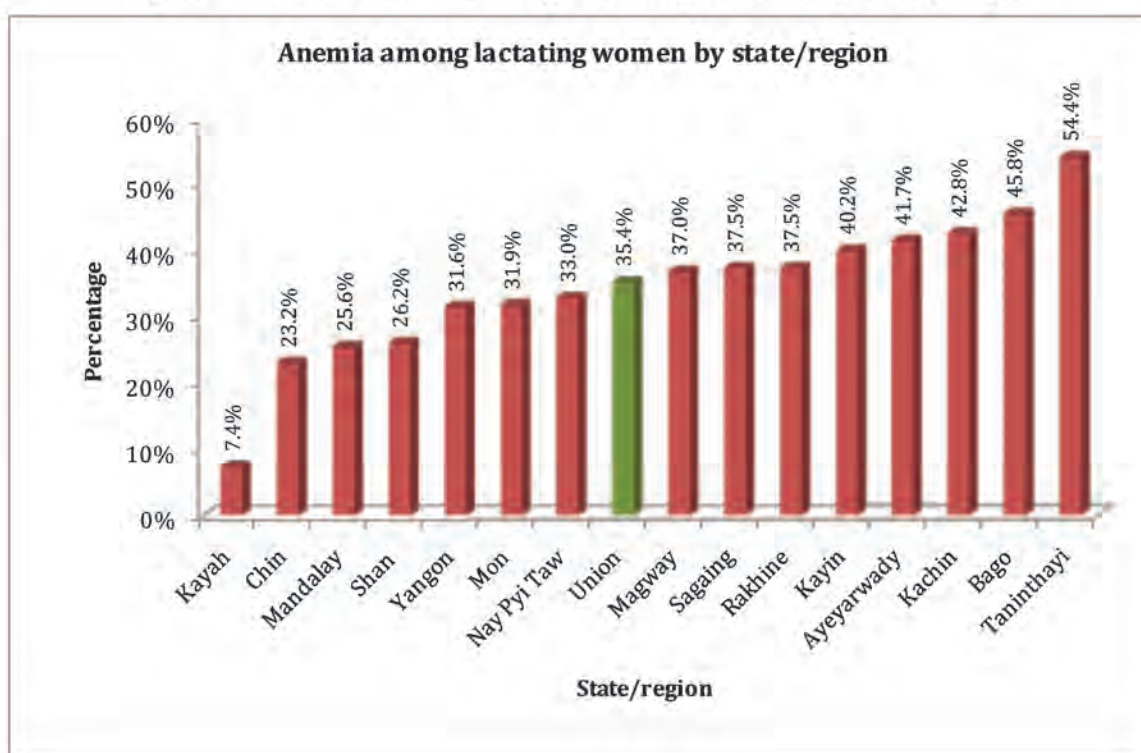


Table 6.5.2.1: Percent distribution of lactating women classified by anemia, and by selected background characteristics, N=907 (MMFCS 2017-18) ^{1, 2}

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL)	(SD)	Number of women
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Age in years																		
15-19	18.6	[8.2-36.9]	6	4.0	[0.5-23.9]	1	9.9	[2.9-28.3]	3	4.8	[1.4-14.6]	2	81.4	[63.1-91.8]	26	12.7	1.9	32
20-24	37.2	[29.4-45.6]	84	3.8	[1.6-8.9]	9	11.8	[7.5-18.0]	27	21.5	[15.6-28.9]	49	62.8	[54.4-70.6]	143	12.3	1.8	227
25-29	34.5	[27.0-42.9]	81	1.2	[0.2-5.5]	3	11.0	[7.0-17.1]	26	22.3	[16.1-30.0]	52	65.5	[57.1-73.0]	154	12.4	1.5	235
30-34	39.3	[31.8-47.3]	85	0.0	0.0	0	18.7	[13.1-25.9]	40	20.6	[14.7-28.1]	45	60.7	[52.7-68.2]	132	12.2	1.5	217
35-39	28.6	[20.6-38.3]	42	0.1	[0.0-0.9]	0	10.4	[5.7-18.4]	15	18.1	[11.5-27.2]	26	71.4	[61.7-79.4]	104	12.6	1.4	146
40-44	50.7	[32.4-68.8]	18	0.0	0.0	0	14.1	[5.6-31.3]	5	36.5	[20.6-56.1]	13	49.3	[31.2-67.6]	18	11.9	1.4	36
≥45	32.1	[8.5-70.6]	4	0.0	0.0	0	0.0	0.0	0	32.1	[8.5-70.6]	4	67.9	[29.4-91.5]	9	12.7	0.9	13
State/region																		
Kachin	42.8	[29.8-56.8]	10	0.0	0.0	0	19.0	[10.9-31.2]	4	23.7	[15.2-35.1]	5	57.2	[43.2-70.2]	13	12.3	2.1	22
Kayah	7.4	[2.7-19.0]	0	0.0	0.0	0	2.1	[0.5-8.4]	0	5.3	[1.9-13.9]	0	92.6	[81.0-97.3]	4	13.4	4.3	5
Kayin	40.2	[29.4-52.0]	10	0.0	0.0	0	14.8	[7.7-26.4]	4	25.4	[15.9-38.0]	7	59.8	[48.0-70.6]	15	12.0	1.8	26
Chin	23.2	[12.4-39.4]	2	4.6	[1.2-16.4]	0	9.3	[4.0-20.3]	1	9.3	[3.0-25.7]	1	76.8	[60.6-87.6]	6	12.6	5.7	8
Sagaing	37.5	[26.5-50.1]	34	0.0	0.0	0	10.1	[4.7-20.1]	9	27.5	[17.8-39.8]	25	62.5	[49.9-73.5]	57	12.3	1.0	91
Tanintharyi	54.4	[42.4-66.0]	13	0.0	0.0	0	11.2	[5.6-21.3]	3	43.2	[31.7-55.5]	10	45.6	[34.0-57.6]	11	12.1	2.1	24
Bago	45.8	[34.2-57.8]	44	3.6	[0.9-13.2]	3	15.7	[8.0-28.4]	15	26.5	[17.4-38.1]	25	54.2	[42.2-65.8]	52	12.1	1.4	95
Magway	37.0	[26.1-49.3]	28	1.8	[0.3-12.0]	1	17.0	[9.7-28.0]	13	18.2	[10.5-29.6]	14	63.0	[50.7-73.9]	48	12.3	1.5	77
Mandalay	25.6	[16.1-38.2]	28	0.0	0.0	0	14.1	[7.3-25.3]	16	11.5	[5.3-23.2]	13	74.4	[61.8-83.9]	82	12.7	1.0	110
Mon	31.9	[21.6-44.3]	11	0.0	0.0	0	8.5	[3.5-19.1]	3	23.3	[14.8-34.7]	8	68.1	[55.7-78.4]	24	12.3	1.4	35
Rakhine	37.5	[25.1-51.9]	14	0.0	0.0	0	11.9	[6.0-22.2]	5	25.6	[15.1-40.1]	10	62.5	[48.1-74.9]	24	12.4	1.8	38
Yangon	31.6	[20.9-44.6]	42	0.0	0.0	0	8.2	[2.5-23.9]	11	23.3	[14.6-35.1]	31	68.4	[55.4-79.1]	90	12.5	0.9	132
Shan	26.2	[16.2-39.4]	26	3.1	[0.8-12.0]	3	12.2	[5.4-25.2]	12	10.9	[4.5-24.2]	11	73.8	[60.6-83.8]	72	12.7	1.4	98
Ayeyarwady	41.7	[27.5-57.5]	52	3.5	[0.9-12.8]	4	14.6	[7.3-26.8]	18	23.7	[13.6-38.1]	29	58.3	[42.5-72.5]	72	12.0	1.3	124
Nay Pyi Taw	33.0	[21.6-46.8]	7	1.8	[0.2-11.9]	0	18.8	[10.6-30.9]	4	12.4	[6.6-22.2]	3	67.0	[53.2-78.4]	15	12.6	3.3	22
Residence																		
Rural	38.1	[33.5-43.0]	249	1.8	[0.8-3.7]	12	14.2	[10.9-18.2]	93	22.2	[18.4-26.4]	145	61.9	[57.0-66.5]	404	12.3	1.5	653
Urban	28.4	[21.9-35.9]	72	0.5	[0.1-3.5]	1	9.5	[5.8-15.2]	24	18.4	[13.1-25.3]	47	71.6	[64.1-78.1]	182	12.6	1.6	254

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL)	(SD)	Number of women
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Wealth index																		
Least	43.8	[35.2-52.8]	91	4.6	[2.0-10.3]	9	17.8	[12.2-25.3]	37	21.4	[15.1-29.4]	44	56.2	[47.2-64.8]	116	11.9	1.8	207
Second	36.4	[29.3-44.2]	88	0.9	[0.2-4.5]	2	9.9	[6.0-15.8]	24	25.6	[19.4-33.0]	62	63.6	[55.8-70.7]	153	12.4	1.2	241
Middle	26.3	[19.3-34.9]	40	0.0	0.0	0	11.9	[7.1-19.3]	18	14.5	[9.3-21.9]	22	73.7	[65.1-80.7]	113	12.7	1.4	153
Fourth	34.4	[26.1-43.9]	51	0.9	[0.1-6.0]	1	12.9	[6.9-22.9]	19	20.7	[14.5-28.5]	31	65.6	[56.1-73.9]	98	12.5	1.8	149
Highest	32.6	[24.2-42.3]	51	0.0	0.0	0	11.8	[6.4-20.8]	19	20.8	[13.9-29.9]	33	67.4	[57.7-75.8]	106	12.4	1.4	157
Household food security status																		
Food secure	35.1	[30.2-40.3]	205	0.9	[0.3-2.8]	5	12.4	[9.2-16.7]	72	21.8	[18.1-26.0]	127	64.9	[59.7-69.8]	378	12.4	1.4	583
Mild insecure	34.0	[24.4-45.2]	40	3.1	[0.8-10.8]	4	7.3	[3.4-14.8]	9	23.6	[15.4-34.5]	28	66.0	[54.8-75.6]	78	12.5	1.8	118
Mod.insecure	35.9	[27.6-45.1]	52	1.4	[0.3-5.8]	2	16.8	[10.9-24.9]	24	17.7	[11.8-25.8]	26	64.1	[54.9-72.4]	93	12.3	1.8	145
Severe insecure	40.0	[26.4-55.3]	24	3.5	[0.5-21.1]	2	18.4	[9.3-33.0]	11	18.1	[9.3-32.0]	11	60.0	[44.7-73.6]	37	11.8	1.9	61
Household Dietary Diversity																		
DDS<5	34.8	[29.7-40.3]	159	2.2	[1.0-4.9]	10	12.7	[9.2-17.2]	58	19.9	[15.7-24.8]	91	65.2	[59.7-70.3]	298	12.3	1.7	457
DDS>=5	36.1	[30.4-42.1]	162	0.6	[0.1-2.4]	3	13.0	[9.5-17.7]	59	22.4	[17.9-27.7]	101	63.9	[57.9-69.6]	288	12.4	1.4	450
Total	35.4	[31.5-39.5]	321	1.4	[0.7-2.9]	13	12.9	[10.2-16.1]	117	21.1	[18.0-24.6]	192	64.6	[60.5-68.5]	586	12.4	1.6	907

1 Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

2 Anemia classification based on hemoglobin (Hb) concentration (WHO 2011)

Any anemia = Hb <12g/dL
 No anemia = Hb ≥12g/dL
 Mild anemia = Hb 11-11.9g/dL
 Moderate anemia = Hb 8-10.9g/dL
 Severe anemia = Hb <8g/dL

6.5.3. Anemia in women of reproductive age

One in three women of reproductive age (30.3%) had anemia while 18.2% had mild anemia, 11.2% had moderate anemia and 0.9% had severe anemia. The women from households with poor wealth status and severe food insecurity had the highest rate of anemia (33% and 35%) compared to those living in wealthier and food secure households (28% and 30%). The women from Rakhine state had the highest rate of anemia (49%) followed by Ayeyarwady region (40.5%), Kachin state (39%) and Tanintharyi region (36.4%) (Table 6.5.3.1, Figure 6.5.3.1).

