



Addressing Stunting in Timor-Leste: An Assessment Report [EXTERNAL]

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ABBREVIATIONS AND ACRONYMS

| | |
|---------------|---|
| ADB | Asian Development Bank |
| AND | <i>Agência Nacional de Desenvolvimento</i> (National Agency for Development) |
| <i>Aldeia</i> | ‘Sub-village’ or hamlet. (There are 2,225 <i>aldeias</i> in Timor-Leste) |
| ANC | Antenatal Care |
| AusAID | Australian Agency for International Development |
| BESIK | <i>Be'e Saneamentu no Ijiene iha Komunitade</i> (AusAID Rural Water Supply and Sanitation Project) |
| BESITL | Timor-Leste Water, Sanitation, and Hygiene CSO Network |
| BMI | Body mass index (kg/m ²) |
| CAP/PAK | Community Action Planning / <i>Planu Aksaun Komunitade</i> |
| CHC | Community Health Center |
| CLTS | Community-Led Total Sanitation |
| CSC | Community Score Card |
| CVTL | <i>Cruz Vermelha de Timor-Leste</i> (Red Cross) |
| DAA | <i>Departamento Abastecimento Agua</i> (Water Supply Department) |
| DFAT | Australian Department of Foreign Affairs and Trade |
| DGAS | <i>Direção General de Água e Saneamento</i> (General Directorate for Water and Sanitation) |
| DHS | Demographic and Health Survey |
| DNCQA | <i>Direção Nacional de Controlo e Qualidade da Água</i> (National Directorate for Control and Quality of Water) |
| DNGRA | <i>Direção Nacional de Gestão de Água</i> (Directorate for Water Resources Management) |
| DNSA | <i>Direção Nacional de Saúde Pública</i> (National Directorate for Public Health) |
| DNSB | <i>Direção Nacional Saneamento Básico</i> (National Directorate for Basic Sanitation) |
| DNSP | <i>Direção Nacional de Saúde Pública</i> (National Directorate for Public Health) |
| DPES | <i>Departamento Promosaus no Edukasaun Saude</i> (Department of Health Promotion and Education) |
| DSA | <i>Departamento de Saúde Ambiental</i> (Department of Environmental Health) |
| EAPR | East Asia Pacific Region |
| EBF | Exclusive Breastfeeding or Exclusively Breastfed |
| ESTATAL | <i>Ministério da Administração Estatal</i> (Ministry of State Administration) |
| FPA | <i>Fasilitador Postu-Administrativu</i> (Municipal Government Outreach Staff) |
| GDP | Gross Domestic Product |
| GMF | <i>Grupu Maneja Fasilidade</i> (Community Water Management Group) |

| | |
|------------|--|
| GoTL | Government of Timor-Leste |
| HAZ | Height-for-age Z-score |
| IFAS | Iron Folic Acid Supplementation |
| IMF | International Monetary Fund |
| IYCF | Infant and Young Child Feeding |
| JICA | Japanese International Cooperation Assistance |
| JMP | Joint Monitoring Programme (for water and sanitation by UNICEF and WHO) |
| KONSSANTIL | National Council on Food Security, Sovereignty and Nutrition |
| MAD | Minimum Acceptable Diet |
| MCC | Millennium Challenge Corporation |
| MCIE | Ministry for Commerce, Industry and Environment |
| MCK | <i>Mandi, Cuci, Kakus</i> – Indonesian public facility combining bathing, washing, and toilet facilities |
| MDD | Minimum Dietary Diversity |
| MDG | Millennium Development Goal |
| MIYCN | Maternal, Infant, and Young Child Nutrition |
| MMF | Minimum Meal Frequency |
| MOAF | Ministry of Agriculture and Fisheries |
| MOE | Ministry of Education |
| MOF | Ministry of Finance |
| MOH | Ministry of Health (<i>Ministério da Saúde</i>) |
| MOSS | Ministry of Social Solidarity |
| MOPTC | <i>Ministério das Obras Públicas, Transportes e Comunicações</i> (Ministry of Public Works, Transport, and Communications) |
| NGO | Non-Governmental Organization |
| O&M | Operations & Maintenance |
| ODF | Open Defecation-Free |
| OR | Odds Ratio |
| PAKSI | <i>Planu Asaun Komunitade ba Saneamentu no Ijieni</i> (Community Action Plan for Sanitation and Hygiene) |
| PDD | <i>Programa Desenvolvimento Descentralizado</i> (Program of Decentralized Development) |
| PDID | <i>Programa de Desenvolvimento Integrado Distrital</i> (Integrated District Development Program) |
| PDL | <i>Programa Desenvolvimento Lokal</i> (Local Development Program) |

| | |
|-----------|---|
| PN-BESITL | National Platform for Water, Sanitation, and Hygiene Network |
| PNDS | <i>Programa Nacional de Desenvolvimento dos Sukus</i> (National Program for Village Development) |
| RCT | Randomized Controlled Trial |
| SAS | <i>Serviço de Água e Saneamento</i> (District Water and Sanitation Service) |
| SBCC | Social Behavior Change and Communication (also called Social Behavior Change) |
| SD | Standard Deviation |
| SDA | Service Delivery Assessment |
| SDP | Strategic Development Plan |
| SIBS | <i>Sistema Informasaun Bee no Saneamentu</i> (Rural water and sanitation information system) |
| SISCa | <i>Servisu Integradu da Saúde Comunitária</i> (Integrated Community Health Service) |
| SMASA | <i>Serviços Municipais Água, Saneamento, e Ambiente</i> (Municipal Water, Sanitation, and Environmental Services) |
| Suku | a village in Timor-Leste |
| TLFNS | Timor-Leste Food and Nutrition Survey, 2013 |
| UNICEF | United Nations Children's Fund |
| URC | University Research Co., LLC (URC) |
| VIP | Ventilated Improved Pit latrine |
| WASH | Water, Sanitation, and Hygiene |
| WFP | World Food Programme |
| WHO | World Health Organization |
| WHZ | Weight-for-height Z-score |
| WSP | World Bank's Water and Sanitation Program |

Executive Summary

Assessment Report Background and Purpose

A Team comprised of Millennium Challenge Corporation (MCC) and University Research Co., LLC (URC) staff visited Timor-Leste in July through August 2018 to identify the main drivers of the high prevalence of stunting in children 0-59 months of age. This report presents the findings related to the drivers of stunting and reviews programming currently underway.

The Team collected data and information (prior to and during the field mission) using the following methods:

- Desk review of the Timor-Leste-specific and global evidence on the prevalence and consequences of stunting;
- Desk review of the drivers of stunting in Timor-Leste and frameworks for their discussion;
- Desk review of the global evidence for the drivers of stunting;
- Interviews with stakeholders at Central and Municipality levels about the drivers of stunting, programs being implemented to address stunting, and efforts to improve hygiene behaviors and water supply and sanitation services;
- Secondary analysis of key indicators related to anthropometry and the minimum dietary diversity indicators for women and children; and
- Other evidence on the wide-ranging contributions of nutrition, water supply, sanitation, and hygiene have on child growth and development.

The major sources of quantitative data on significant factors determining stunting are two analyses conducted using data from the 2013 Timor-Leste Food and Nutrition Survey (TLFNS, 2013):¹ 1) Bivariate and multi-variate analyses reported in the survey report, using stunting prevalence as the dependent variable; and 2) An additional regression analysis, using height-for-age (HAZ) as the dependent variable, conducted by MONASH University on the TLFNS, 2013. These methods and associated constraints are explained in the methodology section.

Timor-Leste has one of the highest prevalence of child stunting in the world (IFPRI, 2016) with over 50% of Timorese children 0-59 months of age stunted in their growth. Maternal underweight and short stature are high in the country. Over one-quarter (27%) of women of reproductive age 15-49 years are underweight, and 10% are of short stature. The linear growth of infants and young children is affected by their nutrition in the “first 1,000 days of life” from pregnancy to the first two years of life, making pregnant women and children 0-23 months the primary focus of programs to reduce stunting.

Findings on the Drivers of Stunting

The drivers of stunting emerge from simple comparisons and bivariate and regression analyses and application of UNICEF’s “Conceptual Framework for Malnutrition” – used to organize the discussion of drivers between those related to disease and those related to inadequate food intake. This is followed by the results of interviews with key stakeholders about the problem of

¹ While the DHS 2016 survey collected anthropometric measurements for children, there is some question about the quality of these data. Because it is not yet validated, this report relies mainly on the TLFNS, 2013 for anthropometry in children. The report presents other information from the DHS 2016.

stunting and its drivers obtained during field visits and by a discussion about the immediate and underlying drivers of stunting.

The prevalence of stunting varies widely by municipality (from 40% to 65%) with children living in rural areas more likely to be stunted (55%) than those living in urban areas (39%). Using demographic data and the prevalence of stunting, the Team determined that the number of stunted children living in rural areas is four times the number of stunted children in urban areas.

Stunting differs by gender with greater prevalence in boys (53%) than girls (47%).² A rapid rise in stunting between birth and two years provides evidence that this group is the most vulnerable and should be the target of interventions. The prevalence of stunting is also strongly associated with wealth quintiles, with stunting highest in the lowest wealth quintile (59%) and lowest in the highest wealth quintile (42%). It should be noted, however, that such a high prevalence among the highest wealth quintile is important as it suggests that factors influencing stunting are beyond poor economic status and poverty. These other factors may include (but are not limited to) poor child feeding, care, and hygiene practices, and possibly environmental conditions. Deeper investigation into these categories would be useful.

Initial correlations of stunting with lack of education and illiteracy levels did not remain once factors were controlled for in the regression analysis. However, mother's height was a strong determinant of stunting and HAZ, suggesting the importance of her own nutrition before her child reaches the age of two, as well as underscoring the inter-generational effects of malnutrition. Immediate and underlying drivers of stunting include the following:

Immediate determinants Adequacy of dietary intake as an indicator of food intake for children and pneumonia as an indicator of morbidity used in this work:

- After adjusting for age and sex, both dietary adequacy³ (Odds Ratio (OR)⁴: 1.96; 95% CI: 1.74-2.24) and suspected pneumonia (OR: 1.25; 95% CI: 1.08-1.46;) remained strong determinants of stunting.⁵
- In a secondary analysis, these findings were confirmed, and specific child feeding practices were also highlighted:
 - Breastfeeding status (in children age 11-23 months) was identified as a strong determinant. Breastfed children in this age group have z-scores 0.16 better on average than non-breastfed children in the same age group.
 - All children who consumed flesh foods, such as meat or fish, in the 24 hours prior to the interview had higher z-scores (+0.096; 2.79; p<0.01) than those that did not have any of these foods, with this effect being strongest among older children (+0.10; 2.42; p<0.05).

Other underlying determinants All factors associated with stunting identified in the bivariate analyses were entered into a model. After adjusting for age and sex:

² In many countries, the prevalence of stunting is higher in boys than girls. The main reasons are likely that boys have slightly higher nutritional requirements than girls, younger boys have higher morbidity rates, older boys 2-5 years may be more mobile than girls. Boys may be given special foods like breastmilk substitutes and junk food which aren't healthier. For example, in the DHS (2016), breastfeeding duration in girls was one month longer (16.6 months) than for boys (15.6 months).

³ Adequate diet was defined as "exclusive breastfeeding for children age 0-5 months, minimum acceptable diet for children age 6-23 months, and an adequate diet for children age 24-59 months."

⁴ Odds Ratio is the odds of an outcome occurring in one group compared to the others.

⁵ NOTE: Diarrhea prevalence, a focus of the Team's effort, was not used as a morbidity indicator in this work.

- Only caregiver's education level and type of latrine in the household were significant determinants. The results showed that risk of stunting was higher among households whose caregivers had a low education level (p ranging from 0.051 to <0.001) and among households having unimproved latrine facilities (p<0.001). In the final analysis, however, these associations disappeared, suggesting they are related to part of the effect of the highest wealth quintile through the higher level of education and better housing conditions.

Disease

There was a significant increase in stunting with child morbidity. The quantitative analyses which examined determinants of stunting in children 0-59 months (TLFNS, 2013) found that being ill two weeks prior to the survey was significantly associated with a higher prevalence of stunting irrespective of type of the disease (p=0.007), and the multi-variate analysis (TLFNS, 2013) identified children with recent pneumonia to be at increased risk of stunting (OR 1.20 CI 1.03-1.40 p=0.023). Having diarrhea in the last two weeks was also found to be strongly associated with a higher prevalence of stunting (p<0.001); however, for some reason recent history of diarrhea was not included in the models for either the multi-variate or regression analyses. Thus, the Team recommends further investigation in this area.

Inadequate food intake

Analyses found that inadequate infant and young child feeding (IYCF) practices, as a proxy for food intake, significantly increased the prevalence of stunting in children. The multivariate analysis found the odds of stunting were higher (OR 1.96) when the child did not have an adequate diet. Except for exclusive breastfeeding, being fed by the recommended IYCF practices were associated with lower prevalence of stunting: breastfeeding between 6-23 months; consuming a diet of minimum dietary diversity and food frequency; and adhering to all recommended IYCF practices. The regression analysis showed similar findings with improved HAZ when children 12-23 months (0.16 cm taller) were still being breastfed and, as mentioned previously, children 6-59 months consumed a source of animal products (e.g., meat, fish) but not eggs with the effect on HAZ from animal products highest in older children.

Access to health care, adequacy of water and sanitation, and other environmental factors

The prevalence of stunting in their children was lower among mothers who used health services. Lower prevalence rates were associated with mothers who used any antenatal care (ANC) and when children received any immunizations.

Access to improved drinking water or the presence of a handwashing station showed no impact on stunting in Timor-Leste. Contained defecation at the individual household level also showed little impact on HAZ; however, community-wide access to either a protected water source or adequate sanitation resulted in significant improvement in weight-for-age z-scores (WHZ). Only the presence of an improved latrine in households had a significant impact on reducing stunting; however, the **regression analysis**, found this association between improved sanitation and reduced HAZ disappeared once other factors were controlled for, and the authors concluded that the initial effect detected may be due to wealth and better housing conditions overall. These findings illustrate the Team's understanding that there is no evidence in these analyses of direct and consistent correlation to stunting with improvements in water supply or sanitation infrastructure. Instead, the potential contribution to stunting reduction is indirect and based on

global experience and research through reduced diarrhea prevalence (i.e., improvements in water, sanitation, and hygiene (WASH) facilities reduce diarrhea prevalence; reduced diarrhea prevalence reduces stunting).

Globally, there is strong evidence that diarrhea affects linear growth. A multi-study analysis found that 25% of stunting in children was attributed to five or more episodes of diarrhea (Checkley, et al., 2008). According to this work, the “odds of stunting at age 24 months increased multiplicatively with each diarrheal episode and with each day of diarrhea before 24 months (all $P < 0.001$). The adjusted odds of stunting increased by 1.13 for every five episodes (95% CI 1.07–1.19)” of diarrhea before age 24 months.

That there was little reduction in stunting and improvement in HAZ with improved water or toilet sources or coverage of open defecation free (ODF) environments may be due to the definitions used for “improvement” rather than to the facility or service itself. Globally, there is inconsistency in the literature in the use of terminology. Furthermore, for children to benefit, their environments—in both urban and rural areas—must be less fecally-contaminated, making improvements in hygiene behaviors and environmental conditions related to diarrheal reduction and childcare the most important interventions. Success in this area requires sequencing of infrastructure improvements and adoption of hygienic practices. Currently, both are deficient and there are unhealthy environments in both urban and rural areas throughout Timor-Leste. In Timor-Leste, specific numbers vary, but municipality and national trends are consistent: less than three-fourths of the national population has access to an improved water source, and less than half have access to improved sanitation (Lockwood et al., 2016). The data in rural areas show that less than two-thirds have access to improved water, and only one in seven have piped water to their premises (Lockwood, et al., 2016). Urban sanitation services consist of open sewers used for agriculture that empty directly to the sea and regularly flood into street and residential areas. Urban water supply is not metered nor monitored for quality and only provides intermittent supply at best without generating revenue. Even where rural water schemes are in place, 10 to 25% are non-functional at any point in time (Lockwood, et al., 2016). The capacity of communities to operate and maintain rural water supply systems is limited, and the failure rate is as much as 50% within two years of commissioning (Smets, 2015). At the same time, some municipalities were successful at eliminating open defecation but only more recently. Over time, this may have an effect as children 0-2 years of age grow up in ODF environments.

There were other factors that are drivers of stunting or HAZ related to environmental conditions or poverty of households. The bivariate analysis found that stunting was highest when children lived on farms, including those producing cash crops, and when families owned livestock. Stunting was less in children living in households with salaried income; however, in the regression analysis there was no effect of labor income on HAZ.