Figure 6.5.3.1: Anemia among women of reproductive age by state/region

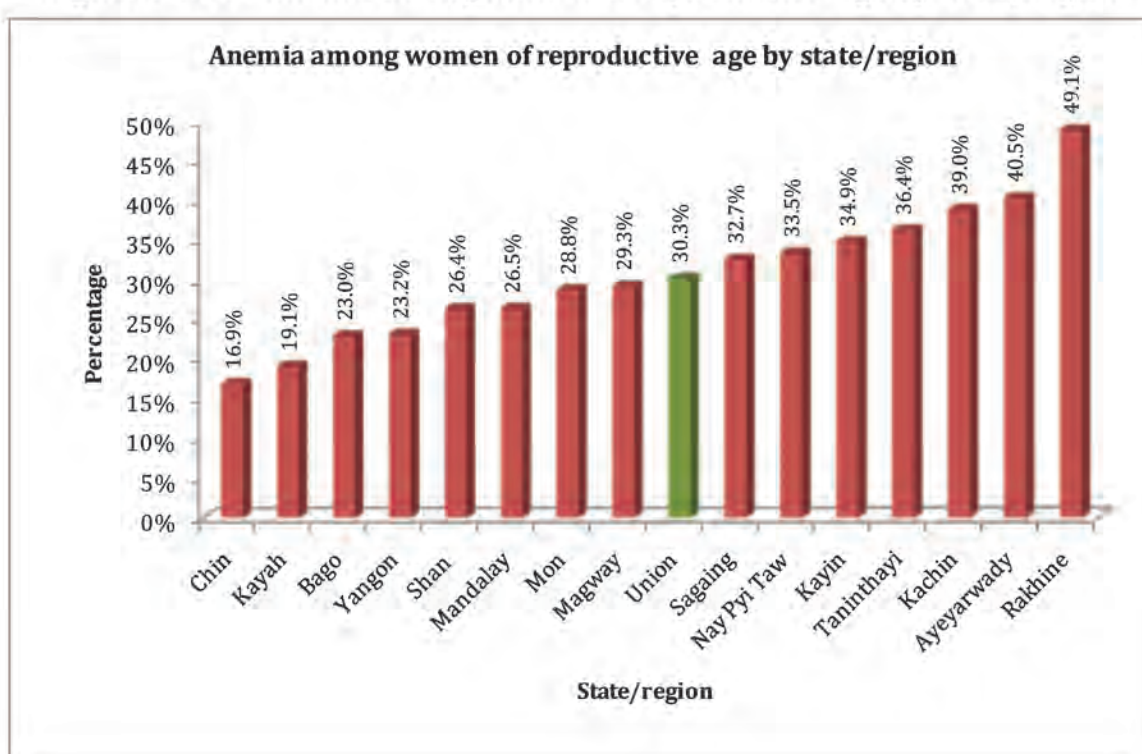


Table 6.5.3.1: Percent distribution of women of reproductive age (15-49 years, non-pregnant, non-lactating) classified by anemia, and by selected background characteristics, N=8,920 (MMFCS 2017-18) ^{1, 2}

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL, SD)	Total women
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)		
Age in years																	
15-19	33.2	[29.6-37.1]	308	1.9	[1.0-3.4]	17	12.3	[10.0-15.1]	115	19.0	[16.2-22.2]	177	66.8	[62.9-70.4]	620	12.3	1.6
20-24	30.8	[27.4-34.5]	301	0.5	[0.2-1.3]	4	11.8	[9.6-14.5]	116	18.5	[15.8-21.7]	181	69.2	[65.5-72.6]	675	12.6	1.5
25-29	26.0	[23.1-29.1]	336	0.4	[0.2-1.2]	6	9.7	[7.9-11.7]	125	15.9	[13.5-18.6]	205	74.0	[70.9-76.9]	958	12.7	1.4
30-34	28.9	[26.0-31.9]	485	0.5	[0.2-1.2]	9	9.2	[7.7-10.9]	154	19.1	[16.7-21.8]	322	71.1	[68.1-74.0]	1,195	12.6	1.4
35-39	29.3	[26.8-32.0]	486	0.8	[0.4-1.5]	13	11.3	[9.6-13.3]	187	17.3	[15.2-19.5]	286	70.7	[68.0-73.2]	1,170	12.6	1.5
40-44	33.2	[29.9-36.7]	458	1.6	[0.9-2.6]	22	12.3	[10.2-14.7]	169	19.4	[16.8-22.2]	267	66.8	[63.3-70.1]	921	12.5	1.6
≥45	32.5	[29.0-36.2]	327	1.3	[0.6-2.6]	13	13.0	[10.4-16.2]	131	18.2	[15.6-21.1]	183	67.5	[63.8-71.0]	679	12.5	1.6
State/region																	
Kachin	39.0	[34.1-44.2]	86	1.1	[0.4-3.2]	2	14.7	[11.2-19.2]	33	23.2	[18.6-28.5]	51	61.0	[55.8-65.9]	135	12.3	2.4
Kayah	19.1	[15.4-23.5]	9	1.4	[0.6-2.9]	1	6.8	[5.0-9.1]	3	11.0	[8.2-14.6]	5	80.9	[76.5-84.6]	38	13.1	5.7
Kayin	34.9	[30.5-39.5]	88	0.5	[0.2-1.5]	1	13.6	[10.1-18.1]	35	20.7	[17.5-24.4]	53	65.1	[60.5-69.5]	165	12.3	2.3
Chin	16.9	[12.7-22.2]	13	1.0	[0.4-2.2]	1	6.8	[4.9-9.5]	5	9.1	[6.2-13.2]	7	83.1	[77.8-87.3]	63	13.1	4.1
Sagaing	32.7	[26.6-39.4]	297	1.1	[0.5-2.3]	10	12.8	[9.4-17.0]	116	18.8	[15.5-22.7]	171	67.3	[60.6-73.4]	611	12.5	1.2
Tanintharyi	36.4	[29.0-44.4]	85	0.5	[0.1-2.3]	1	15.3	[11.1-20.7]	36	20.5	[16.4-25.3]	48	63.6	[55.6-71.0]	149	12.4	2.5
Bago	23.0	[18.7-27.9]	217	0.9	[0.4-2.1]	8	8.5	[6.0-11.8]	80	13.6	[10.4-17.7]	129	77.0	[72.1-81.3]	728	12.7	1.1
Magway	29.3	[23.7-35.6]	223	0.7	[0.2-2.3]	5	11.4	[8.3-15.3]	86	17.2	[13.7-21.4]	131	70.7	[64.4-76.3]	538	12.5	1.3
Mandalay	26.5	[22.3-31.1]	286	1.1	[0.5-2.3]	12	8.4	[5.8-12.0]	91	17.0	[13.9-20.5]	183	73.5	[68.9-77.7]	794	12.7	1.1
Mon	28.8	[24.8-33.3]	99	0.9	[0.4-2.0]	3	8.7	[6.4-11.8]	30	19.3	[16.1-22.9]	66	71.2	[66.7-75.2]	244	12.4	1.7
Rakhine	49.1	[42.2-56.0]	177	0.5	[0.1-2.2]	2	19.7	[15.6-24.7]	71	28.8	[24.7-33.3]	104	50.9	[44.0-57.8]	184	12.0	1.8
Yangon	23.2	[19.0-28.2]	303	1.0	[0.5-2.1]	13	8.0	[6.0-10.6]	104	14.2	[11.4-17.6]	186	76.8	[71.8-81.0]	1,001	12.8	1.1
Shan	26.4	[22.1-31.1]	250	0.8	[0.4-1.9]	8	9.6	[7.2-12.8]	91	15.9	[12.9-19.4]	151	73.6	[68.9-77.9]	697	12.9	1.3
Ayeyarwady	40.5	[34.8-46.5]	496	1.1	[0.6-2.2]	14	15.4	[12.1-19.5]	189	23.9	[19.8-28.6]	293	59.5	[53.5-65.2]	728	12.2	1.1
Nay Pyi Taw	33.5	[29.0-38.3]	72	0.9	[0.4-2.1]	2	12.5	[9.8-15.8]	27	20.1	[17.0-23.5]	43	66.5	[61.7-71.0]	142	12.5	2.7
Residence																	
Rural	30.8	[28.8-33.0]	1,988	0.8	[0.6-1.2]	55	11.6	[10.4-13.0]	749	18.4	[17.0-19.9]	1,184	69.2	[67.0-71.2]	4,457	12.5	1.4
Urban	28.8	[26.3-31.5]	714	1.2	[0.8-1.8]	29	10.0	[8.6-11.7]	248	17.6	[15.8-19.6]	437	71.2	[68.5-73.7]	1,762	12.6	1.7

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background character-istics	Any anemia			Severe anemia			Moderate anemia			Mild anemia			No anemia			Mean Hb (g/dL)	(SD)	Total women
	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)	%	CI	(n)			
Wealth index																		
Least	33.0	[30.1-36.0]	643	1.2	[0.7-2.0]	23	13.6	[11.7-15.8]	265	18.2	[16.1-20.6]	356	67.0	[64.0-69.9]	1,307	12.5	1.4	1,951
Second	32.6	[29.3-36.0]	630	0.5	[0.2-1.1]	10	12.9	[10.9-15.3]	250	19.1	[16.7-21.8]	369	67.4	[64.0-70.7]	1,304	12.5	1.3	1,934
Middle	28.6	[25.6-31.8]	550	1.1	[0.7-1.9]	22	10.0	[8.2-12.0]	192	17.5	[15.2-20.1]	336	71.4	[68.2-74.4]	1,374	12.6	1.5	1,924
Fourth	28.0	[25.2-31.1]	417	0.8	[0.4-1.6]	12	10.3	[8.6-12.4]	154	16.9	[14.6-19.4]	251	72.0	[68.9-74.8]	1,070	12.7	1.7	1,487
Highest	28.4	[25.9-31.1]	462	1.0	[0.6-1.8]	17	8.4	[6.9-10.3]	137	19.0	[17.1-21.0]	308	71.6	[68.9-74.1]	1,163	12.7	1.6	1,625
Household food security status																		
Food secure	29.7	[27.8-31.7]	1,794	0.8	[0.6-1.2]	49	10.4	[9.3-11.6]	628	18.5	[17.1-19.9]	1,117	70.3	[68.3-72.2]	4,248	12.6	1.4	6,042
Mild insecure	31.1	[27.7-34.8]	308	1.6	[0.9-2.9]	16	12.9	[10.7-15.6]	128	16.6	[14.2-19.3]	164	68.9	[65.2-72.3]	680	12.5	1.7	988
Mod.insecure	30.4	[27.0-33.9]	415	0.8	[0.4-1.5]	10	12.1	[10.1-14.5]	165	17.5	[15.0-20.4]	239	69.6	[66.1-73.0]	952	12.6	1.7	1,367
Severe insecure	35.4	[30.4-40.7]	185	1.6	[0.7-3.7]	8	14.6	[11.1-18.9]	76	19.3	[15.4-23.8]	101	64.6	[59.3-69.6]	338	12.4	1.7	524
Household Dietary Diversity																		
DDS<6	31.4	[29.4-33.6]	1,354	0.9	[0.6-1.4]	41	12.2	[10.8-13.6]	523	18.3	[17.0-19.8]	790	68.6	[66.4-70.6]	2,953	12.5	1.6	4,306
DDS>=6	29.2	[27.2-31.3]	1,348	0.9	[0.6-1.3]	43	10.3	[9.1-11.6]	474	18.0	[16.5-19.6]	831	70.8	[68.7-72.8]	3,266	12.6	1.5	4,614
Total	30.3	[28.7-32.0]	2,702	0.9	[0.7-1.2]	84	11.2	[10.2-12.2]	997	18.2	[17.0-19.4]	1,621	69.7	[68.0-71.3]	6,219	12.6	1.5	8,920

1 Values are weighted figures presented weighted figures and in percent with 95% confidence interval unless mentioned otherwise

2 Anemia classification based on hemoglobin (Hb) concentration (WHO 2011)

Any anemia = Hb <12g/dL

No anemia = Hb ≥12g/dL

Mild anemia = Hb 11-11.9g/dL

Moderate anemia = Hb 8-10.9g/dL

Severe anemia = Hb <8g/dL

6.6. Iodine

Myanmar has been practicing the universal salt iodization (USI) since 1997 with the aim of eliminating iodine deficiency disorders (IDDE) in the country. However, it is still challenging to fulfill the recommendation from the Iodine Global Network for the recommended level of iodine in the household salt. In MMFCS, iodine content in salt was measured by the rapid test kit when the survey teams visited the households and one table spoon of salt was collected for measuring the iodine content in laboratory by titration.

6.6.1. Presence of iodized salt in the households

Highlight: Eighty-five percent of households in Myanmar are using iodized salt; however, only a third of households were using adequately iodized salt (i.e. iodine content in salt is $\geq 15\text{ppm}$).

Rapid test results showed that 89.1% of households had iodized salt (i.e. salt contained iodine) and titration results showed that 85% of households had iodized salt (**Figure 6.6.1.1**). The results showed an improvement in the proportion of households using iodized salt between 2015 and 2018 as compared to the Myanmar Demographic and Health Survey (MDHS) which reported that 82% of households had iodized salt. However, it was noted that salt was only tested for the presence or absence of iodine in MDHS and not measured for the iodine concentration in MDHS.

Although the proportion of households using iodized salt was increased from 82% in 2015-2016 to 89.1% in 2017-2018, only 64.5% of households were using adequately iodized salt (i.e. iodine content in salt at household level $\geq 15\text{ ppm}$) by the rapid test. Moreover, titration results showed only 36.8% of households were using adequately iodized salt (**Table 6.6.1.2, Table 6.6.1.3, Table 6.6.1.4, Figure 6.6.1.1**).

Use of iodized salt by background characteristics and type of salt

Tanintharyi region was found to have the lowest rate of households using adequately iodized salt (24.3% and 7.5%) followed by Rakhine state (36% and 12.5%) and Ayeyarwady region (49.3% and 14.9%) by the rapid test and by titration respectively. These findings were supported by the use of crude salt which was found to be highest of households in Tanintharyi region (29.5%) followed by Rakhine state (13.5%), whereas in general only 5% of households in Myanmar were still using crude/crystal salt for consumption. Of the 95% of households using fine salt, 10% were using fine salt without any packaging, 45.5% were using fine salt which were packaged but without any brand

name and only 39.3% were using packaged fine salt with a brand name. It is also noted that there was higher proportion of households who were using crude salt or unpackaged fine salt in the worse wealth status and food insecurity status (Table 6.6.1.1).

Table 6.6.1.1: Percent distribution of type of household salt by selected background characteristics, N=27,339 (MMFCS 2017-18) ¹

Background characteristics	Crude salt		Fine salt without package		Fine packaged salt without brand		Fine packaged salt with brand		Total N
	%	(n)	%	(n)	%	(n)	%	(n)	
State/Region									
Kachin	4.6	(31)	0.9	(6)	59.0	(399)	35.6	(241)	677
Kayah	0.0	(0)	0.9	(1)	97.3	(140)	1.6	(2)	144
Kayin	5.6	(43)	9.5	(74)	66.9	(518)	18.0	(139)	774
Chin	0.3	(1)	0.4	(1)	80.0	(183)	19.4	(44)	229
Sagaing	4.7	(130)	1.3	(360)	41.3	(1,140)	52.6	(1,451)	2,757
Tanintharyi	29.5	(210)	29.7	(211)	5.1	(36)	35.7	(254)	712
Bago	1.2	(34)	33.3	(956)	56.9	(1,634)	8.7	(249)	2,873
Magway	0.3	(7)	6.2	(144)	22.4	(517)	71.1	(1,644)	2,312
Mandalay	10.9	(364)	15.9	(528)	32.6	(1,084)	40.6	(1,349)	3,326
Mon	3.6	(38)	4.1	(44)	47.5	(504)	44.9	(477)	1,062
Rakhine	13.5	(156)	31.0	(358)	8.6	(99)	46.9	(542)	1,156
Yangon	6.3	(251)	7.2	(287)	72.3	(2,875)	14.2	(565)	3,978
Shan	0.3	(8)	1.1	(32)	72.0	(2,117)	26.6	(783)	2,939
Ayeyarwady	0.9	(35)	3.2	(120)	25.4	(952)	70.4	(2,636)	3,742
Nay Pyi Taw	7.9	(52)	0.5	(3)	36.8	(242)	54.8	(361)	659
Household food security status									
Food secure	4.8	(870)	9.1	(1,665)	46.9	(8,551)	39.3	(7,165)	18,251
Mildly insecure	5.9	(188)	11.9	(379)	44.1	(1,400)	38.0	(1,205)	3,171
Mod. insecure	4.1	(172)	11.9	(504)	42.8	(1,819)	41.3	(1,753)	4,248
Severely insecure	7.7	(129)	15.3	(254)	40.3	(672)	36.7	(613)	1,668
Wealth index									
Least	6.6	(422)	14.5	(929)	31.9	(2,044)	47.0	(3,006)	6,401
Second	5.1	(316)	10.7	(668)	37.7	(2,355)	46.5	(2,907)	6,246
Middle	4.6	(256)	9.8	(551)	48.0	(2,688)	37.5	(2,101)	5,595
Fourth	4.3	(195)	8.7	(394)	54.8	(2,477)	32.2	(1,455)	4,521
Highest	3.7	(169)	5.7	(261)	62.9	(2,878)	27.7	(1,268)	4,575
Total	5.0	(1,359)	10.2	(2,802)	45.5	(12,442)	39.3	(10,736)	27,339

¹ Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

Figure 6.6.1.1: Percent of household using iodized salt analyzed by rapid test and Titration

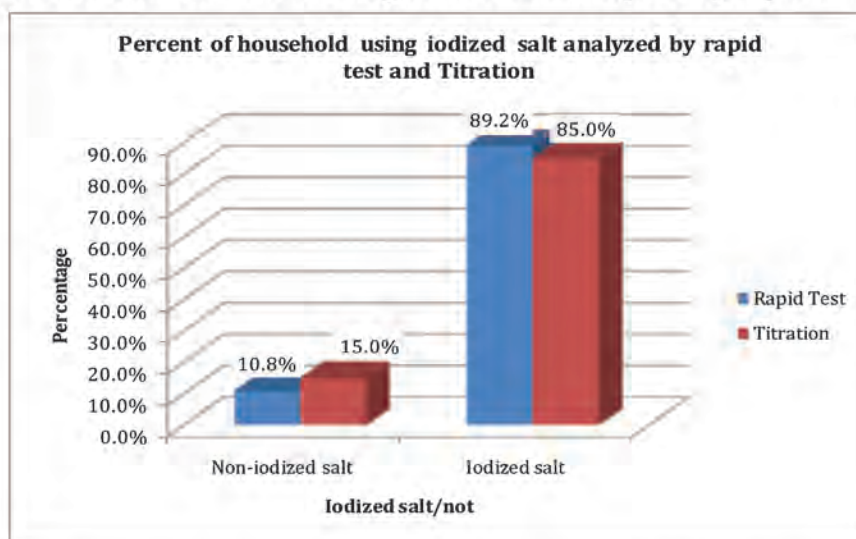


Figure 6.6.1.2: Comparison of Iodine content in household salt analyzed by rapid test kit and titration among states/regions

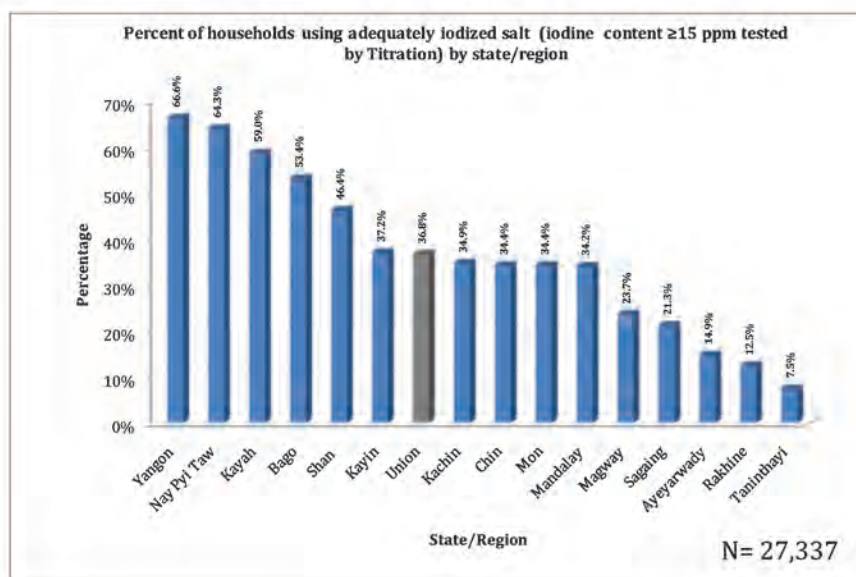
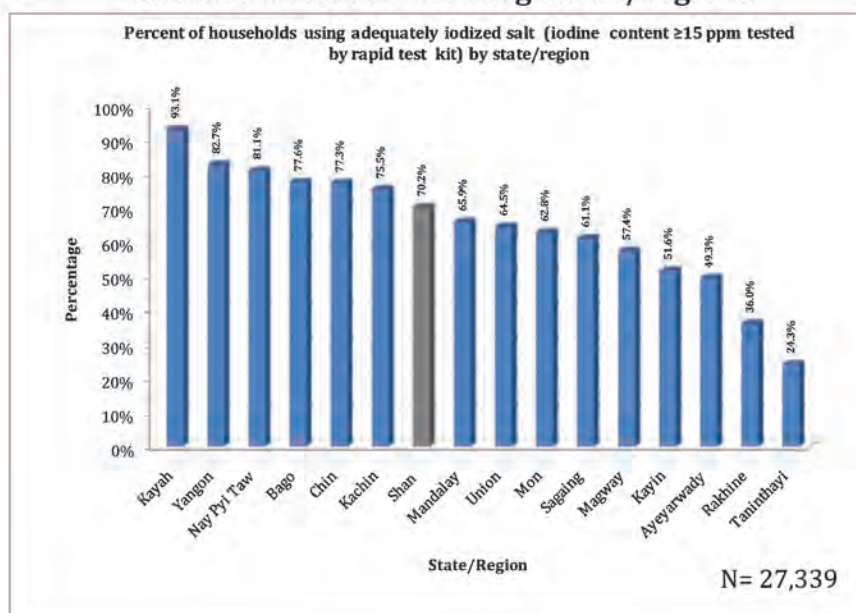


Table 6.6.1.2: Percent distribution of Iodine content of household salt analyzed by rapid test kit by selected background characteristics, N=27,339 (MMFCS 2017-18)