Findings from interviews with stakeholders

The Team visited eight municipalities and interviewed 70 people about their opinions and knowledge related to: nutrition issues: stunting and its causes; and programming necessary to address stunting. Responses were relatively consistent across the municipalities:

- The major nutrition problems identified were (in descending order):
 - Malnutrition with mothers and/or children being underweight or children not gaining enough weight;
 - Poverty;

- Illnesses/infections; and
 - Lack of access to clean water.
- The major causes of malnutrition identified were (in descending order):
 - Lack of knowledge about what foods to feed children and lack of knowledge about good nutrition;
 - Parents not feeding their children nutritious foods and diets lacking diversity; and
 - Lack of clean water and sanitation.
- The vast majority of those interviewed had heard about stunting and most were able to describe what it was, although a few people thought it was genetic and that the Timorese population is just short.
- The major causes of stunting identified were (in descending order):
 - Lack of knowledge about what foods to feed children and lack of knowledge about good nutrition;
 - Parents not feeding children nutritious foods and diets lacking diversity;
 - Genetics; and
 - Lack of clean water and sanitation.
- The most important programs described to address stunting included (in descending order):
 - Improved counseling about good maternal, infant, and young child nutrition (MIYCN);
 - Community promotion about dietary diversity; and
 - Growing more nutritious foods.

Most respondents placed a high value on addressing the problem of stunting. There were a few people who thought stunting was caused by genetic factors (i.e., people are just naturally short), but most recognized it as a problem that could be addressed through better education and counseling of mothers. In most municipalities, there was strong recognition that lack of clean water and sanitation were causes of malnutrition and stunting. In all municipalities that the Team visited, multi-sector coordination did not exist or was weak. Stakeholders did, however, cite coordination as an important element necessary to reduce stunting. Increasing food production did not come out strongly as a solution.

Combined findings from quantitative and qualitative data and information

While the interviews were mostly focused on health and nutrition, lack of clean water and sanitation came out as a major development problem and driver of stunting. When asked, however, about the most important interventions to address stunting, water and sanitation were rarely mentioned. This may be because most people interviewed were from the health sector although they too recognized the need for better access to clean water and sanitation. From the interviews with staff from the District Water and Sanitation Service (SAS), it was clear they knew less about nutrition, but they did understand the importance of clean water and sanitation as important interventions to improve nutrition. There was some awareness of the need to take a multi-sectoral approach to address malnutrition and the role of the sector in this approach.

There was overwhelming recognition that IYCF practices were poor, and the lack of knowledge and information about what to feed children was the major cause of stunting and malnutrition. Poor nutrition of mothers was mentioned as a problem in a few municipalities but not in every

municipality. A few people noted that people were selling or not growing nutritious foods and relying on less nutritious imported food. People living in remote areas with poor access to roads, markets, and health services were mentioned as a major cause of increasing the risk of stunting and malnutrition.

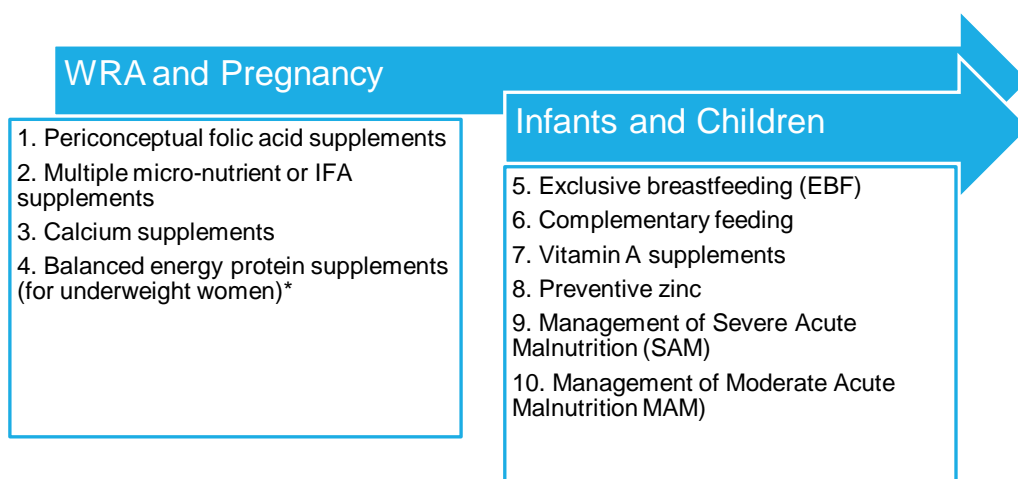
Other underlying causes or drivers of stunting were reported elsewhere and mentioned by a few stakeholders interviewed. Traditional ceremonies and the financial burden they have on families was mentioned in addition to capacity to provide nutritious foods; mothers restricting what they eat during pregnancy; and avoiding or potentially not feeding certain foods to themselves and their children because of strong geographically specific food taboos, but it is unknown if they determine current dietary behaviors. A 2007 study (MOH, 2007) conducted an in-depth consultation with communities in two municipalities about health and nutrition practices and provides interesting information about why certain practices are followed and if mothers are willing to adopt optimal practices. However, more needs to be investigated about current practices and use of health services and how, for example, socio-economic, gender roles, and mothers time constraints, to name a few, affect practices.

The Consequences of Stunting

There is a cost of stunting for each sector in government. For the agriculture sector, stunting compromises the ability to work hard, decreasing agricultural productivity. Stunted children do not enroll on time and may not attend regularly, decreasing grade-completion rates and the performance of the education sector. For the health sector, stunting increases risk of morbidity and mortality and the costs of the health sector. The World Bank estimates that between 4% and 11% of gross domestic product (GDP) is lost annual because of stunting, which would mean that eradicating stunting would add \$68 to \$170 million to the Timor-Leste economy per year.

Global Programming to Reduce Stunting

Nutrition-specific interventions, mainly delivered by the health sector, and **nutrition-sensitive** interventions, mainly delivered by other sectors are being promoted globally to accelerate the response to static and high rates of stunting globally. More is currently known about the impact of the nutrition-specific interventions than nutrition-sensitive interventions on stunting. Ten nutrition-specific interventions were identified globally as the most effective in reducing stunting and malnutrition in countries where the burden of stunting and malnutrition is the highest:



Of these, most is known about implementing programs to improve delivery of iron-folic acid supplements to pregnant women; and improve breastfeeding and complementary feeding practices. Less is known about the impact on stunting of interventions implemented by non-health sectors, particularly agriculture; education; and water and sanitation although there are studies and analyses that demonstrate how important the agriculture and education sectors are to addressing the problem. There is conclusive evidence that increasing the consumption of certain nutrient-rich foods (e.g., animal product) reduces stunting in children; and keeping girls in schools improves the nutritional status of their children when they become mothers.

Other sector activities are called “nutrition-sensitive” because they address the underlying causes of malnutrition. These most commonly include agriculture and access to water supply and sanitation services. Increasing access to improved quality and quantity of water and sanitation systems makes intuitive sense as a proven intervention to reduce diarrhea and likely stunting in in places where there is poor quality and operations of urban and rural water supply and sanitation services.

Landscape Analysis and Current Programming in Timor-Leste

From the landscape analysis, the Team found that there are positive policy and coordination mechanisms in the country. The National Council on Food Security, Sovereignty and Nutrition (KONSSANTIL) has organized multi-sectoral coordination around nutrition, which receives broad support across many sectors, with the notable absence of water supply and sanitation decision-makers on the council. Non-governmental organizations (NGOs) and other stakeholders are implementing programs to address malnutrition – many with innovations that are being used, or may be used in the future, to strengthen national programs implemented by the government. However, the NGOs, and other development partners, have limited reach now and are not always working to build capacity of government to deliver effective programs.

In a recent report, the World Bank (Provo, et al., 2017) stated that reducing malnutrition is not going to be possible “without close engagement with families and communities to reduce the normalcy of stunting, build knowledge of malnutrition, and define solutions building on community assets and institutions.” Key recommendations of this report were to empower families and communities with knowledge and resources to improve child growth and increase coverage of nutrition-specific and nutrition-sensitive interventions. The Team’s findings from its July-August 2018 field mission are consistent with this World Bank’s report. The existing community platform, *SISCa*, which is the Ministry of Health (MOH)’s rural, community-based platform for the delivery of maternal and child health services, has weakened and lacks emphasis on preventing malnutrition. Throughout the health system, the Team found an emphasis on screening for- and treating severe acute underweight and less emphasis on prevention. There is a lack of effective social and behavior change communication (SBCC) strategies with a notable absence of national messages to promote the most important behaviors and absence of support networks to help manage problems families may encounter when endeavoring to implement optimal MIYCN and hygiene behaviors.

While the *importance* of improving child feeding and care, as well as water and sanitation supplies, in both urban and rural areas, was apparent from discussions with stakeholders, including in government. It was also apparent that the *technical knowledge was lacking* – as a general lack of understanding across sectors of optimal MIYCN and hygiene practices and methods of promotion was missing. Supporting recent progress on ODF to further its coverage

should be a priority, as well as efforts to establish the sustainability of both water and sanitation improvements. The work of KONSSANTIL is promising and could be further strengthened with the inclusion of water and sanitation staff from government participating in multi-sector discussions about reducing stunting in the country. This multi-sector focus needs to be strengthened at the municipality-level, too.

The Team believes that it is possible to reduce stunting in children in a short period of time in Timor-Leste, a small country that was able to dramatically improve other development indicators. The Government of Timor-Leste (GoTL) has demonstrated its ability to act successfully as evidenced by: behavior change to promote family use of bednets as part of malaria eradication to only 10 cases nationally in 2017; product delivery in making bednets, spraying, and early detection possible in support of malaria eradication; and infrastructure investments during national electrification efforts that successfully reached the entire country.

Timor-Leste has the funds, the desire, and the foundational institutions to achieve national change. With support, they have proven their ability to build on hundreds of smaller-scale, development partner-facilitated successes and execute evidence-based change. These past successes indicate their readiness to coordinate programs to reduce stunting and improve the country's future prospects.

I. Assessment Report Background

A. Objective and Methodology Used to Collect Information for the Assessment Report

A field mission to Timor-Leste took place from July 20 to August 10, 2018 with the main goal to identify the drivers of stunting. The team collected data and information (prior to and during the mission) using the following methods:

- Desk-review of the Timor-Leste-specific and global evidence on the prevalence and consequences of stunting;
- Desk-review of the drivers of stunting in Timor-Leste and frameworks for their discussion;
- Desk-review of the global evidence for the drivers of stunting;
- Interviews during the field mission with stakeholders at Central and Municipality levels about the drivers of stunting, programs being implemented to address stunting, and efforts to improve hygiene behaviors and water supply and sanitation services;
- Secondary analysis of key indicators related to anthropometry and the minimum dietary diversity indicators for women and children;
- Other evidence on the wide-ranging contributions of nutrition, water supply, sanitation, and hygiene have on child growth and development; and
- Desk-review of documents suggesting interventions, which could be appropriate and effective for addressing drivers of stunting in Timor-Leste.

For the interviews, the Team developed instruments to collect spontaneous responses to questions related to knowledge about stunting and the drivers of stunting and to learn about program coordination and implementation. Not all team members used the instrument to conduct interviews; for example, the instrument developed for use at the Central level was rarely used as team members found it more useful to pursue a different line of questioning as the field mission progressed. At the Municipality level, the instrument was used in about half of interviews. When the instrument was not used, team members asked questions at their own discretion and interests. The Team analyzed information captured from the interviews using the instrument.

Review of quantitative evidence of key drivers

For quantitative assessment of the priority drivers for stunting, a secondary review of existing reports and analyses of anthropometric data was conducted, which identified key determinants of stunting in the country. To identify relevant drivers of stunting from quantitative data, findings from two analyses of the TLFNS, 2013 were used: 1) An analysis included in the TLFNS, 2013 survey report itself,⁶ and 2) A secondary analysis conducted by MONASH University (Cornwell, 2016). The two analyses used slightly different approaches. The determinant analysis included in the TLFNS, 2013 report assesses the relationship between categories of potential factors and the presence of stunting as the dependent (categorical) variable using bivariate and multi-variate analyses. ORs were estimated to note the increased likelihood of an outcome (in this case stunting) occurring. The MONASH University study used statistical models, including regression analyses to identify factors associated with better HAZ, and estimate the effect. In

⁶ TLFNS, 2013 pp.81-88

both analyses, p-values were provided to note the statistical significance and strength of association of relationships of variables assessed. Annex 1 includes a table of the factors most significantly associated with stunting prevalence, with p values and the ORs of the important factors identified in the multivariate model. Key findings for both analyses with variations in stunting prevalence rates are highlighted in Box 1.

There are several limitations to these analyses which should be kept in mind:

1. Morbidity as a factor was assessed using “suspected pneumonia” in the TLFNS, 2013 analysis, while in the MONASH study, the authors used “any illness” – possibly because a higher proportion of children were affected by these illnesses. Although recent episodes of diarrhea was noted to be statistically associated with stunting in the bivariate analysis, this factor was not included as a potential factor in either the multi-variate or regression analyses.
2. Both reports also noted that indicators used for determining whether water and sanitation facilities were of a high standard are not specific enough, and likely hindered a proper analysis of the potential of WASH-related factors as determinants of stunting.

II. Introduction: Prevalence and Consequences of Stunting in Timor-Leste with Global and Regional Comparisons

A. Prevalence of Stunting in Timor-Leste

Prevalence of stunting, underweight, and wasting in children

Timor-Leste has one of the highest prevalences of childhood stunting in the world, (IFPRI, 2016). According to the TLFNS, 2013, over 50% of Timorese children 0-59 months were stunted, with 20% severely stunted; 38% were underweight; and 11% were wasted, with either moderate or severe acute malnutrition.^{7,8}

Although prevalence rates of all three of these measures of malnutrition have declined significantly since 2010 ($p < 0.001$, Z-test),⁹ the overall prevalence in the country remains very high, persistently above the WHO-defined threshold constituting a significant public health problem (Table 1).

Figure 1: Nutritional Status of Children DHS2009/10 and TLFNS, 2013

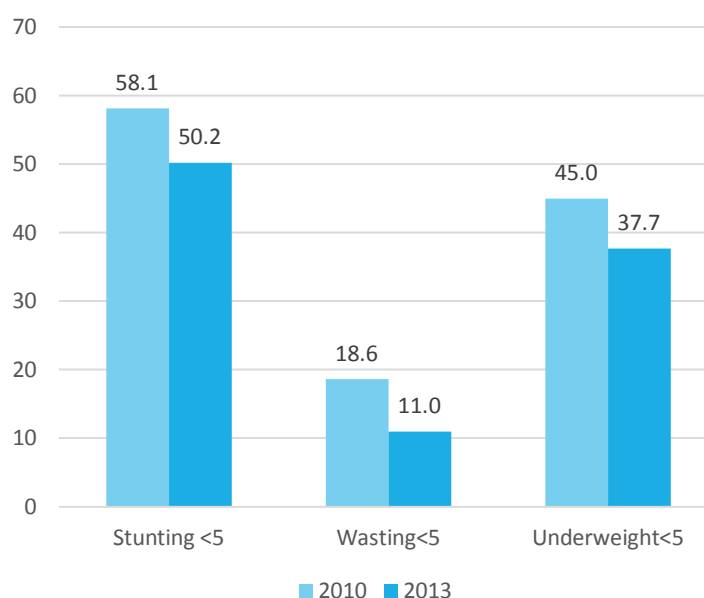


Table 1: The Public Health Significance of Stunting, Underweight, and Wasting

| Measure of Nutritional Status (Percent of children 0-59 months < 2 SD) | DHS 2009/10 | TLFNS 2013 C.I. | WHO Classification for Levels of Public Health Significance ¹⁰ |
|---|----------------|--------------------|--|
| Stunting (low height-for-age) | 58.1 | 50.2 (49.2-51.2) | Very high prevalence ($\geq 40\%$) |
| Underweight (low weight-for age) | 44.7 | 37.7 (36.7-38.7) | Very high prevalence ($\geq 30\%$) |
| Wasting (low weight-for-height) | 18.6 | 11.0 (10.4-11.6) | Serious (10-14%) |

⁷ Stunting or chronic malnutrition is measured by low height-for-age and indicative of past nutritional insult; wasting or acute malnutrition by low weight-for-height which represents recent nutritional deprivation and/or illness; and underweight, which is a composite indicator representing both stunting and wasting, by low weight-for-age. “Low” is defined as less than -2 standard deviations from the median of the WHO Child Growth Standards.

⁸ A Demographic and Health Survey was conducted in Timor-Leste in 2016. Validation of the accuracy of the anthropometry data is currently underway. For this report, the authors use only the anthropometric indicators from the DHS, 2009/10 and TLFNS, 2013 surveys. Other data from the 2016 report are used throughout this report.

⁹ TLFNS, 2013 Survey Report p. Discussion section 7.1 p.154.

¹⁰ WHO nutrition indicator database guide: http://www.who.int/nutrition/nlis_interpretation_guide.pdf p.2

In addition to having the highest rates of stunting in the East Asia Pacific Region (EAPR), Timor-Leste also has the fourth highest prevalence of wasting in the EAPR (UNICEF, undated). While the global average annual rate of reduction in stunting was 2.1% per year between 1990 and 2011, most countries in the EAPR region achieved below 1% per year, and prevalence rates in Timor-Leste remained relatively stagnant between 2002¹¹ and 2009/10. Fortunately, there was a decline in stunting rates between 2009/10 and 2013 with a 4.6% decrease per year (or 2.67 percentage point decrease per year). To adequately address the crisis, however, Timor-Leste must sustain and – better yet – accelerate this progress with strategic investments in evidence-based programming.

Prevalence of stunting and geographic-socio-economic factors

According to the TLFNS, 2013, a high prevalence of stunting among children 0-59 months is evident in all municipalities, with the highest prevalence found in Ermera (65%) and the lowest Lautem (39.5%). Children (aged 0-59 months) who live in rural areas are more likely to be stunted (54.5%) than those living in urban areas (39%). As shown in Annex 1, stunting is higher among boys (53%) than girls (47%), and boys are at a 1.37-fold higher risk of being stunted compared to girls.¹² The prevalence of stunting is high across all wealth quintiles, ranging from 59% for children living in the households at the lowest (poorest) wealth quintile as compared to 42% of those living in households at the highest (richest) wealth quintile. Annex 1 shows that children 0-59 months living in the poorest wealth quintile are at a 1.59-fold higher risk of being stunted than children living in the richest wealth quintile. Such a high prevalence among the richest wealth quintile, which is a “very high prevalence” according to WHO, is important as it suggests that factors influencing stunting are beyond poor economic status and poverty. Other factors are likely related to child care and feeding practices, demographic and possibly environmental factors. These are examined in more detail in the section discussing determinants identified in the analyses.

Children (aged 0-59 months) of mothers with no education are significantly more likely to be stunted (58%) than children of mothers with secondary or tertiary education (45%) (TLFNS, 2013). The child of a mother with no education is at 1.37-fold higher risk of being stunted than a child whose mother has either a secondary or tertiary education. These findings are consistent with results from the 2009/10 DHS. They are also supported by several smaller studies conducted by NGOs that demonstrate similar and very high rates of stunting in Timor-Leste (Grieve, 2018).

Global trends show that stunting increases sharply from birth and peaks in children between 24-59 months. This pattern is similar in Timor-Leste, whereby over a quarter of children (26%) are stunted by 6-11 months of age, doubling to 55% among children age 12-23 months, and peaking at over 60% among children ages 24 to 59 months (TLFNS, 2013).

Other socio-demographic factors were examined for their association with stunting (TLFNS, 2013). Stunting in children 0-59 months was significantly higher when children’s caregivers

¹¹ The WHO Child Growth Database lists the first national nutrition survey as the Multiple Indicator Cluster Survey or MICS 2002. UNICEF, Dili, Timor-Leste, 2003.

¹² In many countries, the prevalence of stunting is higher in boys than girls. Probably the main reasons are that boys have slightly higher nutritional requirements than girls, younger boys have higher morbidity rates, older boys 2-5 years may be more mobile than girls. Boys may be given special foods like breastmilk substitutes and junk food which aren’t healthier. For example, in the DHS (2016), breastfeeding duration in girls was one month longer (16.6 months) than for boys (15.6 months).

were: older; male; divorced or widowed; did not have a high school degree or higher; or were illiterate (Annex 1). Strong associations were found with stunting and children with a recent illness, and those children 0-59 months who did not have an adequate diet. In particular: a lack of breastfeeding; inadequate meal frequency in children age 12-23 months; and a lack of flesh foods in the daily diet of 24-59-month old children were all correlated with increased risk of stunting.

Box 1 provides a summary of key factors identified in multi-variate and regression analyses, which were explained in the methodology section. These models concluded that stunting was strongly related with dietary intake and morbidity, which may be interconnected with the socio-economic status. It was also shown that farming communities, including those growing cash crops, have a higher risk of stunting, even after adjusting for all other factors.

Box 1: Results of Multi-variate and Regression Analyses of Determinants of Stunting

The literature review looked at two analyses, which were conducted using datasets from the TLNFS, 2013: an analysis included in the TLFNS, 2013 report, and a secondary analysis conducted by MONASH University (Cornwell, 2016). Modeling was conducted step-by-step based on the level of factors in the UNICEF Conceptual Framework.

Throughout the modeling, it was shown that:

- **Child's age and sex** were strong determinants of stunting; the risk of stunting was higher among older children aged 24– 59 months and among male children ($p < 0.001$)
- **Mothers height** was also significantly associated with stunting; i.e., children of mothers whose height was < 145 cm had a greater risk of stunting than those from mothers whose height ≥ 145 cm ($p < 0.001$)

Immediate determinants

Adequacy of dietary intake as an indicator of food intake for children and pneumonia as an indicator of morbidity:

- After adjusting for age and sex, **both dietary adequacy**¹³ (OR: 1.96; 95% CI: 1.74-2.24) and **morbidity** (OR: 1.25; 95% CI: 1.08-1.46; for suspected pneumonia) **remained strong determinants of stunting**
- In a second analysis, these findings were confirmed, and specific child feeding practices were also highlighted:
 - **Breastfeeding status** (in children age 11-23 months) was identified as a strong determinant. Breastfed children in this age group **have z-scores 0.16 better on average than non-breastfed children** in the same age group.
 - Children who consumed flesh foods, such as meat or fish in the 24 hours prior to the interview had a higher z-scores than those who did not have any of these foods, with this effect being strongest among the older children.

Other underlying determinants

All factors associated with stunting identified in the bivariate analyses were entered into the model. After adjusting for age and sex:

- **Only caregiver's education level and type of latrine in the household** were significant determinants. The results showed that risk of stunting was higher among

¹³ Adequate diet was defined as exclusive breastfeeding for children age 0-5 months, minimum acceptable diet for children age 6-23 months, and an adequate diet for children age 24-59 months.

households whose caregivers had a low education level (p ranging from 0.051 to <0.001) and among households having unimproved latrine facilities ($p<0.001$). However, in the final analysis, these associations disappeared, and seem to be related to part of the effect of the highest wealth quintile through the higher level of education and better housing conditions.

Basic determinants

For the socio-economic factors, once all factors were included in the model, and adjustments for age and sex:

- **Households whose livelihood was agriculture production and wealth quintile were strong determinants of stunting ($p<0.001$).**

As discussed in the methodology section, diarrhea prevalence was not included in these analyses as an independent variable. No associations were found between stunting and water and sanitation; however, the authors note that this may have to do with lack of specificity with WASH indicators. While water supply and sanitation are globally acknowledged to reduce childhood diarrhea prevalence, associations between stunting and WASH indicators found in the literature are unclear and generally find inconclusive evidence of correlation. Analyses of this work frequently cites as reasons for the lack of clarity and correlation to include: 1) inconsistent definitions of key terminology; 2) non-generalizable site-specific study design; and 3) a lack of focus on children 0-24 months for whom environmental change and hygiene are expected to be more important than infrastructure to diarrhea prevention.

Prevalence of underweight and short stature in women

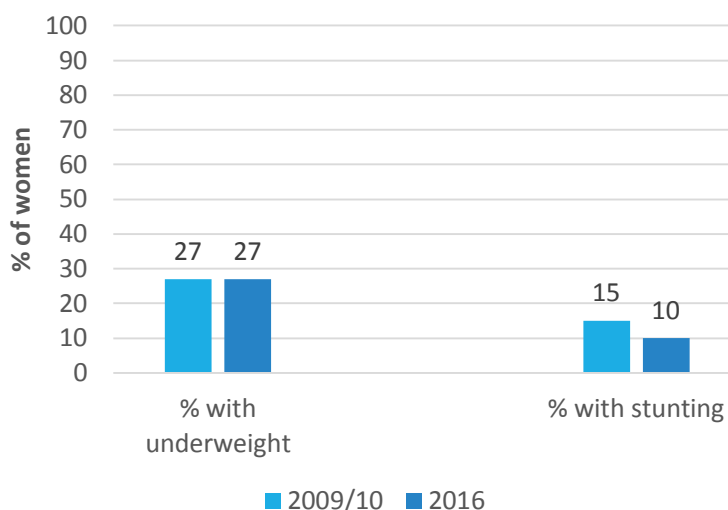
The TLFNS, 2013, found that short stature and underweight status in mothers were both significantly associated with and drivers of stunting in their children 0-59 months. Another study found that a child's height was significantly associated with his/her mother's height in Timor-Leste (Spencer, et al., 2017).

An analysis of the TLFNS, 2013 found that mother's height was a significant determinant of HAZ for children 6-23 months and 24-59 months (Cornwell, et al., 2016).

Underweight status in women of reproductive age is high—with 27% of women age 15-49 years with a body mass index or (BMI <18.5 kg/m²). There has been no change in this prevalence since 2009/10 (Figure 2).

The TLFNS, 2013, found that 25% of women 14-60 years of

Figure 2: Prevalence of Underweight and Short Stature (shown as stunting below) in Women



age were underweight, but because of the different ages sampled, it is unknown, without secondary analyses, if this represents an improvement since 2009/10. There are geographical and age differences in the prevalence of underweight in women. Underweight in women ranges from 19% in Viqueque to 37% in Oecusse in 2016; however, there is little difference in underweight in women in rural versus urban areas. Adolescent girls were most affected in 2016 with 41% of girls 15-19 years categorized as underweight, which is 1.5-2.0 times that of older women. Overweight and obesity, also a form of malnutrition, doubled from 5% in 2009/10 to 10% in 2016 and, while urban overweight and obesity (15%) is twice that of the prevalence in rural areas (7%), overweight and obesity increased in both areas over the 2009/10 to 2016 period.

Women shorter than 145 cm are considered to have short stature, which is indicative of their nutritional status in their first 1,000 days of life. In 2016, 10% of women 15-49 years were found to have short stature, which is a decline from 2009/10 when 15% of women had short stature. Most of this improvement was due to declines in rural areas. The TLFNS, 2013 found 13% of non-pregnant mothers 14 to 60 years had short stature, which is evidence of this downward trend in this indicator in women. This downward trend is positive and may be due to the recovery of the country from a conflict and post-conflict situation.

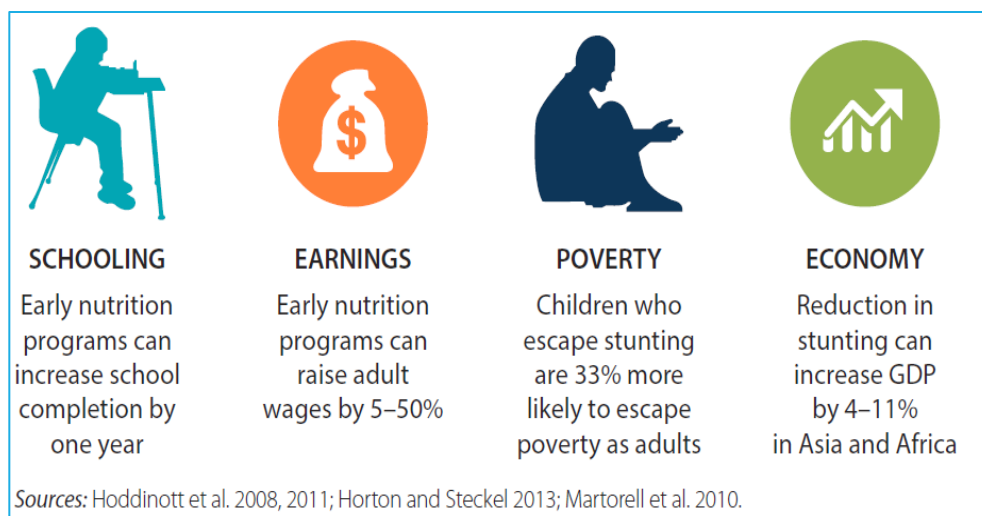
Considering that 48% of the Timorese population is under the age of 18, and 14% under the age of five (2010 census data reported in GoTL, 2014), this suggests that Timor-Leste will continue to face a heavy health and economic burden in years to come, thus highlighting the urgency in identifying and addressing factors that are driving the poor nutritional outcomes in Timor-Leste.

B. The Economic Consequences of Stunting Globally and in Timor-Leste

1. Global evidence of the socio-economic consequences of not addressing stunting

Stunting in children 0-59 months of age is known to be the strongest measure of child well-being and development and social inequality (de Onis and Branca, 2016). While nutrition is often viewed as the responsibility of the health sector, stunting and other forms of malnutrition, have significant consequences on the performance of many government sectors, as well as economic growth writ large for developing countries. Governments' deeper engagement and commitment to fulfilling clearly identified contributions, roles, and responsibilities to reduce stunting are critical to create a rapid, national response to mitigate the costs of stunting. As shown in Section I, stunting in children remains a significant development challenge in Timor-Leste. With declining oil production and reserves (World Bank, 2018), Timor-Leste must take actions now to address the main drivers of stunting, reduce its costs to society, and prepare for the future with a healthy, strong, and productive population at its helm.

To understand the urgency for addressing stunting in Timor-Leste, this section presents current global evidence on the cost of stunting for national development with a focus on the cost of stunting to three sectors: agriculture, education, and health. Recent analyses synthesized by the World Bank (Shekar, et al., 2016) find that: addressing stunting in a population increases school completion by one year; raises adult wages by 5-50%; reduces poverty in 33% of children when they become adults; and increases gross domestic product by 4-11% in Asia and Africa. While economic growth and poverty reduction can resolve malnutrition, progress is slow without known and cost-effective multi-sectoral, nutrition-specific and nutrition-sensitive interventions in place at the community-level. The U.S. Government defines *nutrition-specific* interventions as those implemented by the health sector, while *nutrition-sensitive* interventions are those implemented by other sectors. These definitions will be discussed in more detail below.



Rigorous research conducted in Tanzania makes the case for investment in nutrition interventions at the community level. With a favorable per capita income growth of 3% per year for two decades, income

poverty in Tanzania declined by 84% and underweight in children by 20% without investment in nutrition programs. However, reaching communities with nutrition interventions dramatically accelerated the reduction in underweight. When nutrition interventions reach at least 50% of communities, researchers found a 47% reduction in underweight prevalence in children. By increasing coverage to all communities, the percent reduction in underweight would approach 65% (Alderman, et. al., 2005). With only a 1% per capita income growth rate per year, universal coverage of nutrition interventions would achieve a 60% reduction in underweight over twenty years.

The costs of stunting to the agriculture sector

The agricultural sector measures its performance by crop and livestock outputs and the income it generates. Stunting in children compromises adult productivity, which reduces agricultural output, and, as stated above, reduces adult wages by as much as 5%-50%. A study among low-income men in Brazil, found a 1% increase in height was associated with a 4% increase in wages (Strauss and Thomas, 1998). These authors also found that the low heights and weights of adults in both Brazil and the United States reduces wages, even after controlling for education. This effect is strongest for a manual workforce, including in economies where agriculture is a major revenue. Another form of malnutrition, iron deficiency anemia, reduces the productivity of adults by as much as 5-17%, particularly those working in agriculture and other labor-intensive occupations (World Bank, 2006).

Poor nutrition in children not only increases their risk of illness which is discussed below, it also makes child care more difficult and laborious for families, reducing the productivity of households. Studies in Lao PDR (Gillespie, et., al., 2004) and Malawi (GOM, 2011) found that IYCF practices in children 0-2 years results in children sleeping more at night and being happier and more active during the day. Mothers reported being pleased after using improved IYCF practices because child care was easier, and they were able to get more housework and other work done. Similar findings were reported in a study in Timor-Leste. Improved IYCF resulted in children crying less, being more active, and easier to care for (GOM, 2007).

The costs of stunting to the education sector

The education sector measures its performance by tracking education-related indicators. Stunting in children before two years of age reduces the performance within the education sector by: decreasing age-appropriate enrollment; negatively affecting regular attendance; and reducing the ability of children to learn. This translates to at least one year of school lost. Children who are viewed as physically smaller by their parents have delayed enrollment and may be kept back from school during inclement weather. They also experience more illnesses which decreases attendance rates (Shekar, et al., 2016). Stunted children are more likely to repeat a grade and drop out of school (Daniels and Adair, 2004; Mendez and Adair, 1999). Martorell and others (2010) found that improving weight gain in children 0-2 years of age had the largest effect on educational outcomes compared with improving birthweight or weight gain in children 2-4 years of age. Adequate weight gain during the 0-2 year-period increased schooling by nearly half a year and decreased risk of grade failure by 12%.

The effect of malnutrition on school outcomes also may be mediated by impaired brain development and ability to learn. The human brain reaches most of its maturation by the time children are three years of age, making the first 1,000 days extremely important to cognitive function. (Shekar, et al., 2016). Micronutrient deficiencies also reduce cognitive function. For example, iodine deficiency decreases the intelligence quotient (IQ) by 11 points, and iron deficiency in children < 3 years is associated with developmental deficits and delayed brain maturation (World Bank, 2006). Children stunted before three years of age had poorer educational outcomes, including on cognitive tests. These effects were moderate to large when compared to non-stunted children (Grantham-McGregor, et al. 2007; see Black, et al., 2013). Stunted children <2 years of age appear more apathetic and exhibit negative behaviors and are not as active or inquisitive (Aburto, et al., 2009; Gardner, et al., 1999—see Black, et al., 2013). Improving length-for-age averages in a population by one standard deviation increases grade completion rates by half a grade (Adair, et al., 2013).