Background characteristics	0 ppm		< 15 ppm		≥ 15 ppm		Total (N)
	%	95% CI	(n)	%	95% CI	(n)	
State/Region							
Kachin	4.6	[3.1 - 6.9]	31	19.9	[15.9 - 24.6]	135	677
Kayah	0.9	[0.4 - 1.7]	1	6.0	[4.3 - 8.4]	9	144
Kayin	28.9	[21.1 - 38.2]	224	19.6	[15.7 - 24.1]	151	774
Chin	11.0	[4.8 - 23.2]	25	11.7	[7.7 - 17.4]	27	229
Sagaing	4.4	[3.0 - 6.6]	122	34.5	[28.7 - 40.8]	951	2,757
Tanintharyi	61.9	[48.1 - 74.0]	440	13.8	[8.9 - 20.9]	98	712
Bago	6.5	[3.2 - 12.8]	187	15.9	[13.7 - 18.3]	456	2,873
Magway	10.6	[7.0 - 15.9]	245	32.0	[27.1 - 37.2]	739	2,312
Mandalay	6.6	[4.1 - 10.4]	219	27.5	[22.7 - 32.8]	914	3,326
Mon	14.6	[10.5 - 20.1]	156	22.6	[18.4 - 27.4]	240	1,062
Rakhine	22.9	[16.2 - 31.2]	264	41.1	[35.3 - 47.2]	475	1,156
Yangon	5.2	[2.7 - 9.9]	207	12.1	[9.2 - 15.7]	482	3,978
Shan	8.1	[5.3 - 12.2]	238	21.7	[15.4 - 29.6]	638	2,939
Ayeyarwady	15.7	[12.5 - 19.5]	586	35.0	[29.4 - 41.2]	1,312	3,742
Nay Pyi Taw	2.8	[1.8 - 4.2]	18	16.1	[12.7 - 20.1]	106	659
Residence							
Rural	12.2	[10.6 - 13.9]	2,397	26.7	[24.7 - 28.9]	5,263	19,675
Urban	7.4	[5.9 - 9.2]	568	19.2	[16.7 - 21.9]	1,469	7,664

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	0 ppm			< 15 ppm			≥ 15 ppm			Total (N)
	%	95% CI	(n)	%	95% CI	(n)	%	95% CI	(n)	
Wealth index										
Least	14.7	[12.4-17.5]	944	28.3	[25.5-31.4]	1,815	56.9	[52.8-60.9]	3,643	6,401
Second	11.2	[9.5-13.2]	701	28.4	[26.1-30.8]	1,774	60.4	[57.3-63.3]	3,770	6,246
Middle	10.8	[9.4-12.4]	605	24.1	[22.1-26.3]	1,349	65.1	[62.3-67.7]	3,641	5,595
Fourth	9.6	[8.4-10.9]	433	21.3	[19.3-23.5]	964	69.1	[66.4-71.7]	3,125	4,521
Highest	6.2	[4.9-7.8]	282	18.1	[15.5-21.1]	830	75.7	[72.2-78.9]	3,463	4,575
Household food security status										
Food secure	9.9	[8.7 - 11.1]	1,800	23.8	[21.9 - 25.8]	4,342	66.3	[63.8 - 68.8]	12,109	18,251
Mildly insecure	11.4	[9.6 - 13.5]	362	27.9	[25.4 - 30.5]	884	60.7	[57.5 - 63.8]	1,925	3,171
Moderately insecure	12.8	[10.7 - 15.2]	542	24.1	[21.8 - 26.5]	1,022	63.2	[59.6 - 66.6]	2,684	4,248
Severely insecure	15.6	[12.2 - 19.8]	260	29.0	[25.4 - 32.8]	484	55.4	[50.3 - 60.4]	924	1,668
Dietary diversity										
DDS < 6	11.7	[10.3 - 13.2]	1,617	26.2	[24.4 - 28.2]	3,642	62.1	[59.4 - 64.7]	8,615	13,874
DDS ≥ 6	10.0	[8.7 - 11.5]	1,348	22.9	[21.2 - 24.8]	3,090	67.0	[64.7 - 69.3]	9,028	13,465
Total	10.8	[9.7 - 12.1]	2,965	24.6	[23.0 - 26.3]	6,732	64.5	[62.3 - 66.7]	17,642	27,339

Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

Table 6.6.1.3: Percent distribution of Iodine content of household salt analyzed by titration method by selected background characteristics, N=27,337 (MMFCS 2017-18)

Background characteristics	0 ppm		1- 14 ppm		≥ 15 ppm		Total (N)
	%	95% CI	(n)	%	95% CI	(n)	
State/Region							
Kachin	15.1	[8.3-26.0]	102	50.0	[40.3-59.6]	338	677
Kayah	3.8	[2.2-6.6]	5	37.1	[31.9-42.8]	53	144
Kayin	22.8	[15.7-32.1]	177	40.0	[31.3-49.4]	310	774
Chin	5.6	[2.2-13.1]	13	60.0	[48.6-70.5]	138	229
Sagaing	13.9	[9.0-21.0]	384	64.8	[54.7-73.8]	1,785	2,755
Tanintharyi	65.7	[52.4-76.8]	467	26.8	[17.2-39.3]	191	712
Bago	9.5	[4.8-17.9]	273	37.1	[30.8-43.9]	1,065	2,873
Magway	16.1	[9.2-26.5]	372	60.2	[50.1-69.6]	1,393	2,312
Mandalay	13.2	[7.8-21.3]	438	52.6	[44.0-61.1]	1,751	3,326
Mon	16.8	[9.4-28.2]	178	48.8	[38.7-59.0]	518	1,061
Rakhine	24.9	[15.2-38.0]	288	62.6	[50.7-73.1]	723	1,156
Yangon	5.4	[2.1-13.4]	216	27.9	[22.5-34.1]	1,112	3,978
Shan	14.1	[8.1-23.5]	416	39.4	[30.3-49.4]	1,159	2,939
Ayeyarwady	20.3	[12.8-30.5]	758	64.9	[54.1-74.3]	2,428	3,742
Nay Pyi Taw	3.7	[2.2-6.2]	25	32.0	[26.5-38.0]	211	659
Residence							
Rural	17.0	[14.2-20.2]	3,338	52.2	[48.7-55.7]	10,273	19,673
Urban	10.1	[7.6-13.3]	774	37.8	[33.2-42.7]	2,900	7,664

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	0 ppm			1- 14 ppm			≥ 15 ppm			Total (N)
	%	95% CI	(n)	%	95% CI	(n)	%	95% CI	(n)	
Wealth index										
Least	18	[14.1-21.9]	1,128	53	[48.3-57.0]	3,372	30	[25.9-33.8]	1,902	6,401
Second	16	[13.6-19.7]	1,026	54	[49.9-57.9]	3,365	30	[26.6-32.9]	1,854	6,246
Middle	15	[12.4-18.2]	843	50	[46.2-52.8]	2,770	35	[32.8-38.1]	1,980	5,594
Fourth	14	[11.3-16.1]	613	45	[41.8-48.9]	2,049	41	[38.0-44.3]	1,859	4,520
Highest	11	[8.6-13.9]	502	35	[31.4-39.5]	1,617	54	[49.2-58.1]	2,456	4,575
Household food security status										
Food secure	14.7	[12.4-17.3]	2,682	47.6	[44.5-50.7]	8,680	37.7	[35.2-40.3]	6,888	18,251
Mildly insecure	15.8	[12.9-19.2]	502	49.9	[46.3-53.5]	1,582	34.2	[31.3-37.4]	1,086	3,170
Moderately insecure	15.5	[12.4-19.1]	657	48.8	[44.6-53.0]	2,072	35.8	[32.3-39.3]	1,519	4,248
Severely insecure	16.3	[13.0-20.2]	271	50.3	[45.1-55.4]	839	33.5	[28.9-38.3]	558	1,668
Dietary diversity										
DDS < 6	16.1	[13.6-18.9]	2,228	49.4	[46.3-52.5]	6,852	34.5	[31.9-37.3]	4,791	13,871
DDS ≥ 6	14.0	[11.7-16.7]	1,884	46.9	[43.8-50.1]	6,322	39.1	[36.5-41.7]	5,259	13,465
Total	15.0	[12.9-17.5]	4,112	48.2	[45.4-51.0]	13,173	36.8	[34.5 - 39.1]	10,051	27,337

Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

Table 6.6.1.4: Comparison of Iodine content in household salt analyzed by rapid test kit or titration by selected background characteristics (N for Rapid Test= 27,339, N for Titration = 27,337, (MMFCS 2017-18)

Background characteristics	0 ppm				< 15 ppm				0-14ppm				≥ 15 ppm				Total (N)	
	Rapid Test		Titration		Rapid Test		Titration		Rapid Test		Titration		Rapid Test		Titration		Rapid Test	Titration
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)		
State/Region																		
Kachin	4.6	31	15.1	102	19.9	135	50.0	338	75.5	511	34.9	236	677	677	677	677	677	677
Kayah	0.9	1	3.8	5	6.0	9	37.1	53	93.1	134	59.0	85	144	144	144	144	144	144
Kayin	28.9	224	22.8	177	19.6	151	40.0	310	51.6	399	37.2	288	774	774	774	774	774	774
Chin	11.0	25	5.6	13	11.7	27	60.0	138	77.3	177	34.4	79	229	229	229	229	229	229
Sagaing	4.4	122	13.9	384	34.5	951	64.8	1,785	61.1	1,684	21.3	586	2,757	2,757	2,757	2,757	2,757	2,757
Tanintharyi	61.9	440	65.7	467	13.8	98	26.8	191	24.3	173	7.5	53	712	712	712	712	712	712
Bago	6.5	187	9.5	273	15.9	456	37.1	1,065	77.6	2,229	53.4	1,534	2,873	2,873	2,873	2,873	2,873	2,873
Magway	10.6	245	16.1	372	32.0	739	60.2	1,393	57.4	1,328	23.7	547	2,312	2,312	2,312	2,312	2,312	2,312
Mandalay	6.6	219	13.2	438	27.5	914	52.6	1,751	65.9	2,193	34.2	1,137	3,326	3,326	3,326	3,326	3,326	3,326
Mon	14.6	156	16.8	178	22.6	240	48.8	518	62.8	667	34.4	365	1,062	1,062	1,062	1,062	1,062	1,062
Rakhine	22.9	264	24.9	288	41.1	475	62.6	723	36.0	416	12.5	145	1,156	1,156	1,156	1,156	1,156	1,156
Yangon	5.2	207	5.4	216	12.1	482	27.9	1,112	82.7	3,289	66.6	2,651	3,978	3,978	3,978	3,978	3,978	3,978
Shan	8.1	238	14.1	416	21.7	638	39.4	1,159	70.2	2,064	46.4	1,365	2,939	2,939	2,939	2,939	2,939	2,939
Ayeyarwady	15.7	586	20.3	758	35.0	1,312	64.9	2,428	49.3	1,844	14.9	556	3,742	3,742	3,742	3,742	3,742	3,742
Nay Pyi Taw	2.8	18	3.7	25	16.1	106	32.0	211	81.1	535	64.3	424	659	659	659	659	659	659