The costs of stunting to the health sector

Malnutrition significantly reduces the performance of the health sector by slowing progress in meeting health benchmarks and associated tracking indicators. For example, malnutrition puts mothers and children at higher risk of illness and the need for treatment and hospitalization. Malnutrition also has costs to families by increasing the cost of medical care and funeral costs, if the mother or child dies, causes undue cost to family budgets and may contribute to family debt. When a mother dies in childbirth, her baby, if it survives the delivery, is at great risk of dying in the first year.

Stunting and anemia in pregnant women are associated with 20% of maternal deaths (Black, et al., 2008). Stunting is associated with cephalopelvic disproportion and the need for assisted delivery (Cesarean-section) while anemia during pregnancy may increase blood loss at delivery (Kavle, et al., 2006). Calcium deficiency is associated with hypertension and pre-eclampsia in pregnancy, which are major causes of maternal mortality. To reduce hypertension and the risk of pre-eclampsia, the World Health Organization (WHO) recommends calcium supplementation during pregnancy in countries where dietary intake of calcium is low which comprises most of the developing world (WHO, 2011).

Pre-pregnancy underweight, inadequate weight gain during pregnancy, and micronutrient deficiencies increase the risk of babies being small for gestational age and newborn death due to

prematurity and low birthweight. Several secondary analyses of demographic and health survey (DHS) results and a few randomized-controlled trials find a strong association between mother taking iron-folic acid supplementation (IFAS) and decreased newborn mortality (Dibley, et al., 2012; Nisar, et al., 2015). One randomized control trial in Nepal found a 30% decrease in mortality in children 0-7 years of age when their mothers had taken IFAS during pregnancy (Christian, et al., 2009). Being born with low birthweight (<2.5 kg) increases risk of mortality at birth and throughout life by increasing hypertension, cardiovascular disease, and diabetes in children and adults (Barker, et al., 2002).

Stunting in children increases the risk of under-five morbidity and mortality. Children who have growth faltering, using height-for-age as the measurement, are at a 1.5-fold increased risk of respiratory infections and diarrhea. The risk of respiratory infections and diarrhea is six-fold for a child with severe stunting (Prendergast and Humphrey, 2014). An analysis of nine community-based studies that tracked daily diarrhea morbidity and anthropometry in children longitudinally found that 25% of stunting in children could be attributed to five or more episodes of diarrhea (Checkley, et al., 2008). Children with stunting also have a three-fold increased risk of mortality from sepsis, meningitis, tuberculosis, hepatitis, and cellulitis.

The 2013 Lancet analysis found that at least 15% of under-five deaths in children are associated with stunting alone. Another 12% of deaths are due to fetal growth restriction which is associated with poor maternal nutrition. A total of 45% of under-five deaths are due to nutrition-related disorders¹⁴ (Black, et al., 2013). A significant number of deaths could be averted globally by eradicating malnutrition.

2. The economic consequences of stunting for Timor-Leste

One estimate for the cost of malnutrition in Timor-Leste is \$41 million per year from lost productivity, which is equivalent to 1% of GDP and 2% of non-oil GDP (Provo, et al, 2017). If losses of GDP from stunting are from 4% to 11%, based on global estimates and its 2017 GDP of \$1.7 billion (World Bank, 2018), eliminating stunting would add as much as \$68 million to \$170 million per year to their economy. An area of further inquiry is the relative contribution of different drivers of stunting (e.g., poor dietary intake, excessive disease due to lack of clean water and poor sanitation) to lost GDP. Some economic analyses found that much of GDP loss from malnutrition is mediated through cognitive deficits (Horton and Steckel, 2013). Poor quality WASH are acknowledged as key contributors to high national diarrheal disease prevalence, which is 11% among children 0-59 months according to the 2016 DHS. This results in increased health care costs, as well as reduced productivity of adults who must care for children with diarrhea, and decreased attendance in school for older children with diarrhea (Hutton, et al. as reported in Mara, et al., 2010). The GoTL estimates that poor WASH translates to a loss of \$11 million per year due to stunting and other costs to households and society (GoTL, Timor-Leste Strategic Development Plan 2011 – 2030, 2010).

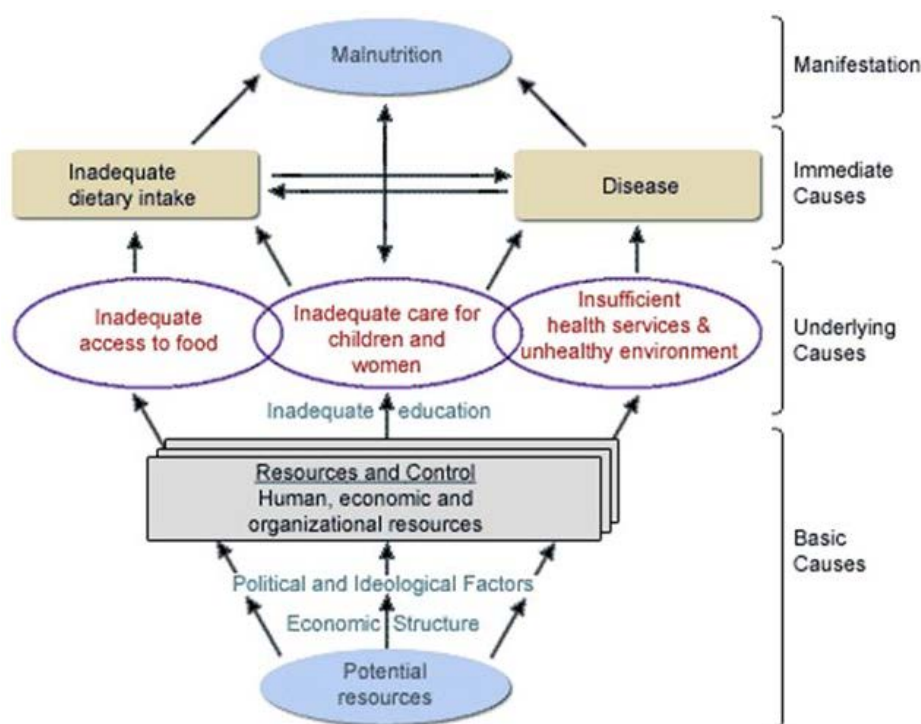
¹⁴ Based on UN prevalence estimates.

III. Findings on the Drivers of Stunting in Timor-Leste

A. Desk review findings, comparisons with global drivers, and results from interviews during the field mission

In 1990, UNICEF created a Conceptual Framework of Malnutrition (UNICEF, 1990) (Figure 3).

Figure 3: The Immediate, Underlying, and Basic Drivers or Causes of Malnutrition



This Framework continues to be used globally to present the immediate, underlying, and basic causes of malnutrition and the relationships within and between these three causes. It was adapted by several organizations and countries including Timor-Leste which created its own framework using a pictorial format (Annex 2).

This section is divided into the following sections: the two immediate drivers of stunting (disease and

inadequate dietary intake), and the underlying drivers of stunting (insufficient health services and an unhealthy environment). Each of these sections presents information and findings from the Desk Review prepared prior to the field mission and subsequent information obtained on the drivers of stunting in Timor-Leste. It compares Timor-Leste-specific drivers of stunting with what is known globally. There are probably few settings where inadequate dietary intake alone or disease alone cause stunting. Instead, inadequate dietary intake and disease interact with each other to exacerbate the prevalence of stunting in any society. A final section discusses the perceptions of people interviewed about the drivers of stunting during the field mission.

1. Disease

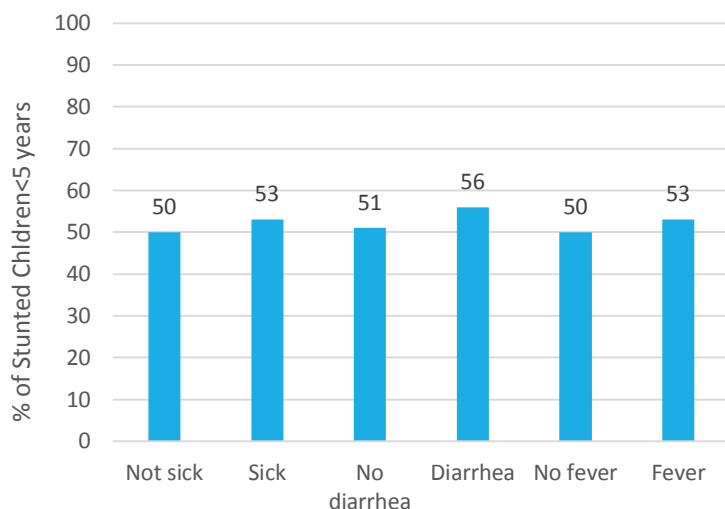
Two of the “Immediate Causes” of malnutrition as shown in the UNICEF framework are infectious diseases¹⁵ and inadequate dietary intake. Most of these diseases in women and children can be prevented through immunizations, use of other health interventions and services, and/or improving the environment people live in. This section discusses the relationship between

¹⁵ In older children and adults, non-communicable diseases (e.g., hypertension, cardiovascular disease, and diabetes) are both caused by malnutrition and may compromise current nutritional status.

disease prevalence and stunting. The coverage of health care and improving the environment will be discussed in the “Underlying Causes” section below.

The two analyses, which examined determinants of stunting in children 0-59 months (TLFNS, 2013) found that being ill two weeks prior to the survey was significantly associated with a higher prevalence of stunting irrespective of type of the disease ($p=0.007$). Figure 4 illustrates how the prevalence of stunting is consistently higher among those children with recent illness

Figure 4: The Prevalence of Stunting in Children and Type of Reported Illness (all differences are significant)



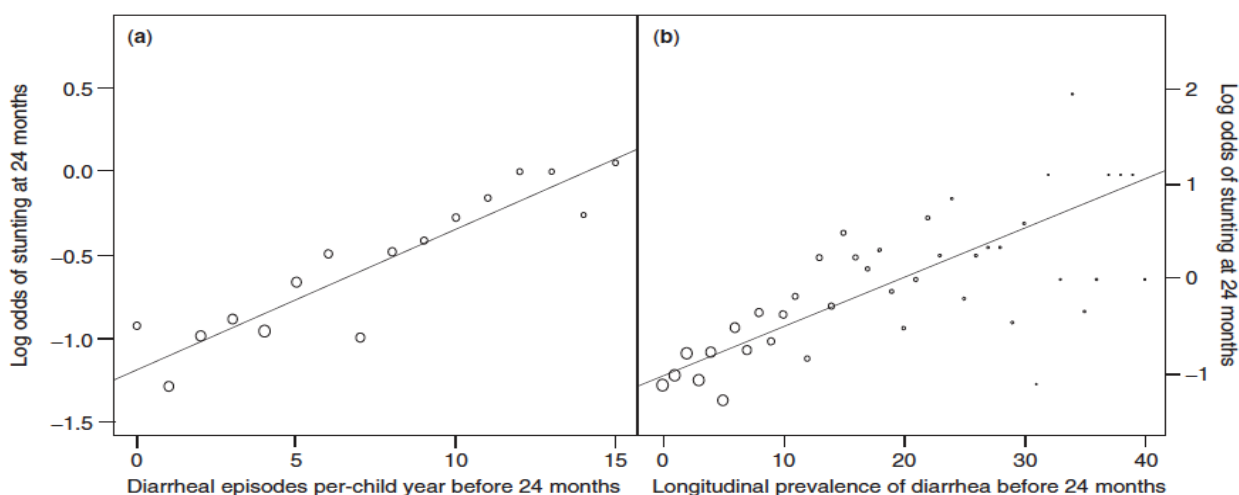
Source: TLFNS, 2013

methodology section, this presents a serious constraint for this assessment and efforts to better understand relationships of diarrheal disease and related potential influencing factors and stunting. Figure 4 indicates that diarrhea is an important illness with respect to stunting in Timor-Leste, but it is perhaps not more important than other childhood illnesses. Such possible correlations are not available from the data presented in Figure 4.

Despite this lack of evidence of direct correlations between stunting and diarrhea in data for Timor-Leste, there is strong global evidence that diarrhea affects linear growth. A multi-study analysis found that 25% of stunting in children was attributed to five or more episodes of diarrhea (Checkley, et al., 2008). In fact, the adjusted odds of being stunted at two years of age increased by 1.13 for every five episodes of diarrhea. According to this study, the “odds of stunting at age 24 months increased multiplicatively with each diarrheal episode and with each day of diarrhea before 24 months (all $P<0.001$). The adjusted odds of stunting increased by 1.13 for every five episodes (95% CI 1.07–1.19)” of diarrhea before age 24 months (Figure 5). Children 0-59 months in Timor-Leste were found to cumulatively produce almost 300,000 diarrhea episodes per year (GBD Diarrhoeal Diseases Collaborators, 2017) with a prevalence of 16% (DHS, 2009/10).

than those without illness for any illness, and for each type of illness (see Annex 1). The multi-variate analysis (TLFNS, 2013) also identified children with recent pneumonia to be at increased risk of stunting (OR 1.20 CI 1.03-1.40 $p=.023$).

Having diarrhea in the last two weeks was also found to be strongly associated with a higher prevalence of stunting ($p<.001$); however, for unknown reason the study authors did include diarrhea in the models for either the multi-variate or regression analyses. As discussed earlier in the

Figure 5: Multi-country associations between diarrheal incidence, prevalence, and stunting

Source: Checkley, et al., 2008.

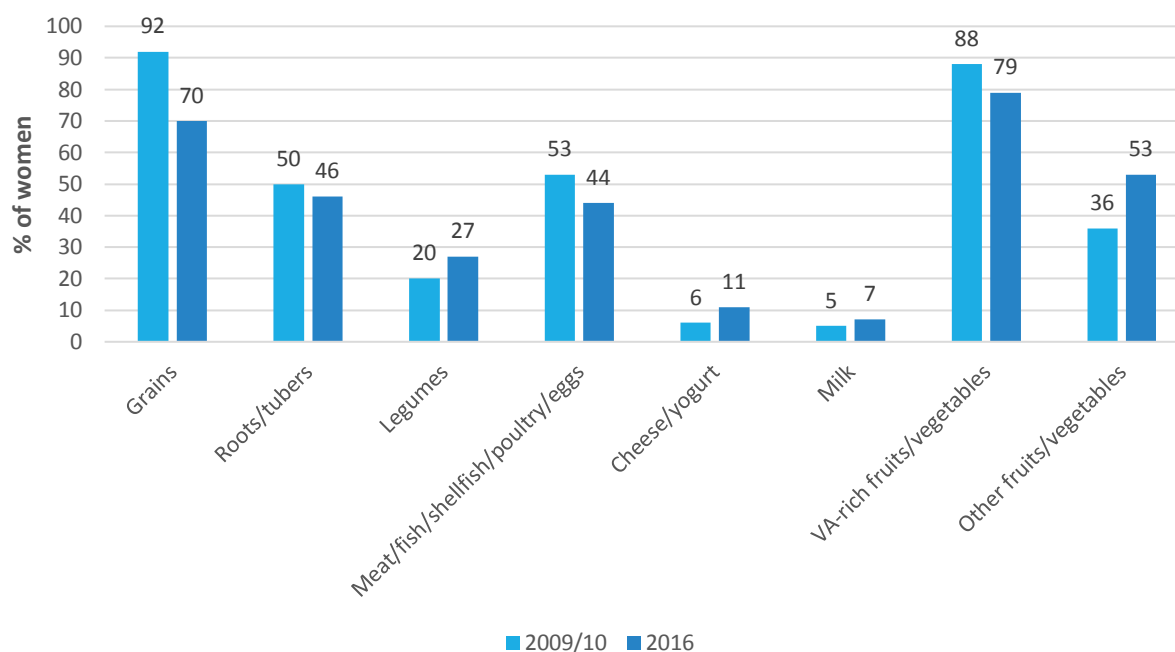
2. Inadequate dietary intake

Stunting is caused by: 1) inadequate growth of the fetus during pregnancy, due to the mother's poor health and inadequate dietary intake; and 2) inadequate growth of children in their first two years of life (the first 1,000 days) also due to poor health and dietary intake. As mentioned in the section on disease, the two immediate drivers of stunting, disease and inadequate dietary intake, usually occur together to compromise stature in children and adults.

Adequate dietary intake of energy and essential nutrients (water and certain amino acids, fatty acids, vitamins, and minerals) are necessary for health, growth, and development. Having a diverse diet increases the likelihood that requirements for essential nutrients and other chemicals in food known to promote health (e.g., plant pigments) will be met. Inadequate dietary intake of one or more nutrients over a prolonged period increases the severity of infections and increases the risk of all forms of malnutrition and death. Illness and disease put individuals at greater nutritional risk by increasing loss and decreasing utilization of nutrients. When diseases are excessive, frequent, and remain untreated, they cause malnutrition. Pregnant women and young children are most at risk because they have high nutritional requirements and suffer the most from the consequences of malnutrition. In the analyses, dietary adequacy was identified as one of the main determinants of stunting in children (OR: 1.96; 95% CI: 1.74-2.24) and, as discussed more below, the diets of children 0-59 months in Timor-Leste are very poor (inadequate).

Inadequate dietary intake of mothers and women

There is sufficient evidence, from qualitative and quantitative studies, that dietary intake is poor in women in Timor-Leste. As reviewed earlier, from quantitative data, the prevalence of underweight in women is extremely high, which suggests inadequate dietary intake. This is supported by data from the DHS 2009/10 and 2016, shown here, on the types of foods women are consuming, but not the amounts of food consumed. (Note: URC conducted this analysis because the maternal dietary intake information was not reported in 2016.) While there is no information about what women are consuming during pregnancy, there is information on dietary intake in women of reproductive age 15-49 years in the previous 24 hours (Figure 6).

Figure 6: Food Groups Consumed by Women, 2009/10 & 2016

As shown, the diversity of their diets is limited in 2009/10 and 2016. While most women consumed grains (92%) and vitamin A-rich fruits and vegetables (88%) in 2009/10, only a little more than half of women (53%) consumed meat/fish/poultry or eggs and half consumed roots/tubers (50%). Legumes and other fruits and vegetables were consumed by 20% and 36% of women, respectively, but few women consumed dairy products or milk. In 2016, women's consumption of different foods decreased compared with 2009/10 except for other fruits and vegetables and milk products which increased. There was a large decrease in grains between 2009/10 (92%) and 2016 (70%). Consumption of animal products is considerably higher in urban areas in both 2009/10 and 2016 (data not shown).

Bivariate analyses from the 2013 TLFNS found stunting in children is significantly lower when their mothers received ANC and when they received and consumed a dietary supplement (Timor Vita); see the Underlying Causes section.

Inadequate dietary intake in children 0-23 months

Before 2006, DHS collected the only two infant and young child feeding (IYCF) indicators for children 6-23 months: 1) children 6-8 months receiving food; and 2) children 6-23 months breastfeeding. Through the analysis of several datasets, WHO (2008) created three indicators to determine the minimum adequate diet (MAD) for complementary feeding for children 6-23 months:¹⁶ 1) children being breastfed or receiving milk products; 2) children consuming 4 out of 7

¹⁶ Note: the complementary feeding period is during the period when children are 6-23 months. Starting at six months children should be introduced to and fed foods to complement the nutrients in breastmilk. Before six months, breastmilk meets all the child's nutritional requirements; after six months the child should continue to receive breastmilk, still an important nutrient-rich food source, and also receive additional nutrient-rich foods. The "complementary feeding" period used to be referred to as the "weaning period," a term which is no longer used.

food groups¹⁷ (minimum dietary diversity or MDD); and 3) children consuming the appropriate number of meals per day (minimum meal frequency or MMF per day). These indicators are now being investigated in most national nutrition surveys.

Figure 7: Coverage of IYCF Indicators in Children 0-23 months, 2016

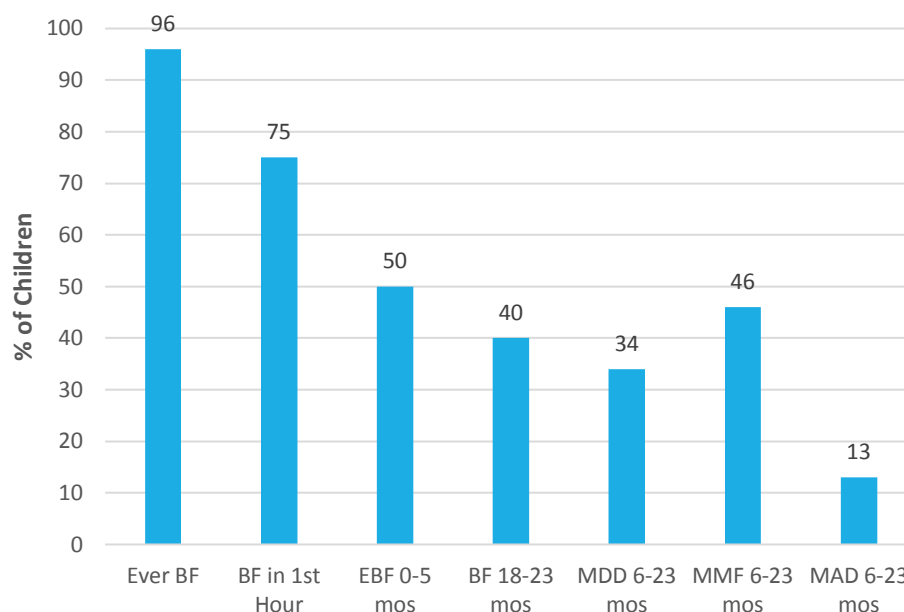


Figure 7 shows the coverage of key IYCF practices in the first two years in 2016.

The majority of children are breastfed at some time in their life (96%). However, only 75% are breastfed in the first hour after delivery, and only 50% are exclusively breastfed (EBF) in their first six months. By 18-23 months, only 40% of children are still breastfed.

Coverage of recommended feeding practices during the complementary feeding period, 6-23 months, are very low and urgently need to improve. Only 34% of children 6-23 months receive MDD, and when drilled down to the 6-8 months period, less than 10% receive MDD. Only 46% of children receive MMF, a number which in most countries is usually above 85%. MMF does not change dramatically by age group.

Overall, only 25% of all children 6-23 months are receiving a MAD.¹⁸ MAD does, however, vary by municipality (from 3% in Lautem to 26% in Manatuto), by urban-rural areas (19% in urban areas versus 11% in rural areas), by gender (15% in females versus 12% males), and wealth quintile (6% in the lowest/poorest quintile versus 22% in the highest/richest quintile).

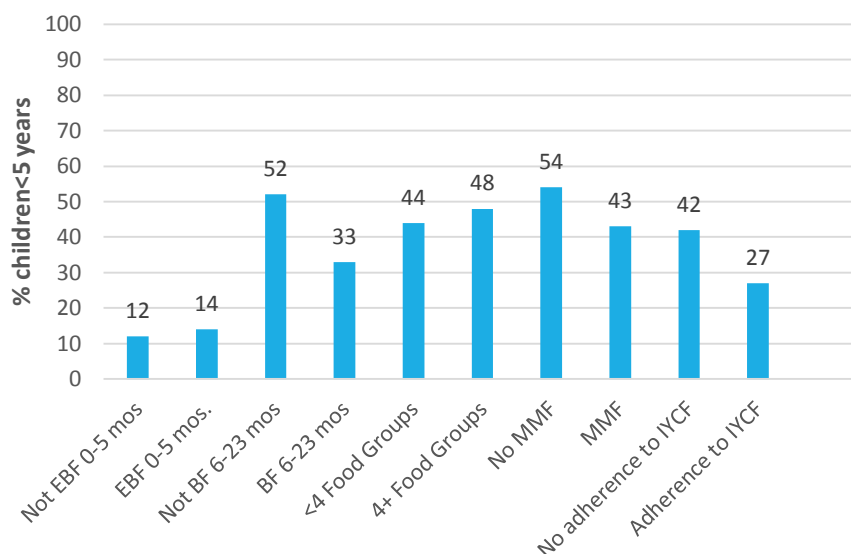
While the complementary feeding indicators were collected in 2009/10, WHO changed the definition after that survey so that both breastfed and non-breastfed children should receive at least four food groups per day. URC was able to recalculate the 2009/10 data using the new WHO criteria for MDD. The MDD score for both breastfed and non-breastfed children 6-23 months increased from 29.6% in 2009/10 to 33.6% in 2016.

It is not possible, however, to compare the 2009/2010 and 2016 DHS MMF and MAD complementary feeding indicators because WHO changed the definition of the indicators and

¹⁷ Grains, roots, and tubers; legumes and nuts; dairy products; flesh foods (meat, fish, poultry, liver/organ meats); eggs, vitamin A-rich fruits and vegetables; and other fruits and vegetables.

¹⁸ The non-breastfed child needs to receive 1-2 cups of milk or other dairy products and 1-2 extra meals per day.

Figure 8: Stunting and IYCF Practices in Children <2 years (differences are significant except for EBF)



some of the information needed for the calculations were not collected in the 2009/10 survey. However, URC conducted a secondary analysis of the 2009/10 survey to compare MAD for breastfed children. MAD decreased from 18% of breastfed children being fed a MAD in 2009/10 to 14% in 2016. The proportion of breastfed children receiving MMF decreased from 71%

in 2009/10 to 50% in 2016. Also, over this period, the proportion of women consuming grains decreased which may account for the decrease in MMF. It is unknown why these changes occurred, but it could be attributable to El Niño effect on agriculture production.

The association of IYCF with stunting in children

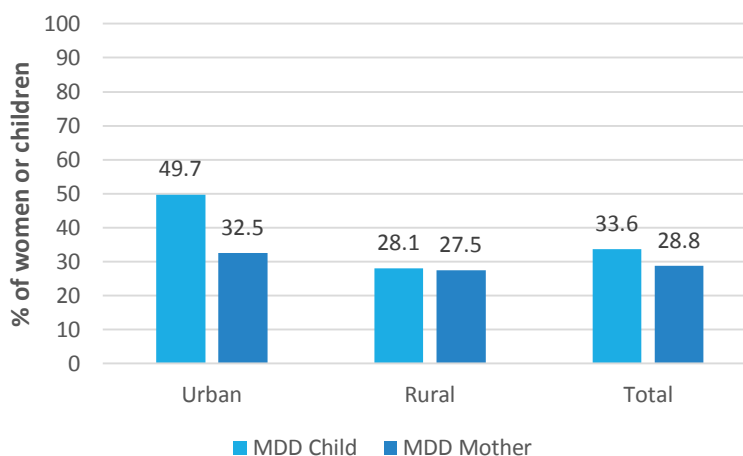
Figure 8 shows that there is a significant relationship between all IYCF indicators and stunting. Higher coverage of all IYCF indicators, except EBF, reduces the risk of stunting in children.

While there is no relationship between EBF and stunting, when children 0-5 months are EBF and children 6-23 months receive a MAD, the prevalence of stunting is reduced.

Dietary diversity is important to promoting growth. The regression analysis of the TLFNS, 2013, found that consumption of meat and fish (but not eggs) significantly improved HAZ

in children 6-23 months and in children 24-59 months (Cornwell, et al., 2016). Children living in households in higher wealth quintiles and households with non-agricultural income increased their chances of consuming animal foods.

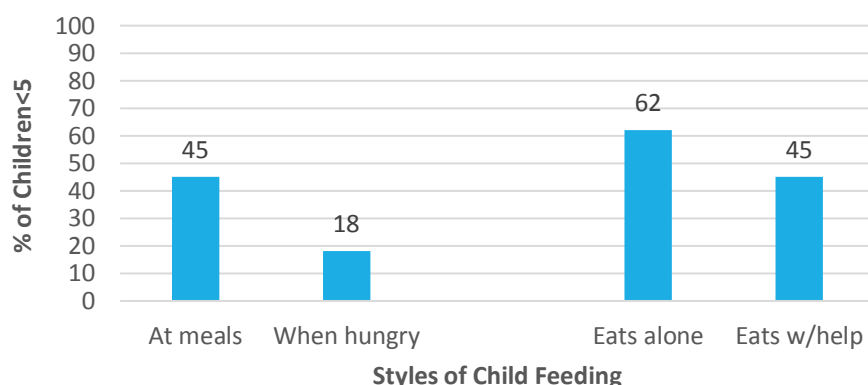
Figure 9: MDD among mothers and children, 2016 [using the WHO definition ($\geq 4/7$ groups)]



To understand if adults have more dietary diversity than children, URC used the 2016 maternal dietary intake data to create the MDD indicator (based on the WHO IYCF definition of consuming at least 4 out of 7 foods groups).¹⁹ Using this indicator, more children than mothers appear to have a diverse diet, which is an unusual finding suggesting that mothers have a less diverse diet than their children (Figure 9). The difference in urban areas is also quite striking; 50% of children consume a minimum diverse diet compared to only 33% of mothers who consume diets of the same diversity. Mothers in both urban and rural areas, and children in rural areas have a very limited diet (poor diversity)

The TLFNS, 2013, asked mothers about the way they fed their children. Feeding style or “responsive feeding” has been found to affect food intake of children. Encouraging and helping children to eat and offering children food (or more food at meals) if they demand or accept it improves overall food intake in children. Figure 10 shows that stunting was associated with the way children are fed.

Figure 10: Stunting in Children 6-23 months & Feeding Style (all differences are significant)



Stunting was significantly higher when children were only fed when families have meals (45%) versus being fed when they are hungry (18%). Stunting was higher when children eat by themselves (62%) versus when the mother encourages her child to eat (45%). In the survey report, it was estimated that only 57% of children 6-23 months were fed responsively,

defined by feeding the child when he or she shows signs of hunger and is helped to eat during mealtimes (TLFNS, 2013).

The TLFNS, 2013, reported high prevalence of several micronutrient deficiencies in children 6-59 months including zinc (34%), iron (20-50% depending on the biomarker used), and vitamin A (10%). There was no significant association between these micronutrient deficiencies and stunting.

The TLFNS, 2013, also found that detectable levels of aflatoxin were over 80% in both women and children 6-59 months. Aflatoxin is a known liver carcinogen and is associated with stunting in West African children, with the risk highest in children who are not breastfed or receive a diet made composed primarily of maize (Gong, et al., 2004). In Timor-Leste, stunting was significantly higher ($p < 0.001$) in children with detectable levels of aflatoxin (serum aflatoxin ≥ 0.20 pg/mg albumin) (42%) compared to children with undetectable levels (34%).

¹⁹ The Maternal Minimum Dietary Diversity indicator is defined by the FANTA project as consuming five out of ten foods groups. It was not possible to calculate this indicator because two food groups were combined.

Global evidence for the relationship between maternal diet and IYCF and stunting in children

The global evidence for the relationship between maternal diet and stunting in children is not extensive, probably because length at birth is not normally measured as an outcome. Instead, birth outcomes are tracked, particularly low birthweight and prematurity. These birth outcomes may be indirectly related to length at birth (Shekar, et al., 2016). As mentioned in Section II mother's height is associated with stunting and HAZ in their child, which was detected as significant association in both the bivariate analysis and the regression analysis (Cornwell, et. al., 2016).

While the 2013 Lancet series found no effect of breastfeeding promotion on weight or length in infants (Bhutta, et al., 2013), there are several studies that show breastfeeding reduces excessive morbidities like diarrhea in babies that affect child growth. The 2008 Lancet documents that there is a two to three-fold increase in diarrhea and pneumonia incidence when babies 0-5 months are predominately, partially, and not breastfed (Black, et al., 2008). This risk continues for children 6-23 months when they are not breastfed. A multivariate analysis of the TLFNS, 2013, data found that height-for-age Z-scores (HAZ) were higher in breastfed children 6-23 months but lower in children 24-59 months (Cornwell, et al., 2016). Breastmilk is still an important nutrient-rich food for children 6-23 months, particularly important in poor households, which promotes growth while breastfeeding after 24 months probably means children are not getting enough food to provide energy and other nutrients needed to promote growth.

The 2013 Lancet series found strong evidence that promotion of optimal complementary feeding practices increase HAZ and, from several DHS studies, children receiving MDD decreases their risk of being stunted. Studies on nutrition education in food secure populations showed a significant increase in HAZ, but the effect on stunting was not significant. There was a significant increase in weight gain but not on weight-for-age (WAZ). In food insecure areas, nutrition education improved HAZ and WAZ and reduced stunting. (Bhutta, et al., 2013).

An important underlying cause of malnutrition is geographic location. The higher prevalence of stunting in rural areas in Timor-Leste, as shown in section II, is similar to global estimates that stunting in rural 1.45 times higher in rural compared with urban areas (Black, et al., 2013). Based on the prevalence of stunting in 2013 and the latest census figures (GoTL, 2015), the number of stunted children 0-59 months age is nearly four times higher rural (42,528 children<5 years)²⁰ compared with urban areas (11,523 children<5 years).²¹

As stated in the disease section, frequent episodes of diarrhea are associated with 25% of stunting in children with five or more episodes of diarrhea per year (Checkley, et al., 2008). This association needs to be mindful of the poor diets, which children are receiving before, during, and after illnesses in most developing countries. Lutter (et al., 1990) and Walker (et al., 1992) found that when children with frequent bouts of diarrhea received a food supplement, the effect on height disappeared. This means that continuing to feed children during and to feed more after illness is important to mitigate the effect of disease on illness. In Timor-Leste, only 7% and 5% of children 0-59 months of age were given more liquids or food, respectively, during diarrhea. A quarter of children were given much less or no liquids and food during diarrhea.

²⁰ An estimated 9% of the total population are children<2 years of age.

²¹ The total rural population is 838,961 x 9% of the population are children<2 years (75,506) x 55% stunting rate in rural areas=42,528 stunted children <2 years in rural areas; total urban population is 328,281 x 9% x 39% stunting rate in urban areas=11,523 stunted children <2 years in urban areas.