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristics	0 ppm				< 15 ppm				0-14ppm				≥ 15 ppm				Total (N)	
	Rapid Test		Titration		Rapid Test		Titration		Rapid Test		Titration		Rapid Test		Titration		Rapid Test	Titration
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)		
Residence																		
Rural	12.2	2,397	17.0	3,338	26.7	5,263	52.2	10,273	61.1	12,016	30.8	6,061	19,675	19,673				
Urban	7.4	568	10.1	774	19.2	1,469	37.8	2,900	73.4	5,627	52.1	3,990	7,664	7,664				
Wealth index																		
Least	14.1	896	17.3	1,100	28.1	1,788	52.0	3,314	57.9	3,684	30.7	1,954	6,368	6,368				
Second	11.3	717	16.2	1,029	28.3	1,802	54.4	3,462	60.4	3,840	29.4	1,867	6,359	6,359				
Middle	11.0	616	15.2	851	24.1	1,347	49.6	2,770	64.9	3,624	35.2	1,965	5,587	5,586				
Fourth	10.1	446	14.0	619	22.0	976	45.7	2,024	67.9	3,011	40.4	1,789	4,433	4,432				
Highest	6.3	291	11.2	513	17.8	818	34.9	1,604	75.9	3,484	53.9	2,476	4,593	4,593				
Household food security status																		
Food secure	9.9	1,800	14.7	2,682	23.8	4,342	47.6	8,680	66.3	12,109	37.7	6,888	18,251	18,251				
Mildly insecure	11.4	362	15.8	502	27.9	884	49.9	1,582	60.7	1,925	34.2	1,086	3,171	3,170				
Moderately insecure	12.8	542	15.5	657	24.1	1,022	48.8	2,072	63.2	2,684	35.8	1,519	4,248	4,248				
Severely insecure	15.6	260	16.3	271	29.0	484	50.3	839	55.4	924	33.5	558	1,668	1,668				
Dietary diversity																		
DDS < 6	11.7	1,617	16.1	2,228	26.2	3,642	49.4	6,852	62.1	8,615	34.5	4,791	13,874	13,871				
DDS ≥ 6	10.0	1,348	14.0	1,884	22.9	3,090	46.9	6,322	67.0	9,028	39.1	5,259	13,465	13,465				
Total	10.8	2,965	15.0	4,112	24.6	6,732	48.2	13,173	64.5	17,642	36.8	10,051	27,339	27,337				

Values are weighted figures presented in percent with 95% confidence interval unless mentioned otherwise

6.6.2. Iodine status

Iodine deficiency can cause several adverse consequences throughout the lifecycle and has been associated with mental impairment and goiter in older children and adults and complications with pregnancy, including stillbirth and congenital anomalies (WHO, UNICEF et al. 2007). In addition, inadequate iodine intake during pregnancy may lead to irreversible fetal brain damage (de Escobar, Obregón et al. 2007).

It was mentioned that the median urinary iodine concentration (mUIC) based on single spot urine samples is a reliable population indicator of iodine status. Moreover, in UIC surveys in school-age children are the recommended method to monitor iodine nutrition in populations.

Iodine status of primary school age children (5-9 years of age)

Highlight: Median urinary iodine concentration (mUIC) among children 5-9 years of age is 138.5µg/L.

The mUIC among 5-9 year old children was 138.5µg/L and IQR for UIC was [77.1-214.8]. According to the WHO, this indicates that the iodine intake among these children is adequate (WHO 2013). However, children in some states/regions were found to have insufficient iodine intake with the lowest mUIC in Rakhine state (68.6µg/L) followed by Ayeyarwady region (81.0µg/L), Chin state (87.9µg/L) and Tanintharyi region (103.5µg/L) (**Table 6.6.2.1, Figure 6.6.2.1**). It was also found that the higher the wealth quintile and food security status of household, the better was the urinary iodine concentration among primary school age children (**Figure 6.6.2.2**). Our findings show consistency between poor use of adequately iodized salt (salt iodine content ≥ 15 ppm) in households and low level of mUIC among 5-9 year old children in Rakhine state, Ayeyarwady region, Tanintharyi region and Chin state.

Figure 6.6.2.1: Median urinary iodine concentration among 5-9 year children by state/region

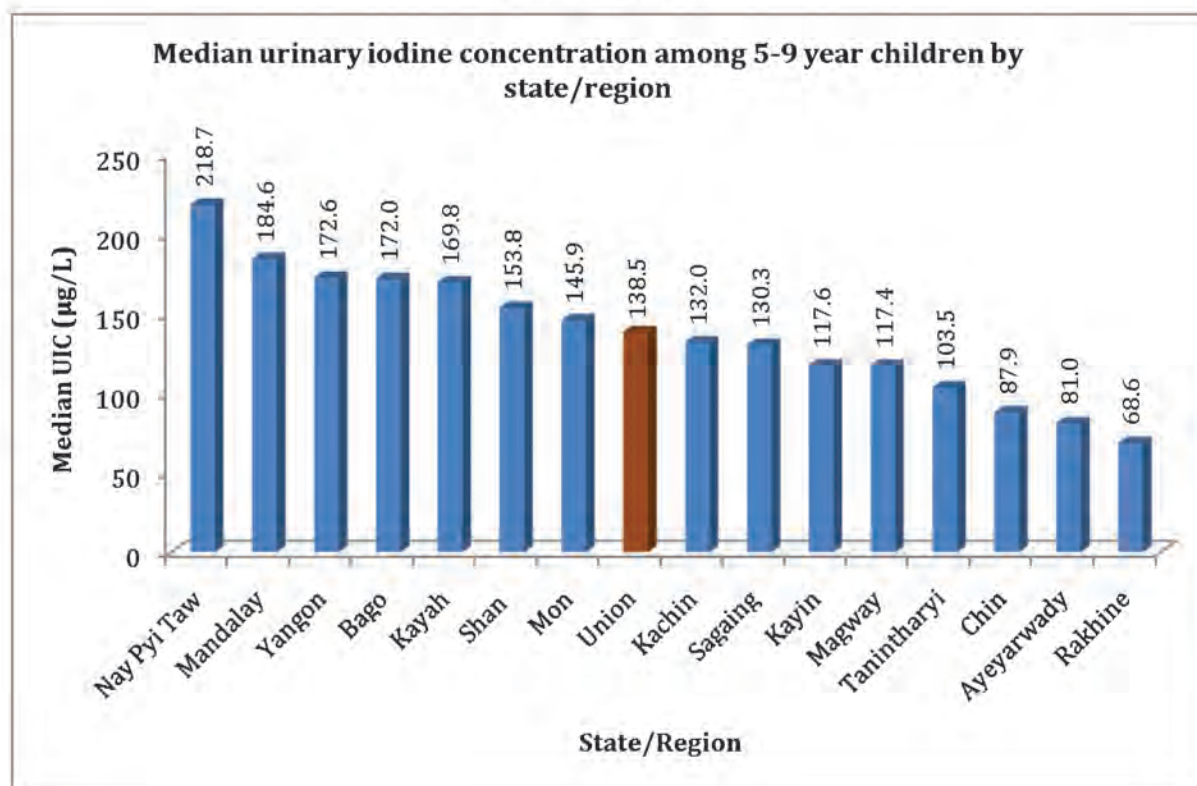
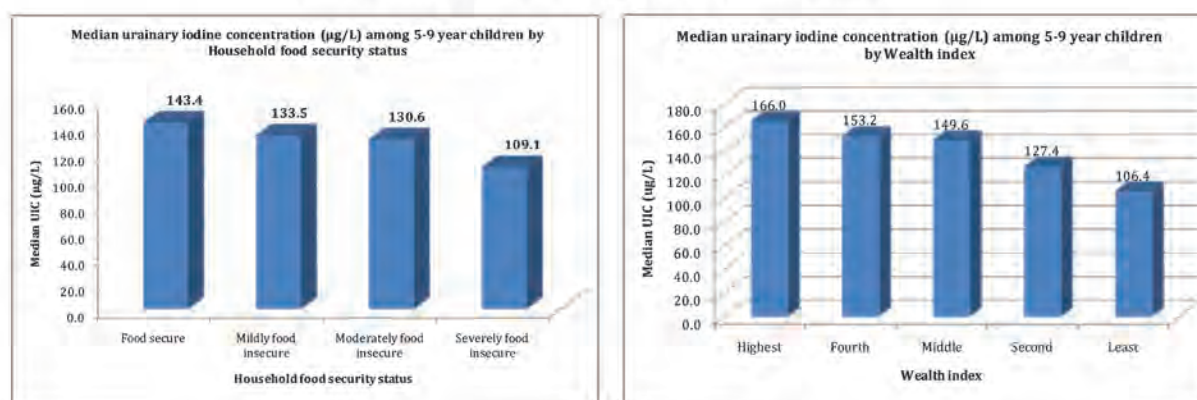


Figure 6.6.2.2: Median urinary iodine concentration among 5-9 year children by household food security and wealth index



Iodine status of pregnant women

Highlight: Median urinary iodine concentration (mUIC) among pregnant women is 121.8µg/L and it shows there is insufficient iodine intake among pregnant women in Myanmar.

Median urinary iodine concentration (mUIC) among pregnant women was 121.8µg/L indicating there was insufficient iodine intake among pregnant women in Myanmar. The mUIC among pregnant women was lowest in Rakhine state (59.1 µg/L) followed by Ayeyarwady region (79.8 µg/L) and Tanintharyi region (82.5 µg/L) (**Table 6.6.2.2, Figure 6.6.2.3**). It was also noted that poor use of adequately iodized salt in households from Rakhine state, Ayeyarwady and Tanintharyi regions was reflected by low level of mUIC among pregnant women in those areas. Pregnant women from poorer households also had low level of mUIC (**Figure 6.6.2.4**). These findings suggest that the salt iodization program should pay more emphasis in these geographic areas to prevent the adverse effects of iodine deficiency.

Figure 6.6.2.3: Median urinary iodine concentration among pregnant women by state/region

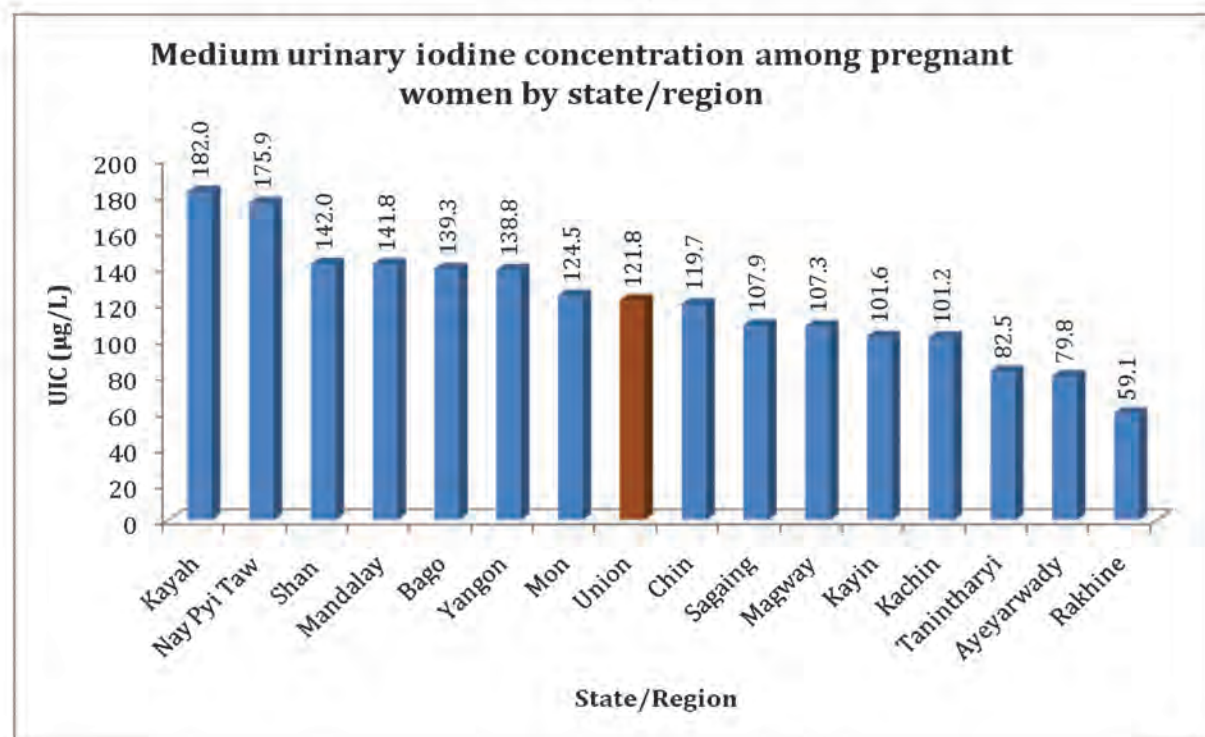


Figure 6.6.2.4: Median urinary iodine concentration among pregnant women by household food security and wealth index