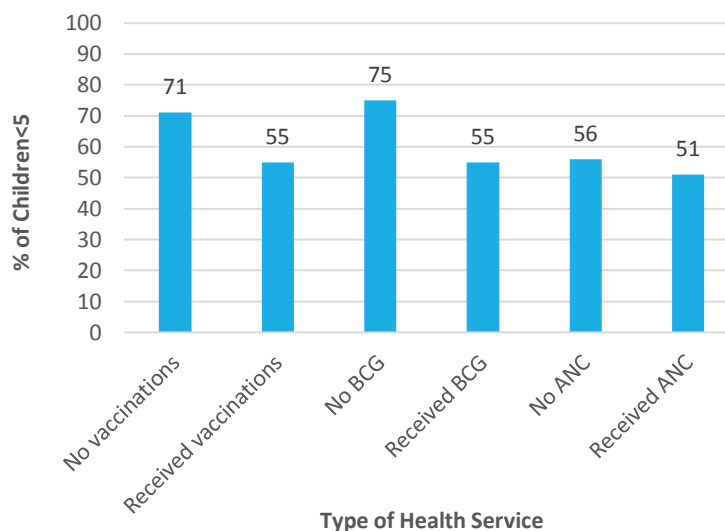
3. Underlying Causes

This section focuses on health service utilization and WASH interventions as they relate to stunting. Increased exposure to health interventions and services is linked to lower rates of stunting in children (Figure 11).

Use of health services

Results from a bivariate analysis (TLFNS, 2013) shows stunting is significantly higher when children are not vaccinated or do not receive BCG. Stunting in children is significantly higher when mothers do not receive antenatal care (ANC). While stunting was lower when mothers received 4+ ANC visits (50%) compared with mothers who received <4 ANC visits (52%), the difference was not significant.

Figure 11: Prevalence of Stunting and the Use of Health Services (differences are significant)

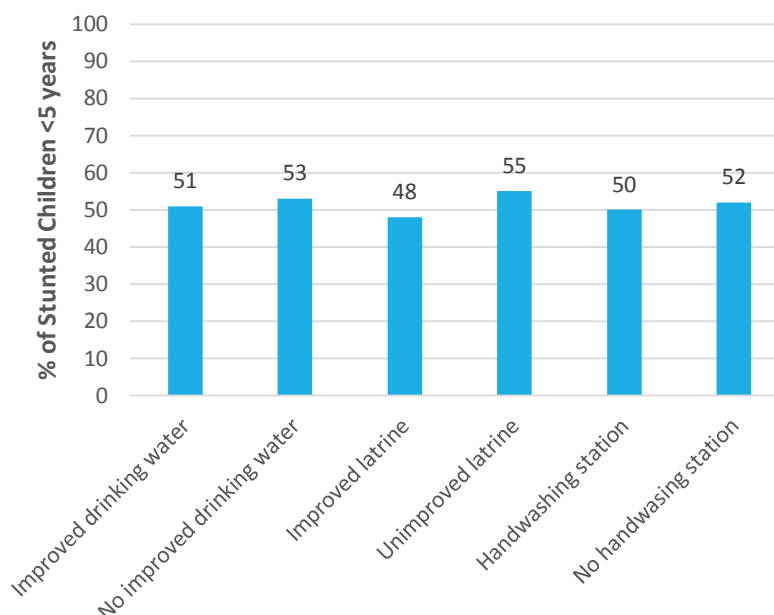


WASH interventions

Figure 12 shows the results of the bivariate analysis of WASH interventions affecting stunting (TLFNS, 2013).

There was no significant difference in the prevalence of stunting when households had an improved source of drinking water or easy access to handwashing (e.g., a handwashing station). There was a significant reduction in stunting when there was an improved latrine in the household. The bivariate analysis of the TLFNS, 2013, also found no

Figure 12: The Prevalence of Stunting in Children and Improved Water and Sanitation (only the type of latrine was significant)



significant difference in stunting when the area children were living in were open defecation free (ODF), even at higher coverage of $\geq 50\%$ of *aldeias* or hamlets practicing ODF.

The linear regression model of HAZ conducted by MONASH University using data from the TLFNS, 2013, found no effect on HAZ when families had a protected water source, a toilet with a septic tank, pit toilet or the *suku* had access to a protected water source or adequate sanitation (Cornwell, et. al., 2016). The only significant effect on child height was a mild effect in children 6-23 months when families used a pit latrine. As explained in the methodology section, this may be a limitation related to general indicators used.

While we are focusing on the drivers of stunting in this report, the analysis results on wasting are of interest. When this same model was applied to weight-for-height z-scores (WHZ), there was no effect on WHZ for improved WASH at the household level. There was a significant impact on WHZ when the *suku* had access to a protected water source and for children 6-23 months when the *suku* had access to adequate sanitation. The importance of community coverage over individual household latrine use in rural areas is consistent with the global literature. Three 2017 studies examined the impact of minimum levels of sanitation coverage on health and nutrition. A review of 29 DHS reports from across the world showed that benefits from improved sanitation are only realized at approximately 60% coverage or higher (Jung et al., 2017). A field study in 121 villages in Mali found that child HAZ had a significant and positive linear relationship with community latrine coverage while individual household latrine ownership was not associated with improved child health (Harris et al., 2017). Finally, a meta-analysis of four different types of cross-sectional surveys found that “community-level access to sanitation is associated with lower odds of stunting and anemia for children [0-59 months] independent of household-level sanitation access” (Larsen et al., 2017).

Despite these clear findings, global evidence on improved water and sanitation access and its impact on stunting are mixed. A World Bank report (Spears, D., 2013 as cited in Bhutta, et al., 2013), based on the analysis on demographic and health surveys in 65 developing countries found that open defecation explained 54% of the international variation in child height. In fact, it was better at explaining variations in height than GDP, which only explained 29% (as reported in Bhutta, et al., 2013). Until recently, open defecation has been a prevailing behavior in rural areas of Timor-Leste while open disposal of wastewater into uncovered drains has been common in urban areas. Rurally, conditions are changing (Table 2) as several municipalities have been certified as ODF, others are nearing that goal, but several lag behind.

Table 2: Estimated Open Defecation-Free (ODF) status by Municipality

| Municipality | Percent of ODF Households* (estimated by WaterAid 2018 through informal partner reporting) | Households (2015) | Population (2015) |
|--------------|---|----------------------|----------------------|
| Aileu | 98 | 7,745 | 48,554 |
| Ainaro | 77 | 11,527 | 66,397 |
| Baucau | 73 | 22,659 | 124,061 |
| Bobonaro | 94 | 18,397 | 98,932 |
| Covalima | 61 | 11,820 | 64,550 |
| Dili | 94 | 31,575 | 252,884 |
| Ermera | 100 | 21,165 | 127,283 |
| Lautém | 60 | 12,998 | 64,135 |

| | | | |
|----------|-----|--------|--------|
| Liquiçá | 100 | 11,063 | 73,027 |
| Manatuto | 43 | 8,338 | 45,541 |
| Manufahi | 81 | 8,901 | 52,246 |
| Oecusse | 68 | 13,659 | 72,230 |
| Viqueque | 75 | 15,115 | 77,402 |

**The most common form of sanitation in ODF households was a simple unimproved latrine.*

Diarrhea, an acknowledged cause of stunting, is reduced when WASH improves. In a 2004 review by Fewtrell and Colford, point-of use treated drinking water, expanded water supply into households, handwashing promotion, and sanitation interventions were shown to be effective in reducing diarrhea in multiple age cohorts. These and other authors have found a combination of WASH interventions including improved water supply, sanitation, and hygiene behaviors together reduce diarrhea prevalence but are not more effective than individual interventions.

As an example of this, studies have shown that having household water connections are a more effective means of reducing diarrhea than standpipe provision outside the household compound (Fewtrell & Colford 2004; Cumming and Curtis 2018; Tumwine et al 2002). In the latter study, authors attributed the observations to the significant increase in daily water consumption as making the difference in reducing diarrhea. This indicates a possible crucial benefit in rural areas of Timor-Leste of not only establishing sustainable water supply services, but also maximizing the number of household connections and the volume of water available to each household.

Despite this linkage between improved WASH and a corresponding reduction in diarrheal disease, a recent study and controversial study in an area of Bangladesh where stunting was prevalent found no effect of improved water, sanitation, handwashing or a combination of the three on stunting. The nutrition intervention, counseling to improve IYCF, and the provision of a lipid-based nutrient supplement improved HAZ compared to the control and WASH interventions (Luby, et al., 2018). The combination of WASH with nutrition did not improve HAZ in children beyond what was achieved with the nutrition intervention alone.

Sector thought leaders have questioned the external utility of the conclusions from Luby, et al 2018 and a related study in Kenya due to unique site conditions, limited intervention choice, and the relatively advanced WASH status in the selected communities (Cummings and Curtis 2018, Coffey and Spears 2018). In addition, WaterAid's reflections on the two studies suggest that improved sanitation coverage was not high enough to reduce fecal contamination in the community and the use of chlorine for water treatment is ineffective against pathogens known to cause diarrhea (WaterAid, 2018). Other studies on the stunting-WASH connection are underway in Mozambique and Zimbabwe that sector leaders hope will clarify the utility of findings.

Any variations in findings about the effectiveness of WASH interventions on stunting may be due to different definitions used for improved water and sanitation, as well as limitations to the study design itself. Definitional issues were a problem in the regression analysis of the TLFNS, 2013, mentioned above—that sources of improved water and sanitation may not in fact, be improved enough to have impact. In the case of the Bangladesh study, the amount of water available to households was, unfortunately, not measured presenting a critical study limitation. MCC is well positioned to clarify the differing literature findings by ensuring that the monitoring and evaluation plan for any nutrition-sensitive WASH effort clearly defines and tracks outcome-

focused indicators that can validate the WASH → diarrhea reduction → stunting reduction continuum.

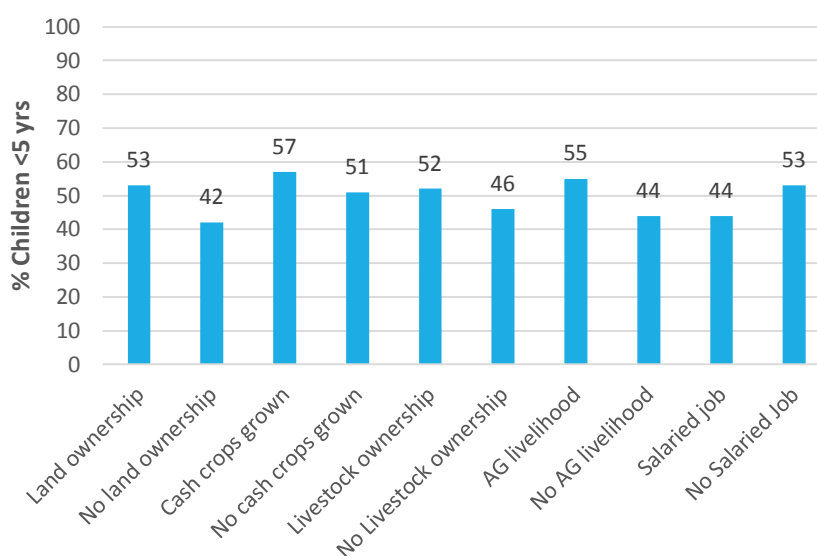
A proposed cause of stunting is environmental enteric dysfunction (EED), a theorized result of fecal-oral contamination from contact with human and animal feces. EED is a sub-clinical condition resulting in atrophy of the intestinal villi and chronic inflammation causing malabsorption of nutrients and increased permeability to enteric pathogens (Prendergast and Humphrey, 2014). This theory indicates a need to focus and tailor WASH interventions on children to interrupt the fecal-oral transmission route before onset of the condition (Mbuya and Humphrey, 2016), including drinking only safe water, disposing of feces safely, emphasizing caregiver handwashing practices, and creating a healthy environment for children through safe play spaces to reduce the contact of children with human and animal feces. In Timor-Leste, a high percentage of households in rural areas exhibit poor overall hygienic conditions and own unpenned livestock whose feces might have contact with children. The impact of safe play spaces is only now being explored.

While ODF is increasing in coverage in some municipalities, the functionality of sanitation systems, adoption of hygiene practices, and use of safe water needs improving in Timor-Leste. Interventions to address health environments for children have yet to be tested in the field. Given the prevailing poor hygiene conditions found in rural and urban areas of Timor-Leste, research into benefits of protected, safe and sanitary baby/child-friendly spaces for exploration and play, hygiene for baby/child (regular bathing, handwashing, sanitary play and teething objects), and clean and protected eating spaces for babies/children all merit investment.

In summary, in Timor-Leste, children 0-59 months in urban and rural settings are regularly exposed to and affected by health risks from environmental conditions encompassing a variety of pathogen transmission pathways including inadequate quantity and quality of drinking water, uncontained defecation by people and animals, sewage-laden flooding, and poor household

hygiene practices. To maximize the benefits of, for example, improved feeding practices or micronutrient supplementation, children's continued exposure to these environmental sources of fecal contamination must be minimized through a combination of health, infrastructure, and environmental control efforts. To understand and optimize implementation of these investments,

Figure 13: Stunting and Land and Livestock Ownership and Livelihoods (all differences are significant)



the epidemiological underpinnings of the infections-malnutrition cycle in Timor-Leste need be thoroughly monitored through sentinel sites, as described elsewhere in this document, that include rigorous measuring and monitoring of diarrheal disease reduction from WASH interventions.

Livelihoods

Underlying causes of stunting may also be related to access to food and livelihoods that provide food to the household, either through own-production or purchase. Figure 13 shows the prevalence of stunting by land and livestock ownership and household's livelihood.

As noted in the review of the bivariate analysis in section II, the prevalence of stunting in children was significantly higher when families were engaged in agricultural activities, including producing cash crops, owning land, and livestock. The multi-variate analysis found that children living in households with agriculture as their livelihood were more at risk of being stunted (OR 1.25; CI 1.13-1.39; $p < 0.001$). As shown here, stunting prevalence was lower in families that worked in salaried positions. The presence of livestock in the family can increase children's risk of consuming animal feces, if the animals are not penned or children are left unsupervised.

4. Perceptions of the drivers of stunting: findings of the Team from interviews in eight municipalities.

The Team interviewed 70 people, mainly working for government, in eight municipalities. Table 3 shows the top four responses for each question asked by Group A and Group B. The questions and answers presented here are related to the drivers of stunting.

Table 3: Findings from the field interviews about stunting

| | Municipalities | |
|---|--|---|
| | Group A: Ainaro, Bobonaro, and Manufahi | Group B: Baucau, Ermera, Lautem, Oecussi and Viqueque |
| What are the major problems in your municipality? | Lack of clean water and sanitation: 10 Lack of information about good nutrition: 10 Lack of education: 7 Poverty: 7 | Poor nutrition/malnutrition: 10 Lack of clean water or sanitation: 6* Poor economic growth: 4 Lack of education: 3 Low agriculture productivity: 3 Lack of job opportunities: 3 |
| What are the nutrition problems in your municipality? | Mothers are underweight or have poor nutrition: 10 Children are underweight for not gaining enough weight: 9 Complementary feeding and nutrition are poor: 3 Lack of knowledge about what to feed children or good nutrition: 3 | Children underweight or with acute malnutrition: 17 Poor child feeding and care practices: 6 Lack of knowledge about what to feed children: 5 Low coverage of WASH: 5** Illness/infections: 6* High MAM and SAM: 4 Mothers have poor nutrition: 2 |
| What are the causes of malnutrition? | Lack of knowledge about good nutrition: 8 Lack of family food: 6 Poverty/few jobs: 5 Lack of clean water and sanitation: 2 | Parents don't give nutritious food/diversity of foods to children: 16 Lack of knowledge, parents don't know foods to give children: 11 Poor IYCF practices: 8 Frequent infections: 8 Lack of clean water and sanitation: 6 Dirty, unhygienic environment for children: 6 Lack of family food: 3 |
| Have you heard of stunting? | Yes: 19 No: 1 | Yes: 17 No: 6 |
| Were able to define stunting | 13/16 | 14/17 |
| What are the main causes of stunting? | Poor IYCF: 7 Lack of clean water and sanitation: 6 Poverty/lack of access to food: 6 Lack of knowledge about what children should eat: 5 | Feeding children poor quality foods/low dietary diversity: 15 Genetics: 8 Frequent bouts of acute malnutrition: 5 Poor IYCF practices: 5 Lack of child care: 4 |

| | Municipalities | |
|---|--|--|
| | Group A: Ainaro, Bobonaro, and Manufahi | Group B: Baucau, Ermera, Lautem, Oecussi and Viqueque |
| Who is most affected by stunting? | Rural/remote communities: 6 People without knowledge about good nutrition: 2 People who marry early & have too many children: 2 | Children <5: 9 Poor families who can't afford food: 7 Rural families: 5 People who lack access to health services: 3 People who don't have information on what foods to eat: 3 |
| What are the most important interventions to addressing stunting? | Treating malnutrition and food aid: 2 Counseling about good nutrition in ANC through 5 years: 2 Education and Mother Support Groups: 2 | Community education/promotion of dietary diversity: 7 Focus on the first 1,000 days IYCF practices: 5 Grow more nutritious foods: 5 |

**in four instances, interviewers did not follow tool, asked directly about WASH*

*** in three instances, interviewers did not follow tool*

Most people gave multiple answers and had diverse opinions for each question. All answers were recorded for each interview. While most of the interviewers did not probe for answers, the respondents were told before the interview that the visit was related to health and nutrition so some of their responses may have been influenced by this. In some interviews, often interviews of SAS staff, the questionnaire was not used and instead direct WASH-related questions were asked, this too may have influenced responses.

When asked about the problems in their municipality, answers were fairly consistent across municipalities: poor nutrition and malnutrition and lack of clean water and sanitation were the most common responses, followed by lack of knowledge about good nutrition, poor economic growth, poverty, and lack of education.

When asked what the nutrition problems were in their municipality, malnutrition or specifically underweight or acute malnutrition were most often mentioned. The concept of children not gaining enough weight was mentioned in Manufahi, and the high number of MAM and SAM cases were discussed in most locations. In addition, poor child feeding and care practices were often mentioned as a problem, as well as a lack of caregiver knowledge about the right foods to give children. Many health service respondents lamented that although they provide information on feeding practices to mothers, there is slow uptake or adoption of the recommended practices. Stunting was rarely mentioned as one of the nutrition problems.

When asked about the causes of malnutrition, lack of knowledge about what foods to feed children, and parents not giving nutritious or quality foods to children were by far the most common mentioned. Also mentioned, but only half as frequently were poor IYCF practices; frequent illnesses; lack of clean water and sanitation; lack of family food; and poverty.

The importance of maternal nutrition and care during pregnancy to prevent child malnutrition was only partially recognized. A few respondents said that inadequate dietary intake during pregnancy may be affected by cultural beliefs and taboos about what women should consume during pregnancy. When asked if women eat less overall or less of certain types of food during pregnancy to avoid having a big baby and difficult delivery, a few respondents said this was a problem but were not sure if restricting food occurred over the entire course of the pregnancy or only in the first trimester when mothers experience “morning sickness.” It was reported these beliefs vary across the country and area. A nutrition coordinator reported that women do not like to take IFAS because they fear having a big baby. A qualitative study in 2007, however, found no women reporting taboos that restricted food during their pregnancy (MOH, 2007). There was a belief that IFAS would increase birthweight, but this belief did not deter women from taking IFAS.

All respondents in Ainaro, Bobonaro, Baucau, and Manufahi and most of the respondents in the other municipalities (36/43) had heard of the word “stunting” (which was translated to the word *ra’es*). Only seven people, mainly those working in agriculture or water and sanitation, had not heard of stunting, although they aware of malnutrition. The majority of those who had heard of stunting were able to correctly define it. Most people defined stunting as children being too short (27/33) or adults being too short. One person described it as “abnormal growth.” Stunting was defined as a genetic condition by 12/43 people, including health and nutrition staff, although a genetic origin was given listed as a second reason.

When asked what caused stunting, respondents answers included (in descending order): children not being fed a quality or diverse diet and poor IYCF practices; genetic causes; lack of knowledge about what children should be fed; lack of clean water and sanitation; poverty and lack of access to food; and acute malnutrition. For about a quarter of respondents, genetics was listed as a main cause of stunting although they gave other causes as well. The Team’s impression was people are becoming aware of the problem of stunting and its causes but still had trouble completely dismissing genetic origins as a cause. While awareness about the problem of stunting and its causes appears to be increasing, not all people could entirely let go of the belief that people in Timor-Leste are “just short.”

“Everyone is short so people don’t recognize it as a problem, so they don’t do anything about it.”

There was recognition in all municipalities that children under 5 years and families who live in rural and remote areas are most at risk of stunting and other nutrition problems. These people don’t have access to roads, markets, or health services which puts them at risk of malnutrition and other health problems. People who do not have information or knowledge about good nutrition were mentioned as most affected by stunting. Although poverty and the inability to afford food was considered a problem, one of the biggest recognized challenges was how to motivate and support families to adopt recommended practices. Many health workers felt that practical direction was needed in this area.

Respondents considered some form of counseling about good nutrition – either for mothers during pregnancy or mothers of young children – the most important interventions to address stunting. Mother support groups were mentioned as a way to provide this education and provide an educated resource directly in communities. Community-level work was identified as crucial to reach and support families. Health workers also stressed that the focus should be on prevention of malnutrition and that the window of opportunity, first 1,000 days should be the focus of any

intervention. Another important intervention was addressing lack of food and growing more nutritious foods. One person who thought stunting was due to genetics commented that it would be most effective “*to get short people to marry tall people.*” That stunting is still viewed as having a genetic origin making people in Timor-Leste “just short” suggests there is still work to do in raising awareness about the cause of stunting. Box 2 provides evidence for why stunting in children 0-59 months of age is not due to a genetic predisposition.

Box 2: Dispelling Beliefs that Children and Populations are Short Because of Genetics: What’s the Evidence?

Historical evidence suggests that heights increase in populations when diets and living conditions improve. When individuals migrate from developing countries to developed countries, where diets are more diverse and environmental conditions are better, they are taller than children remaining in the countries they came from. More than four decades ago, it was observed that African children were tallest in the highest socio-economic groups (Rea, 1971 in Gibson, 1990). The misconception persists globally and in Timor-Leste that being too short or stunted is genetically determined rather due to poor nutrition and a poor environment. The WHO’s Multicenter Growth Reference Study found linear growth variation of children within countries was 70% while it was only 3% among the six different sites in both developed and developing countries (Garza, et al., 2013).

B. The Hierarchy of the Drivers of Stunting: Synthesis of Findings

While the interviews were teed up as being related to health and nutrition, lack of clean water and sanitation came out as a major development problem and driver of stunting. When asked about the most important interventions to address stunting, however, improving water and sanitation were not mentioned. The 2013 TLFNS and its analyses also did not find strong associations between stunting and WASH interventions. The fact that WASH was not identified as an intervention to reduce stunting may be because most people interviewed were mainly from the health sector although they too recognized the need for better access to clean water and sanitation. From the interviews with staff from SAS, it was clear they knew less about nutrition, but they did understand the importance of clean water and sanitation as an important intervention to improve nutrition. They are less aware of a multi-sectoral approach to address malnutrition. Multi-sector coordination about the problem of stunting were limited in most places but are urgently needed.

There was overwhelming recognition that IYCF practices were poor, as found in the review above, and lack of knowledge and information about what to feed children was identified by interviewees as a major cause of stunting and malnutrition. Poor nutrition of mothers was mentioned as a problem in a few municipalities but not in every municipality. A few people noted that people were selling or not growing nutritious foods and relying on less nutritious imported food. These findings from the interviews were corroborated by the 2013 TLFNS and its analyses. People living in remote areas where they have poor access to roads, markets, and health services was mentioned as a major cause of increasing the risk of stunting and malnutrition, also found in the 2013 TLFNS.

There are other underlying causes of stunting reported in various qualitative studies (as well as mentioned by several respondents during the Team’s field mission), which are unique to Timor-Leste. Several people mentioned that traditional ceremonies are a financial burden on families,

which significantly deplete the family's budget and cripple ability to provide nutritious foods. A few people mentioned that mothers restrict what they eat during pregnancy or may not feed certain foods to children due to beliefs the child cannot or should not eat these foods. These beliefs appear to vary geographically, but it is unknown if they determine current dietary behaviors. A 2007 study (MOH, 2007) conducted an in-depth consultation with communities in two municipalities about health and nutrition practices that provides interesting information about why certain practices are followed and if mothers are willing to adopt optimal practices. However, more needs to be known about current practices and use of health services and how, for example, socio-economic, gender roles, and mothers time constraints, to name a few, affect practices.

IV. Readiness of the GoTL to address stunting

A. Government of Timor-Leste's strengths and weakness to address the drivers of stunting

After 400 years of colonial rule and 25 years of Indonesian occupation, Timor-Leste is a young post-conflict country that in less than 20 years achieved relative peace and stability and progress in addressing targets in several social sectors including health and education. Successes in malaria control, reducing under-five mortality and other areas (listed below) suggests that Timor-Leste can address the problem of stunting when it mobilizes commitment and the budget to address important development problems.

Achievements in health

1. Malaria

In 2016, only 95 cases of malaria were reported compared to nearly 20,000 confirmed cases in 2011. In 2017, the most frequently reported number is 10 cases nationally. This is a stunning and admirable impact in any location and particularly impressive in that Timor-Leste occupies only one-half of Timor island. The 2017–2021 National Strategic Plan for Malaria Elimination (GOTL, 2017) credits a “well-funded program with a technically strong strategy built on the foundation of a rapidly evolving health system that is providing basic health services down to the household level.” These gains were so dramatic that the National Malaria Strategic Plan 2015–2020 (GOTL, 2015) was rendered obsolete several years early, necessitating the development of a National Strategic Plan for Malaria Elimination 2017–2021 (GOTL, 2015). The 2015–20 plan aims to reduce the level of malaria morbidity and mortality in Timor-Leste in 2012 by 30% by the year 2017, and to further reduce cases by 20% by the year 2020. These targets have been exceeded, and no deaths from malaria were reported in 2015 or 2016. Aileu, Lautem, and Liquicia municipalities did not report a case of malaria in 2015 or 2016, while the majority of cases (88 out of 95 in 2016) were reported in Oecusse. Between 2006 and 2013, the number of reported malaria cases in Timor-Leste dropped dramatically from 220 cases per 1000 people in 2006 to less than 1 case per 1000 in 2013.²²

In 2009–10, 40.9% of households had at least one insecticide-treated nets (ITN), which increased to 64.0% in 2016. Similarly, the average number of ITNs per household almost doubled over this period, from 0.8 to 1.5 (DHS, 2016).

The South East Asia Regional Office for the World Health Organization (SEARO) credits political commitment, advances in diagnostic testing and treatment, and financial support for this improvement. Much of this success is attributed to the high level awareness raising which reached communities and government coordination.

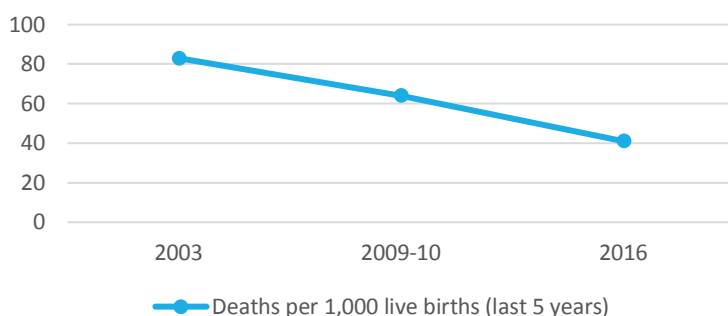
Timor-Leste progressed to the malaria elimination phase, which involves the interruption of indigenous transmission. The focus of the National Strategic Plan for Malaria 2017–2021 includes universal access to early diagnosis and prompt treatment, malaria prevention and intensified surveillance. The 2017–21 Plan calls for the establishment of a high-level Task Force for Malaria Elimination directly under the Prime Minister's Office to sustain political and financial commitment and to oversee the implementation of the malaria elimination program.

²² Timor-Leste: Strong malaria control program cuts cases, <http://www.searo.who.int/mediacentre/events/timor-leste-malaria-story/en/>

2. Child Mortality

The under-five mortality rate fell by over 50% between 2003 (83 deaths per 1,000 live births) and 2016 (41 deaths per 1,000 live births). Note though that the 2016 DHS advises caution with the interpretation of these figures due to some discrepancies in the data. Factors contributing to

Figure 14: Deaths per 1,000 live births between birth and 5 years



this impressive decline include improved access to antenatal care, malaria control efforts, and implementation of WASH interventions.

3. Open defecation

The Sustainable Development Goals include a target to achieve access to adequate and equitable sanitation and hygiene for all and end open defecation by 2030, paying special attention to

the needs of women and girls and those in vulnerable situations. According the Timor-Leste 2015 Census, 21% of people still practiced open defecation, a decline from 28.4% in 2009/10 (TLDHS, 2010). Despite this relatively high level, there are remarkable successes in many parts of Timor-Leste in pursuit of becoming ODF, including the February 2018 declaration that Ermera Municipality is entirely ODF. A former senior official in the Ministry of Health attributes this success to community action: “By engaging communities, this municipality has ensured toilets for every household. Stopping open defecation and practicing good hygiene behaviors not only keep family members healthy, but also reduces the burden of medical expenses for every family.” International and local NGOs lead the transformative efforts on the ground under the overall coordination of the Ministry of Health. Following Ermera’s success, contacts in the field report that four other municipalities over 90% of communities (*aldeias*) have eliminated open defecation with consistent attribution to ministry leadership, clarity of programming, sustained coordination, and deep community engagement. A 2017 study (Moran, 2017) in certain ODF locations found that 20% of households in *aldeias* declared ODF returned to open defecation – primarily because their latrine “had fallen into disrepair.” This should not be read as a negation of the importance of the national progress, but instead as an indicator of the need to relentlessly continue and refine efforts across all ODF *aldeias*.

4. Antenatal care and maternal mortality²³

In 2005, the maternal mortality ratio (MMR) in Timor-Leste was one of the highest in the world at 506 maternal deaths per 100,000 live births. By 2010, MMR had fallen to 317 deaths per 100,000 live births, and by 2015, the MMR was 215 deaths per 100,000 live births. The annual rate of reduction between 2005 and 2015 was a remarkable 8.6%.

The notable fall in the MMR is partially explained by a concomitant improvement in a broad range of maternal health indicators. Although the percentage of women receiving at least one ANC visit stagnated (86% in 2009/10 and 84% in 2016), the percentage of women who received four or more ANC visits rose from 55% to 77%. During this same six-year period, the percentage

²³ All MMR and ANC data presented in this section are from the DHS

of births that were attended by a skilled birth attendant rose from less than a third (30%) to more than half (57%), and the percentage of births that took place in a health facility rose from a fifth (22%) to almost half (59%). Perhaps most strikingly, the percentage of women reporting postnatal check-up within two days increased from 3% to 35%. Equally impressive is the rapid decrease in the rate of total fertility from 7.9 children in 2010 to 4.2 in 2016.

In explaining these impressive results, the Maternal Health Task Force reports that “The Ministry of Health in Timor-Leste has since worked diligently to encourage institutional delivery, guaranteeing free health care for all and improving access to health care at referral hospitals, community health centers and at rural health posts. The government has actively promoted policies to enhance community engagement, raise awareness of maternal health issues, improve maternal nutrition and streamline family planning services.”

4. Breastfeeding

Between 2003 and 2013, there was a steady increase in the percentage of infants who were breastfed in the first hour after birth from 47% in 2003 (DHS) to 82% in 2009/10 (DHS) and 93.4% in 2013 (TLFNS). However, that progress was not sustained, and the percentage declined to 75% in 2016 (DHS).

Similarly, the proportion of children 0-6 months who were exclusively breastfed (EBF) rose from 30.7% in 2003 and 52.3% in 2009/10 and then to 62.3% in 2013. Like immediate breastfeeding, though, EBF then declined in 2016 to 50% (DHS, 2016). The Alola Foundation and its founder, former First Lady Dr. Kirsty Sword, are credited with championing breastfeeding and inspiring and educating women across Timor-Leste in appropriate breastfeeding practices. Since the positive results from 2003 to 2013 were not sustained in 2016, there is an opportunity to re-strengthen programs that protect, support, and promote appropriate IYCF practices.

Establishing a strong enabling environment

For nutrition and WASH, progress toward targets is slow. Rates of malnutrition remain above acceptable public health levels for most indicators, delivery and sustainability to water and sanitation services are poor across rural and urban communities. Institutionally, the government took initiative to establish a strong enabling environment through: supportive policies, plans, and strategies; new staff dedicated to nutrition; and multi-sectoral coordination involving multiple sectors across government.

Strategic documents and declarations

- **Timor-Leste Our Nation Our Future (2020)** documents priorities identified by the people of Timor-Leste following independence and shaped the **National Development Plan (2002)** which identified health (including access to water and sanitation services), second to education, and agriculture as the nation’s top priorities. The National Development Plan identified elimination of hunger and food self-sufficiency as a key priority.
- **Decree-law No. 4/2004** was developed following independence to “create and establish conditions for water distribution for domestic use” and continues to guide the water sector in urban and rural areas as approval of a subsequent water policy remains pending. Key commitments contained in the law related to appropriate, secure, and sustainable urban water supplies; full cost recovery from customers; affirmation of community

management of rural water supplies; and commitment to “secure optimal benefit for the Timorese people’s health, for agriculture and for the environment.