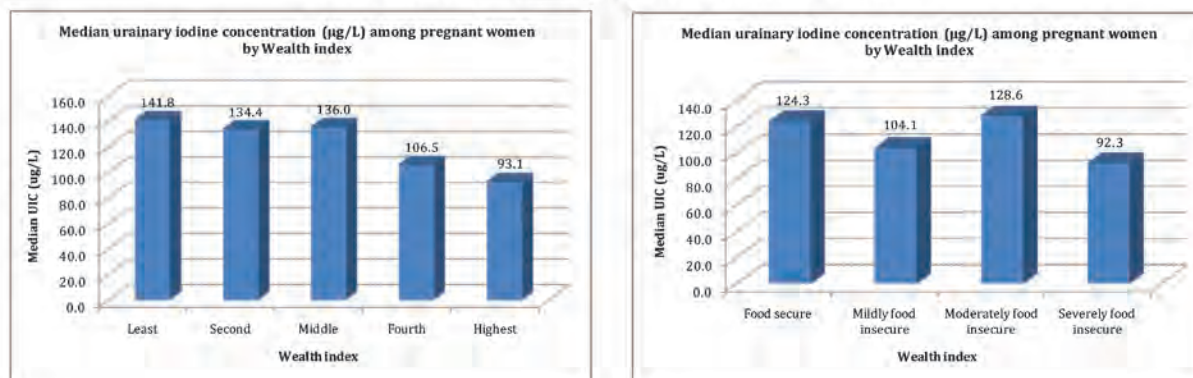


Figure 6.6.2.5: Median urinary iodine concentration among 5-9 year children and pregnant women in selected states/regions

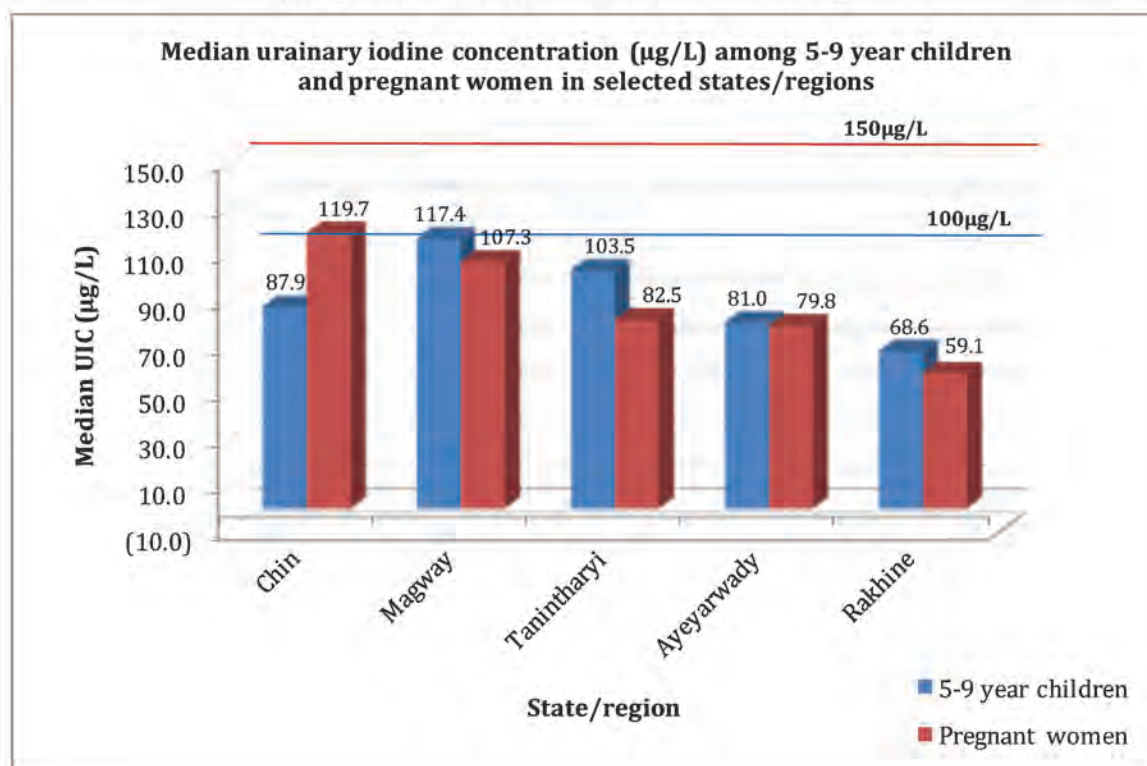


Table 6.6.2.1: Median urinary iodine concentration (mUIC) among 5-9 year children by selected background characteristics¹

Background characteristics	UIC (µg/L)		Number of children
	Median	IQR	
Gender			
Male	142.9	[81.2-224.7]	4,495
Female	134.1	[72.9-206.0]	4,470
State/Region			
Kachin	132.0	[78.9-193.4]	222
Kayah	169.8	[116.1-250.8]	48
Kayin	117.6	[73.7-188.6]	258
Chin	87.9	[46.8-149.8]	72
Sagaing	130.3	[74.5-194.9]	908
Tanintharyi	103.5	[65.2-155.1]	230
Bago	172.0	[98.3-283.4]	951
Magway	117.4	[69.1-183.6]	767
Mandalay	184.6	[113.5-328.7]	1,095
Mon	145.9	[92.2-208.2]	349
Rakhine	68.6	[41.8-110.7]	365
Yangon	172.6	[119-274.8]	1,298
Shan	153.8	[83.9-233.3]	942
Ayeyarwady	81.0	[46.1-129.0]	1,246
Nay Pyi Taw	218.7	[146.6-401.3]	76
Residence			
Rural	124.8	[69.3-203.7]	6,483
Urban	165.5	[104.1-260.2]	2,482
Wealth index			
Least	106.4	[59.5-182]	2,242
Second	127.4	[72.4-204.4]	2,101
Middle	149.6	[84-234.5]	1,792
Fourth	153.2	[93.4-230.5]	1,426
Highest	166.0	[104.1-257.8]	1,404
Household food security status			
Food secure	143.4	[80.6-219]	865
Mildly insecure	133.5	[72.7-216.3]	156
Moderately insecure	130.6	[74.3-205.5]	1,555
Severely insecure	109.1	[60.8-205.1]	646
Household dietary diversity			
DDS < 6	133.3	[73.1-212.1]	4,374
DDS ≥ 6	142.2	[79.9-219.3]	4,591
Total	138.5	[77.1-214.8]	8,966

1 Values presented here are weighted figures

UIC = Urinary iodine concentration

IQR = Inter-quartile range (25th percentile – 75th percentile)

Table 6.6.2.2: Median urinary iodine concentration (mUIC) among pregnant women by selected background characteristics¹

Background characteristics	UIC (µg/L)		Number of children
	Median	IQR	
Age in year			
15-19	126.9	[68.7-193.2]	46
20-24	117.1	[61.2-182.8]	228
25-29	119.0	[72.7-193.8]	234
30-34	132.1	[68.4-194.9]	219
35-39	111.6	[57.3-167]	134
40-44	122.1	[73.8-222.9]	31
>=45	184.8	[184.8-184.8]	2
State/Region			
Kachin	101.2	[63.2-183.2]	22
Kayah	182.0	[126.1-284.6]	5
Kayin	101.6	[54-190.1]	26
Chin	119.7	[76.6-181.2]	7
Sagaing	107.9	[55.5-161.6]	92
Tanintharyi	82.5	[45.5-138.2]	24
Bago	139.3	[91.5-193.8]	96
Magway	107.3	[67.2-205.6]	77
Mandalay	141.8	[76.2-231.5]	111
Mon	124.5	[82.6-223.6]	35
Rakhine	59.1	[38.3-117]	37
Yangon	138.8	[93.8-208.7]	128
Shan	142.0	[77.2-205.2]	86
Ayeyarwady	79.8	[35.7-150.3]	125
Nay Pyi Taw	175.9	[108.4-263.9]	22
Residence			
Rural	107.3	[61.1-181.4]	649
Urban	144.5	[88.7-214.3]	244
Wealth index			
Least	93.1	[52.7-186]	214
Second	106.5	[70.8-171.1]	181
Middle	136.0	[71.5-193.9]	196
Fourth	134.4	[71.1-199.8]	160
Highest	141.8	[89.5-253.1]	142
Household food security status			
Food secure	124.3	[70.8-186.4]	598
Mildly insecure	104.1	[52.8-182.9]	109
Moderately insecure	128.6	[72.7-203.4]	133
Severely insecure	92.3	[56-180.6]	53
Household dietary diversity			
DDS < 6	119.0	[67.2-186]	417
DDS ≥ 6	123.9	[68.7-186.4]	477
Total	121.8	[67.9-186.2]	893

1 Values presented here are weighted figures

UIC = Urinary iodine concentration, IQR = Inter-quartile range (25th percentile – 75th percentile)

6.7. Sodium

6.7.1. Sodium intake among women of reproductive age

Amongst women of reproductive age (15-49 years of age), the mean sodium level excreted over 24 hour was 123.5 mmol (95%CI: 114.8 to 132.2 mmol), which corresponds to 2.8 g sodium (95% CI 2.6 to 3.0 g) or 7.3 g salt (95% CI 6.8 to 7.8 g). Nearly two-thirds (64.1%) of WRA had sodium intake exceeding WHO cutoff of 2 g/day (WHO 2012). Mean sodium intake (g/day) was higher than 2g/day in all age groups, regions, sites (urban and rural), wealth levels, household food security status and household dietary diversity status. Compared to adult men, more subgroups in WRA had a mean sodium intake of ≥ 3 g/day, especially younger age groups (15-29 years old), in some regions (Kachin, Kayah, Sagaing, Taninthayi, Ayeyarwaddy, and Nay Pyi Taw), in the middle wealth index, and in households having more dietary diversity score (**Table 6.7.1.1**). Calculated average salt intake among women of reproductive age was 7.3g/day and 65.4% of these women were consuming salt intake exceeding the WHO recommendation (i.e. >5 g/day of salt).

6.7.2. Sodium intake among adult men

Amongst adult men (15-49 years of age), the mean sodium level excreted over 24 hour was 112.3 mmol (95%CI 103.7 to 120.8 mmol), which corresponds to 2.6 g sodium (95% CI 2.4 to 2.8g) or 6.6 g salt (95% CI 6.1 to 7.1g). More than half (56.2%) of MRA had sodium intake exceeding WHO cutoff of 2 g/day. Mean sodium intake (g/day) was higher than 2 g/day in all age groups, regions (except Kayah), sites (urban and rural), wealth levels, household food security status and household dietary diversity status. Mean sodium intake was much higher (≥ 3 g/day) amongst younger age groups (15-24 years old), and in Kachin and Nay Pyi Taw regions. Calculated average salt intake among adult men was 6.6g/day and 57.8% of men 15-49 years of age were consuming salt intake exceeding the WHO recommendation (**Table 6.7.1.2**).

Table 6.7.1.1: Urinary sodium excretion and calculated sodium and salt intake among women of reproductive age by selected background characteristics, N =434 (MMFCS 2017-18)

Background characteristic	Sodium excretion (mmol./day)				Sodium intake (g/day)				% Sodium intake (>2g/day)				Salt intake (g/day)				% Salt intake (>5g/day)				Total
	Mean	SD	UCI	LCI	Mean	SD	UCI	LCI	%	CI	(n)	Mean	SD	UCI	LCI	%	CI	(n)			
Age in year																					
15-19	133.3	47.4	109.8	156.7	3.1	1.1	2.5	3.6	70.2	[45.3-87.1]	20	7.9	2.8	6.5	9.2	77.8	[54.1-91.2]	22	28		
20-24	140.1	77.9	117.8	162.4	3.2	1.8	2.7	3.7	72.9	[57.1-84.5]	41	8.3	4.6	7.0	9.6	76.4	[61.0-87.0]	43	57		
25-29	155.5	102.0	125.0	186.0	3.6	2.3	2.9	4.3	71.6	[57.0-82.7]	50	9.2	6.0	7.4	11.0	73.4	[59.0-84.1]	51	70		
30-34	128.8	63.9	112.0	145.6	3.0	1.5	2.6	3.3	70.2	[57.1-80.7]	58	7.6	3.8	6.6	8.6	70.2	[57.1-80.7]	58	83		
35-39	102.9	66.1	84.0	121.7	2.4	1.5	1.9	2.8	54.9	[41.3-67.8]	46	6.1	3.9	5.0	7.2	54.9	[41.3-67.8]	46	84		
40-44	106.2	55.7	89.5	122.9	2.4	1.3	2.1	2.8	53.5	[38.3-68.1]	35	6.3	3.3	5.3	7.3	53.5	[38.3-68.1]	35	65		
>=45	101.2	61.3	79.5	122.9	2.3	1.4	1.8	2.8	59.2	[41.8-74.6]	28	6.0	3.6	4.7	7.3	59.2	[41.8-74.6]	28	47		
State/Region																					
Kachin	137.3	119.7	108.2	166.5	3.2	2.8	2.5	3.8	72.0	[51.3-86.3]	8	8.1	7.1	6.4	9.8	72.0	[51.3-86.3]	8	11		
Kayah	132.2	255.1	103.0	161.4	3.0	5.9	2.4	3.7	76.9	[55.4-89.9]	1	7.8	15.1	6.1	9.5	76.9	[55.4-89.9]	1	2		
Kayin	121.1	129.4	89.6	152.6	2.8	3.0	2.1	3.5	57.5	[38.8-74.3]	7	7.1	7.6	5.3	9.0	57.5	[38.8-74.3]	7	12		
Chin	122.9	278.0	83.4	162.4	2.8	6.4	1.9	3.7	54.8	[35.2-73.0]	2	7.2	16.4	4.9	9.6	54.8	[35.2-73.0]	2	4		
Sagaing	138.5	82.1	101.3	175.7	3.2	1.9	2.3	4.0	60.4	[41.9-76.3]	28	8.2	4.8	6.0	10.4	63.2	[44.5-78.6]	29	46		
Tanintharyi	129.4	118.9	101.8	157.1	3.0	2.7	2.3	3.6	73.9	[54.6-86.9]	8	7.6	7.0	6.0	9.3	73.9	[54.6-86.9]	8	11		
Bago	126.5	62.4	97.1	155.9	2.9	1.4	2.2	3.6	64.1	[45.2-79.4]	29	7.5	3.7	5.7	9.2	64.1	[45.2-79.4]	29	46		
Magway	108.3	56.0	84.8	131.9	2.5	1.3	1.9	3.0	55.3	[36.3-72.8]	19	6.4	3.3	5.0	7.8	55.3	[36.3-72.8]	19	34		
Mandalay	113.8	50.6	89.7	137.9	2.6	1.2	2.1	3.2	57.4	[39.5-73.5]	30	6.7	3.0	5.3	8.1	61.2	[43.2-76.6]	32	52		
Mon	99.4	75.5	77.4	121.4	2.3	1.7	1.8	2.8	59.6	[40.2-76.3]	10	5.9	4.5	4.6	7.2	59.6	[40.2-76.3]	10	18		
Rakhine	102.8	54.4	86.5	119.2	2.4	1.2	2.0	2.7	63.9	[44.5-79.6]	11	6.1	3.2	5.1	7.0	63.9	[44.5-79.6]	11	18		
Yangon	127.1	45.8	101.2	153.1	2.9	1.1	2.3	3.5	64.3	[45.0-79.9]	41	7.5	2.7	6.0	9.0	64.3	[45.0-79.9]	41	63		
Shan	119.9	53.3	94.4	145.4	2.8	1.2	2.2	3.3	62.7	[43.7-78.4]	29	7.1	3.1	5.6	8.6	62.7	[43.7-78.4]	29	47		
Ayeyarwady	131.1	50.3	104.7	157.4	3.0	1.2	2.4	3.6	75.8	[56.9-88.1]	47	7.7	3.0	6.2	9.3	79.2	[60.5-90.5]	49	62		
Nay Pyi Taw	148.3	132.4	117.3	179.3	3.4	3.0	2.7	4.1	78.7	[59.1-90.5]	8	8.7	7.8	6.9	10.6	78.7	[59.1-90.5]	8	10		
Residence																					
Rural	126.3	73.6	115.5	137.1	2.9	1.7	2.7	3.2	65.6	[58.8-71.9]	206	7.5	4.3	6.8	8.1	67.0	[60.2-73.1]	210	314		
Urban	116.3	72.3	102.3	130.2	2.7	1.7	2.4	3.0	60.2	[49.3-70.3]	73	6.9	4.3	6.0	7.7	61.3	[50.3-71.3]	74	120		

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristic	Sodium excretion (mmol/day)				Sodium intake (g/day)				% Sodium intake (>2g/day)				Salt intake (g/day)				% Salt intake (>5g/day)				Total
	Mean	SD	UCI	LCI	Mean	SD	UCI	LCI	%	CI	(n)	Mean	SD	UCI	LCI	%	CI	(n)			
Wealth index																					
Least	120.2	55.5	101.4	139.0	2.8	1.3	2.3	3.2	67.9	[52.7-80.1]	49	7.1	3.3	6.0	8.2	67.9	[52.7-80.1]	49	72		
Second	112.5	69.1	91.7	133.2	2.6	1.6	2.1	3.1	56.1	[41.9-69.4]	43	6.6	4.1	5.4	7.9	58.9	[44.8-71.6]	46	77		
Middle	143.9	89.5	121.8	166.0	3.3	2.1	2.8	3.8	69.0	[57.2-78.7]	76	8.5	5.3	7.2	9.8	70.1	[58.4-79.7]	77	110		
Fourth	107.0	68.9	91.2	122.9	2.5	1.6	2.1	2.8	53.7	[40.8-66.1]	41	6.3	4.1	5.4	7.2	56.3	[43.3-68.5]	43	77		
Highest	124.6	65.5	109.4	139.9	2.9	1.5	2.5	3.2	70.5	[58.0-80.5]	69	7.4	3.9	6.5	8.3	70.5	[58.0-80.5]	69	98		
Household food security status																					
Food secure	124.0	73.4	113.4	134.6	2.9	1.7	2.6	3.1	64.1	[57.1-70.4]	202	7.3	4.3	6.7	7.9	65.8	[58.9-72.0]	207	315		
Mild. insecure	136.4	66.6	113.9	158.9	3.1	1.5	2.6	3.7	72.8	[55.4-85.2]	30	8.0	3.9	6.7	9.4	72.8	[55.4-85.2]	30	41		
Mod. insecure	115.2	80.5	92.2	138.3	2.6	1.9	2.1	3.2	59.6	[43.3-74.0]	32	6.8	4.7	5.4	8.2	59.6	[43.3-74.0]	32	53		
Severe. insecure	113.3	75.6	76.8	149.9	2.6	1.7	1.8	3.4	60.7	[36.8-80.4]	15	6.7	4.5	4.5	8.8	60.7	[36.8-80.4]	15	25		
Household Dietary Diversity																					
HDDS<6	113.5	69.2	101.6	125.3	2.6	1.6	2.3	2.9	57.2	[48.2-65.7]	109	6.7	4.1	6.0	7.4	58.3	[49.3-66.8]	111	190		
HDDS>=6	131.3	76.8	119.0	143.6	3.0	1.8	2.7	3.3	69.6	[62.1-76.2]	170	7.7	4.5	7.0	8.5	70.9	[63.5-77.4]	173	244		
Total	123.5	74.2	114.8	132.2	2.8	1.7	2.6	3.0	64.1	[58.4-69.5]	279	7.3	4.4	6.8	7.8	65.4	[59.7-70.7]	284	434		

Values presented here are weighted figures

Table 6.7.1.2: Urinary sodium excretion and calculated sodium and salt intake among adult men by selected background characteristics, N = 427 (MMFCS 2017-18)

Background characteristic	Sodium excretion (mmol./day)				Sodium intake (g/day)				% Sodium intake (>2g/day)				Salt intake (g/day)				% Salt intake (>5g/day)				Total
	Mean	SD	UCI	LCI	Mean	SD	UCI	LCI	%	CI	(n)	Mean	SD	UCI	LCI	%	CI	(n)			
Age in year																					
15-19	133.3	47.4	109.8	156.7	3.1	1.9	2.4	3.8	62.2	[41.9,79.0]	23	7.9	4.8	6.1	9.8	62.2	[41.9-79.0]	62.2	28		
20-24	140.1	77.9	117.8	162.4	3.2	1.8	2.4	3.9	69.7	[48.4,84.9]	27	8.1	4.7	6.3	10.0	69.7	[48.4-84.9]	69.7	57		
25-29	155.5	102.0	125.0	186.0	2.9	1.6	2.4	3.4	66.6	[50.0,80.0]	36	7.4	4.0	6.1	8.7	66.6	[50.0-80.0]	66.6	70		
30-34	128.8	63.9	112.0	145.6	2.5	1.5	2.0	2.9	57.1	[42.8,70.3]	44	6.3	3.9	5.2	7.4	57.1	[42.8-70.3]	57.1	83		
35-39	102.9	66.1	84.0	121.7	2.1	1.6	1.8	2.5	43.0	[30.7,56.1]	36	5.5	4.1	4.6	6.5	45.9	[33.4-59.0]	45.9	84		
40-44	106.2	55.7	89.5	122.9	2.2	1.2	1.8	2.5	54.8	[39.6,69.2]	38	5.6	3.0	4.7	6.5	55.7	[40.4-69.9]	55.7	65		
>=45	101.2	61.3	79.5	122.9	2.8	2.0	2.2	3.4	58.3	[42.8,72.4]	39	7.2	5.1	5.7	8.8	59.0	[43.4-73.0]	59.0	47		
State/Region																					
Kachin	137.3	119.7	108.2	166.5	3.2	2.9	2.5	3.8	66.1	[45.9,81.8]	7	8.1	7.3	6.4	9.9	71.5	[51.9-85.3]	8	11		
Kayah	132.2	255.1	103.0	161.4	2.6	7.2	1.8	3.4	56.8	[37.2,74.4]	1	6.6	18.4	4.6	8.6	56.8	[37.2-74.4]	1	2		
Kayin	121.1	129.4	89.6	152.6	1.8	2.0	1.3	2.3	35.5	[20.0,54.8]	4	4.6	5.1	3.4	5.8	42.4	[25.5-61.3]	5	12		
Chin	122.9	278.0	83.4	162.4	2.3	4.1	1.8	2.9	51.5	[32.3,70.2]	2	5.9	10.4	4.5	7.3	51.5	[32.3-70.2]	2	4		
Sagaing	138.5	82.1	101.3	175.7	2.4	1.4	1.7	3.0	55.7	[37.3,72.7]	24	6.1	3.6	4.5	7.7	55.7	[37.3-72.7]	24	46		
Tanintharyi	129.4	118.9	101.8	157.1	2.9	2.8	2.1	3.6	70.8	[49.3,85.8]	6	7.3	7.2	5.5	9.2	70.8	[49.3-85.8]	6	11		
Bago	126.5	62.4	97.1	155.9	2.6	1.3	1.9	3.2	53.0	[34.7,70.5]	25	6.6	3.3	5.0	8.1	53.0	[34.7-70.5]	25	46		
Magway	108.3	56.0	84.8	131.9	2.7	1.9	1.9	3.5	53.0	[34.3,70.9]	18	7.0	4.9	4.9	9.1	53.0	[34.3-70.9]	18	34		
Mandalay	113.8	50.6	89.7	137.9	2.5	1.3	1.8	3.2	55.3	[35.6,73.5]	27	6.4	3.4	4.6	8.3	55.3	[35.6-73.5]	27	52		
Mon	99.4	75.5	77.4	121.4	2.9	2.6	2.1	3.7	63.1	[43.3,79.3]	11	7.5	6.7	5.5	9.6	63.1	[43.3-79.3]	11	18		
Rakhine	102.8	54.4	86.5	119.2	2.6	1.9	2.0	3.2	63.0	[43.4,79.1]	11	6.7	4.9	5.1	8.2	63.0	[43.4-79.1]	11	18		
Yangon	127.1	45.8	101.2	153.1	2.5	1.1	1.9	3.0	48.0	[30.5,66.0]	31	6.3	2.7	4.8	7.8	48.0	[30.5-66.0]	31	63		
Shan	119.9	53.3	94.4	145.4	2.8	1.1	2.3	3.4	63.0	[43.2,79.2]	28	7.3	2.9	5.9	8.7	63.0	[43.2-79.2]	28	47		
Ayeyarwady	131.1	50.3	104.7	157.4	2.5	0.9	2.0	2.9	62.7	[44.0,78.2]	38	6.3	2.3	5.1	7.5	66.2	[47.3-81.0]	40	62		
Nay Pyi Taw	148.3	132.4	117.3	179.3	3.4	3.3	2.6	4.2	81.1	[61.5,92.0]	8	8.7	8.5	6.8	10.7	81.1	[61.5-92.0]	8	10		
Residence																					
Rural	126.3	73.6	115.5	137.1	2.6	1.6	2.3	2.8	57.6	[50.4,64.5]	178	6.6	4.2	6.0	7.2	58.6	[51.4-65.5]	181	314		
Urban	116.3	72.3	102.3	130.2	2.6	1.8	2.2	2.9	55.1	[44.0,65.8]	65	6.6	4.5	5.7	7.5	55.5	[44.3-66.1]	65	120		

MMFCS (National Nutrition Centre, DoPH, MoHS)

Background characteristic	Sodium excretion (mmol/day)				Sodium intake (g/day)				% Sodium intake (>2g/day)				Salt intake (g/day)				% Salt intake (>5g/day)				Total
	Mean	SD	UCI	LCI	Mean	SD	UCI	LCI	%	CI	(n)	Mean	SD	UCI	LCI	%	CI	(n)			
Wealth index																					
Least	120.2	55.5	101.4	139.0	2.5	1.4	2.0	2.9	60.6	[44.8,74.5]	39	6.3	3.7	5.2	7.4	61.3	[45.4-75.2]	39	72		
Second	112.5	69.1	91.7	133.2	2.8	1.6	2.4	3.3	59.3	[46.9,70.6]	62	7.3	4.2	6.2	8.4	59.3	[46.9-70.6]	62	77		
Middle	143.9	89.5	121.8	166.0	2.2	1.5	1.8	2.6	49.0	[36.3,61.8]	42	5.7	3.8	4.7	6.7	49.0	[36.3-61.8]	42	110		
Fourth	107.0	68.9	91.2	122.9	2.8	2.0	2.3	3.3	60.3	[46.1,72.9]	44	7.1	5.1	5.8	8.4	63.2	[49.1-75.3]	46	77		
Highest	124.6	65.5	109.4	139.9	2.5	1.7	2.1	2.9	56.4	[43.8,68.2]	57	6.5	4.3	5.5	7.5	57.4	[44.7-69.1]	58	98		
Household food security status																					
Food secure	124.0	73.4	113.4	134.6	2.6	1.6	2.4	2.8	58.4	[51.2,65.3]	176	6.6	4.1	6.0	7.3	59.3	[52.1-66.2]	179	315		
Mild. insecure	136.4	66.6	113.9	158.9	2.5	1.6	2.1	2.9	56.2	[40.1,71.1]	30	6.4	4.0	5.4	7.4	57.0	[40.8-71.8]	30	41		
Mod. insecure	115.2	80.5	92.2	138.3	2.5	2.0	1.9	3.1	49.7	[33.6,65.9]	28	6.5	5.0	5.0	8.1	50.5	[34.3-66.6]	28	53		
Severe. insecure	113.3	75.6	76.8	149.9	2.8	2.0	1.8	3.9	56.2	[28.0,80.9]	10	7.3	5.1	4.5	10.0	56.2	[28.0-80.9]	10	25		
Household Dietary Diversity																					
HDDS<6	113.5	69.2	101.6	125.3	2.5	1.7	2.2	2.8	51.6	[42.9,60.1]	105	6.4	4.4	5.6	7.1	51.8	[43.2-60.3]	105	190		
HDDS>=6	131.3	76.8	119.0	143.6	2.7	1.6	2.4	2.9	61.8	[53.5,69.5]	139	6.9	4.2	6.2	7.5	63.2	[54.9-70.7]	142	244		
Total	123.5	74.2	114.8	132.2	2.6	1.7	2.4	2.8	56.9	[50.9,62.8]	243	6.6	4.3	6.1	7.1	57.8	[51.7-63.6]	247	427		

Values presented here are weighted figures

7. Discussion

The MMFCS was conducted between end of November 2017 and May 2018 concurrently in all states/regions aiming to provide updated and representative data on nutrition and micronutrient status of population in Myanmar.

Household food security and household dietary diversity provide an indication of household's affordability, availability and accessibility to food. Almost two thirds of household were reported to be food secure and the rest experienced different levels of severity of food insecurity. Household food security improved with wealth and twice the number of households in the wealthiest (88.3%) compared to poorest (44.1%) households reported being food secure. Children from food insecure households often experienced chronic malnutrition such as stunting. There was a high percentage of stunted children in food insecure households.

In MMFCS, stunting among children 6-59 months of age was 26.7% with the highest rate reported in Chin state (40.3%). The finding for stunting in Chin state was similar to that reported in previous surveys (58% in 2010 and 41% 2015) (MOH and MONPED 2010, MOHS and ICF 2017). In addition, Chin state, Ayeyarwady region and Rakhine state had a high prevalence of stunting in many of the target groups such as primary school age children (5-9 years of age) and adolescent girls. Promotion of optimal infant and young child feeding practices should be reinforced in these areas. Special attention should also be given to households in the lowest tertile of HDDS in which their diet consists merely of cereals and vegetables with very little animal source foods.

While still trying to fight against the high burden of undernutrition, Myanmar is also experiencing overnutrition. The findings show 3.3% of primary school age children, 5.5% of adolescent girls, 22.9% of women of reproductive age and 11.0% of men were overweight and 7.3% of those women and 2.0% of men were obese. Previous surveys conducted by the MoHS for diabetes mellitus and non-communicable diseases (NCD) risk factors among men and women aged 25-64 years showed overweight to be 14.1% of men and 30.8% of women and obesity 2.6% of men and 8.4% of women (MOH, WHO et al. 2014). The findings highlight that health promotion activities on healthy diet and physical activity should be enhanced.

Micronutrient deficiencies are common in the country as well as in the regions and deficiencies of more than one micronutrient often coexist. However there is lack of information on the current micronutrient status of population in the country. Previously, a few studies were conducted nationwide in Myanmar such as anemia surveys (NNC 2003, 2005), a vitamin A survey (NNC and DMR 2012) but only selected indicators were included in those studies. Therefore there is no concrete information to reflect the true micronutrient status of the population.

Micronutrient surveys should be conducted at regular intervals to understand the nutritional situation of the population and to design appropriate interventions which can directly address the needs of population. In Myanmar, the MMFCS is the first survey including comprehensive indicators of micronutrient biomarkers and we believe that the findings will be useful to undertake important policy making and to serve as a baseline for future surveys as well as evaluating the effectiveness of ongoing nutrition interventions. In fact, the findings are being released just before the start of inception period activities of the multi-sectoral national plan of action on nutrition (MS-NPAN). Thus an understanding of the current nutrition situation of the population will be useful for the forthcoming nutrition interventions.

This interim report serves as the background information to the upcoming results of findings on micronutrient status which is planned to be reported later this year. In this interim report, we have presented findings on household food security, household dietary diversity, anthropometry, anemia, iodine content in salt, iodine status and sodium status.

Anemia has been one of the common nutrition problems in Myanmar. Previous surveys showed that 64.6% of preschool children (Nutrition survey by NNC 2005), 26.4% of adolescent girls (National Hemoglobin survey by NNC 2002), 71% of pregnant women (National Hemoglobin survey by NNC 2005), and 45.2% of women of reproductive age (National Nutrition survey by NNC 2005) were anemic. In the recently conducted MDHS survey, anemia was found in 57.8% of children under 5 years of age and 46.6% of reproductive age women (MOHS and ICF 2017).

In the MMFCS, 35.6% of 6-59 month children, 51.1% of primary school age children, 29.8% of adolescent girls, 40% of pregnant women, 35.4% of lactating mothers and 30.3% of women of reproductive age were reported to be anemic. Iron supplementation, deworming and nutrition education are the main strategies for the control of anemia in

Myanmar. Generally, there is a decreasing trend in the prevalence of anemia in many of the target groups and it will be interesting to know the iron status of the different target groups in the next report. It is also important to highlight that the prevalence of anemia among primary school age children and pregnant women are still remain a severe public health problem ($\geq 40\%$) as defined by the WHO (WHO 2011). The findings show that there are high rates of anemia in Kachin state, Rakhine state, Ayeyarwady region and Tanintharyi region in many of the target groups and we need to reinforce the anemia control program in those areas.

Iodine is one of the key nutrients important for the brain development of children. Myanmar is on its track to achieve elimination of iodine deficiency disorders in reduction of visible goiter rate however the main obstacle is the iodine content of household salt. Although universal salt iodization (USI) is being implemented, the findings from this survey shows that only 36.8% of households were using adequately iodized salt (i.e. iodine $\geq 15\text{ppm}$) as assessed by the titration method as the gold standard. The findings were also consistent with the urinary iodine excretion. Tanintharyi region, Rakhine state and Ayeyarwady regions had the lowest rate of households with adequately iodized salt.

On the other hand, urinary sodium concentration was in excess and sodium intake exceeding $>2\text{g/day}$ in more than half of both adult men and women of reproductive age (64.1% in women vs. 56.9% in men) respectively showing there is an increased risk of NCD such as hypertension. Estimated salt intake exceeding the WHO recommended level (i.e. $>5\text{g/day}$) is 65.4% in women and 57.8% in men. In addition, this finding is closely related to USI program as careful adjustment is needed to achieve intended level of iodine in salt while aiming to reduce sodium intake from salt.

The findings from this MMFCS interim report are expected to provide initial information and contribute to planning of nutrition programs for the country. In next report, the findings related to micronutrient status will be available to provide evidence to design nutrition-specific (including food-based recommendations, fortification and supplementation) and targeted interventions to improve micronutrient status of the people of Myanmar.

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