- The **Comoro Declaration** signed in 2010 by ten line-ministers reaffirms the fundamental right of all people in Timor-Leste to be free from hunger, stating the right for all citizens to have access to good quality, nutritious food. Shortly thereafter, national recognition of the importance of multi-sectoral action in the reduction of malnutrition was enshrined in the development of the National Council on Food Security, Sovereignty and Nutrition (KONSSANTIL) whose mandate is to guide the national multi-sectoral response to food insecurity and malnutrition.
- **The Strategic Development Plan 2011-2030 (SDP)** (GoTL, 2010) superseding the **2010 National Development Plan** and setting out several strategies aimed at transitioning Timor-Leste from a low income to an upper middle-income country. The SDP identifies nutrition and food security and the management of water resources as fundamental to enhancing economic development. Relevant targets include reaching food security by 2020, self-sufficiency for food staples by 2020, self-sufficiency for all foods and access to clean water and improved sanitation for all citizens by 2030. Training health care workers, increasing biodiversity with a focus on nutritious and high-yield crops and livestock; increasing irrigation and fertilizer use; improving rural water supply and drainage and urban sanitation and improving food transportation, storage, and processing infrastructure are recommended interventions. One goal of the Plan is for all citizens in Timor-Leste to have access to clean water and improved sanitation by 2030. The Plan addresses urban sanitation, rural water supply, and drainage, but there are no targets related to rural sanitation.
- **Decree No. 4/2004 on Water Services** implemented upon independence continues to guide the water sector by defining the two national approaches to urban and rural water supply. For urban areas, piped water supply is provided in water supply zones, under the management of Direção Nacional de Saúde Pública (National Directorate for Public Health, DNSA). In rural areas, community water management groups have the responsibility for supplying water to communities either through formal user groups (Grupo Maneja Facilidade or GMF (Community Water Management Group)) or informal structures. These community groups are directed to develop local methods to raise revenues for operations, with technical input and oversight provided by DNSA. The rural responsibility for DNSA is not fully elaborated in the decree, which contributes to current ambiguity. Both a law and policy for water resources management, as well as a policy for water supply are pending approval by the Council of Ministers.
- In 2014 Timor-Leste was the first country in Asia to commit to the FAO Zero Hunger Challenge. **The 2014-2025 Zero Hunger Challenge National Action Plan** (GoTL, 2014) established under KONSSANTIL commits to ending hunger and malnutrition. The Action Plan has five pillars with targets including: 1) equitable access to food year-round for everyone; 2) reducing stunting to zero; 3) creating sustainable and climate resilient food systems; 4) increasing smallholder productivity and income; and 5) zero food waste. Pillars 1 and 2 include a combination of outcomes, outputs, activities, and indicators associated with increased water supply for homestead gardening, wider access to water

and sanitation facilities, and improved hygiene as contributions to addressing hunger and malnutrition.

- In 2015 GOTL actively supported the adoption of the Sustainable Development Goals. Using SDG 2 as a foundation, it developed a **Roadmap for Nutrition (2017)** (GoTL, 2017). The Roadmap highlights actions to achieving SDGs by increasing resources for nutrition; reducing chronic undernutrition, stunting, anemia, acute undernutrition, and wasting; and increasing political commitment and investment, healthcare capacity, and community nutrition education.
- **The National Health Sector Strategic Plan (2011–2030)** (GoTL, 2011) is a revised version of the **Health Sector Plan (2008-2012)**. The new Plan includes several nutrition targets including 60% of infants under six months being exclusively breastfed by 2015, 50% of infants under one year receiving appropriate complementary foods (in addition to breastfeeding) by 2015, 50% of schools implementing recommended feeding programs by 2015 and community engagement in nutrition and food security programs increased by 30 %. Unfortunately, the Plan makes no reference to WASH services as a contributor to nutrition outcomes, but it does discuss “access to drinking water” and “access to sanitation and hygiene” along with “food safety,” “vector borne diseases,” “waste management,” and “air pollution” as environmental issues for which strategies and expected results are presented. No WASH-specific strategies are presented, but indicators relate to policies for sanitation and water quality, resources and support systems, access to water and sanitation facilities, and health facility waste management.
- **Ministério das Obras Públicas, Transportes e Comunicações’ (Ministry of Public Works, Transport, and Communications, MOPTC’s) Five-Year Water and Sanitation Action Plans** typically represent the goals of the current government, but are not fully developed to address institutional development, capacity, and full budget needed to implement the plans. The authors are not aware of a Plan that is current in effect.
- **The National Basic Sanitation Policy** (GoTL, 2014) was endorsed in 2012 and comprehensively covers urban and rural areas, as well as household, institutional, and community sanitation. The Policy names MOH as the lead agency for rural sanitation and dictates that demand-led approaches, in particular CLTS, lead the implementation of rural sanitation with technical guidance from the MOPTC. It contains policy principles, policy instruments, and financing rules that should be utilized. It also clarifies the roles and responsibilities of the various actors in the system and sets out an integrated and staged approach to achieving a healthy environment, with ODF *sucos* being the first target.
- A draft **Strategic Sanitation Plan (2020)** establishes priorities and actions to achieve sanitation targets. Initially covering rural areas, the Plan provides sanitation targets, identifies priority groups and geographic areas; determines the best use of sub-sector resources and capacity; and proposes tracking of *suco* sanitation using five levels of achievement – the first being ODF *sucos*.
- **The National Nutrition Strategy (2014–2019)** (GoTL, 2014) was an update from the **2012 National Nutrition Strategy and the 2004 National Nutrition Strategy**, which were both very focused on the role of Ministry of Health. The new Strategy is much more focused on the multisector dimensions of nutrition. Through this lens (including health, public works, education, agriculture and social solidarity) and the implementation of

nutrition-specific and nutrition-sensitive interventions and approaches. The broad goals of the Strategy are to; 1) increase nutrient intake in mothers, adolescent girls, and children; 2) improve healthcare for mothers and children; 3) improve household, community, and national food security; 4) improve water supply and sanitation access and hygiene practices; 5) promote optimal nutrition practices; and 6) improve capacity for nutrition action. Costing for the Strategy was completed but never endorsed.

- **The 2017 National Food and Nutrition Security Policy** (GoTL, 2017), updated from the **2005 Food Security Policy** aims to eliminate hunger and malnutrition considering nutrition, livelihoods and sustainability. The Policy includes eight goals include: 1) increasing nutritious local food production and the links between producers and consumers; 2) increasing sustainable food production and climate change resilience; 3) making safe, nutritious, high-quality food consistently available throughout the country; 4) increasing rural incomes; 5) improving nutritious food access for the most vulnerable; 6) improving women's and children's health status; 7) improving food and nutrition education; and 8) creating effective food and nutrition information systems.
- In 2014, Timor-Leste also committed to the Community of Portuguese-Speaking Countries **Food Security and Nutrition Strategy (ESAN-CPLP)**.
- **The draft Reproductive Maternal, Neonatal and Child Health (RMNCH) Strategy (GoTL-MOH)** includes several targets related to nutrition all of which are aligned with the targets outlined in the National Nutrition Strategy (2014-2019). The Strategy has a strong emphasis on providing appropriate reproductive and preventative health care services for adolescents. The Strategy was endorsed under the fifth constitutional government but retracted shortly afterwards because of sensitivities related to access to family planning for unmarried adolescent girls.
- **The Ministry of Agriculture and Fisheries (MOAF) Strategic Plan (2014 - 2020) (GoTL, 2014)** outlines nine main goals including: 1) increasing rural incomes and reduce poverty; 2) increasing household food and nutrition security; 3) supporting the transition from subsistence to commercial farming; 4) promoting environmental sustainability and conservation of natural resources; 5) sustainably increasing food production through improved crop varieties, forestry, livestock species, and fisheries; 6) improving market access and market value addition; 7) improving the enabling environment, including legislation, policies, institutions, and infrastructure; 8) strengthening the MAF; and 9) conserving, managing, and utilizing natural resources.
- **The National Aquaculture Development Strategy (2012–2030)** (GoTL, 2013) strongly emphasizes the role of fisheries in reducing malnutrition and poverty. The 2020 goal is to increase fish consumption from six to 15 kilograms per capita/year by 2020.
- **Timor-Leste National Strategic Plan for Education 2011-2030** (GoTL, 2011) includes only a few references to nutrition and WASH. Limited access to adequate water supply and sanitation facilities is mentioned as one of the reasons for absenteeism. One of the activities under key result area 1.4 is to develop and implement special packages (including special nutrition and health programs to incentivize the participation of parents and civil society associations to encourage enrolment in public and private Pre-School Education.

Multi-sector coordination

KONSSANTIL is the multi-sector coordinating body for nutrition in the country. It made significant progress in bringing relevant sectors together and, based on a KONSSANTIL meeting the Team attended, enjoys wide support from the relevant sectors involved. Non-traditional sectors are involved as well. While no specific mention of nutrition or WASH is made in relevant policies of the MOSS, MOF, Ministry of Commerce Industry, and Environment (MCIE), and/or the Ministry of State Administration, all are active members of KONSSANTIL at the technical level and have expressed interest in supporting the agenda for improving nutrition and food security.

The need to strengthen coordination among sectors and development partners came out strongly during stakeholder meetings, the potential role of KONSSANTIL in this process was mentioned on several occasions. Platforms such as the KONSSANTIL permanent technical secretariat, the Ministry of Health Nutrition Working Group, the Health Development Partners meeting, the Rural Development Partners meeting, and the recently established informal nutrition development partners forum all provide forums for sharing information and discussing issues; however, the landscape remains fragmented with inconsistent coverage of interventions and at times, duplication of programs.

Human resource capacity development

Human resource capacity in the Timor-Leste health sector is improving, and the Government demonstrated strong commitment to increasing the workforce. For example, from a workforce of only 233 physicians in 2010 (which included 169 expatriate doctors), a ratio of 0.20/1000 people, analysts forecast that the number of doctors will reach 800 in 2018 (a ratio of 0.68/1000 people). In 2010, the ratio of nurses/midwives per 1,000 people was 1.08. This ratio is expected to be 1.79/1,000 people in 2018, almost doubling the ratio of the health workforce (nurses, physicians and midwives)/1,000 people in just eight years (Cabral, et al., 1982).

Similarly, the nutrition workforce grew substantially over the past few years, with government staffing existing positions and creating new positions. Currently there are 13 District Public Health Officers in Nutrition who supervise Nutrition Coordinators based at every community health center (CHC) in every sub-municipality (63 in total) and 17 Nutrition Assistants based at selected Municipality Health Services. In addition, the MOH developed guidelines for the establishment of volunteer Mothers Support Groups in every *suku* as an extension to the SISCa health outreach service.²⁴ While these results are impressive, the absence of a strategic approach to human resource development and absence of associated policies to guide effective absorption and retention puts sustaining workforce quality at risk. While decentralization may assist, gaps in management capacity, appropriate and relevant preservice and in-service training, effective supportive supervision, planning, and monitoring, public financial management and logistics, still exist and highlight the need for a more strategic approach to human resource development (Assante, 2014).

These gaps hold true for the water supply and sanitation sectors as well. There is a shortage of qualified staff in urban operations, and the unavailability of engineers and skilled technicians hinders willingness to invest in expanding and improving urban infrastructure. Workforce

²⁴ SISCa is one of three Ministry Health platforms for provision of health and nutrition services. The other two are mobile clinics and health facilities. SISCa is a community-based platform.

numbers and capacity are particularly strained at the municipal level managing urban systems and providing support to rural operators. These shortages impede government's ability to develop proposals and get approvals from the municipal administration. This contributes significantly to low budgetary disbursements. Similarly, technical and organizational capacity at the sub-district level are also constraints leading to delays in providing support to GMFs for repairs and to ineffective monitoring and reporting of service levels. Nowhere in the sector is there an assessment of actual human resource needs to support urban growth, municipal operations, or community management. Skilled technical staff are a critical shortage as are community outreach workers to respond to GMF needs and internalize ODF work from local and international NGOs into a government-led practice.

While several capacity needs assessments were conducted for medical personnel, including physicians, nurses and midwives (Guest, et al., 2017; Hou, et. al., 2016; Smith, et al., 2016), a comprehensive capacity needs assessment of personal working in nutrition (national and frontline) in the MOH and across the water supply and sanitation directorates is a high priority need for Timor-Leste. In addition, existing job descriptions for existing positions are typically overly ambitious and in-service training for staff is limited to a short duration courses covering multiple modules and volumes of information (e.g., the recently endorsed Specific Nutrition Intervention Package (SNIP)). Medical staff receive training on inpatient care of acute malnutrition. But, this training was delivered in only six hospitals to date. More recently, the MOAF launched a nutrition-sensitive agriculture curriculum targeting Agriculture Extension Workers, which provides an opportunity to reach men with nutrition messages since most extension workers are men who interact with male farmers.

Despite the high burden of malnutrition in Timor-Leste, there are no accredited pre-service trained clinical nutritionists/dietitians. Less than a handful have a medical degree (2/102), three are qualified nurses or midwives, and the majority hold a public health degree from Timor-Leste (65/102). One Department of Public Health Officer (DPHO) in nutrition has a diploma 3 in environmental health only and the recently employed Nutrition Facilitators have just completed secondary school (17/17).

Mother Support Group members (volunteers) and PSFs (Family Health Promotion volunteers) receive some ad-hoc nutrition training but this is mostly delivered by NGOs working with these groups and individuals.

Consistent feedback received from a range of stakeholders during the field mission indicated the need to strengthen human resource capacity in nutrition, water supply maintenance, and sanitation promotion (from national to frontline workers), with several stating the need for more supportive supervision and others requesting training on nutrition sensitive interventions and social and behavioural change communication theory and methods.

B. Unique challenges and opportunities in Timor-Leste

Timor-Leste remains one of the world's poorest nations, and dependence on dwindling oil revenues threaten economic growth. In a tight fiscal environment, national priorities compete for funding and the government has focused on rebuilding the country's infrastructure, much of which was damaged or fell into disrepair during decades of conflict. Consequently, social

services remain underfunded. A unifying national champion for the cause is therefore sorely needed. Former President Taur Matan Ruak was an effective supporter throughout his presidential term, and there is great optimism that he will reprise the role of nutrition champion in his tenure as Prime Minister under the 8th Constitutional Government.

A comprehensive understanding of the breadth, depth and consequences of the problem is needed at all levels of government to ensure that policies and programming reflect the complex multisectoral underlying and immediate causes of undernutrition. The Presidents Nutrition Awards Program (2014-2017) is an example of an initiative that achieved high level national advocacy and awareness about the issue of malnutrition, whilst recognising and rewarding community-based programs and good multisector practice. Coupled with evidence-based programming and policy reform, the continuation of such a program under the Presidents or the Prime Minister's office could be a way to maintain the momentum and continue awareness raising. As the jury for the former President's Nutrition Awards Program (2014-2017), the role of KONSSANTIL became more visible and understood. The President initiated roundtable dialogues on nutrition and food security, which also provided a platform for KONSSANTIL councils at the sub-national level to become more involved in nutrition and food security policy dialogue. There are opportunities to strengthen these (and similar) approaches with capacity development and engagement.

While progress has recently been made, the unique role of KONSSANTIL in driving the nutrition and food security agenda in Timor-Leste remains underutilized. Various reports, including the National Nutrition Strategy, and others recognize the important role of KONSSANTIL and recommend that the Council be strengthened to ensure "high level coordination and leadership to move the nutrition agenda forward in Timor-Leste. Improving nutrition must become a central priority for KONSSANTIL and member ministries, and can be evidenced through leadership commitment, prioritization of PANHAM-TIL activities, and creation of a common results framework with sectors responsible for appropriate nutrition-related indicators." The National Nutrition Strategy (2014-2019)²⁵ recommends, "establishing a Inter-ministerial Committee/Commission on Nutrition in the PM/VPM's Office for inter-sectoral coordination, negotiating budget for nutrition specific and sensitive interventions and nutrition strategy implementation monitoring." There is a broad consensus among stakeholders that KONSSANTIL should be elevated to the Prime Minister's Office and be supported by a dedicated and funded Secretariat, reporting to the Prime Minister.

National commitment to reducing the burden of malnutrition is well reflected in the series of national policies and plans. However, alignment of targets and interventions is lacking, and challenges remain in establishing and maintain the intricate coordination required to effectively deliver the range of ambitious interventions required to meet targets. Furthermore, some policies were endorsed without a costed plan (e.g. the National Nutrition Strategy 2014-2019), leaving implementation beyond the means of current national budget allocations. In addition, national budgets are traditionally delivered by sector and there are few instances of sufficiently funded multi-sectoral plans. The lack of dedicated funding for the Zero Hunger Action Plan, costed at

\$17 million dollars a year, is an example of this. Timor-Leste has been active in seeking and guiding international support to meet these goals, but significant gaps remain.

Further compounding the political challenge is the common and pervasive perception among the population (including health workers) that stunting is genetic and not problematic, rendering the issue of impaired growth invisible. Indeed, with half of children 0-59 months stunted, this condition is effectively normalized. Political will and community motivation to address an issue that is not recognized as a concern is limited. Consequently, funding is directed to treatment of acute, “visible” conditions, rather than prevention programs.

At the community level, challenges persist in sufficiently targeting programs at adequate depth and intensity towards women and children. There is global recognition that risk factors for stunting start pre-conception and continue into early childhood, and the importance of addressing the nutrition of women and children is reflected in national plans and policies. However, the absence of evidence-based interventions targeting women of reproductive age; for example, intermittent IFAS for adolescent girls and calcium supplementation in pregnancy remains an unfilled gap.

A common response to the question posed to stakeholders during the field mission on the causes of stunting, was the lack of knowledge of caregivers. The low coverage of programs aimed at improving nutrition promoting practices across sectors using effective SBCC methods at saturation level, hinders progress in this area.

Related to policy reform, multisector coordination, scale up of effective interventions and the need for more targeted SBCC, is human resource capacity. Whilst Timor-Leste has had impressive results increasing its workforce, the absence of a strategic approach to human resource development in Timor-Leste and appropriate policies to guide effective absorption and retention; sustaining workforce quality and implementing quality programs at scale is at risk. While decentralization may assist, gaps in management capacity, appropriate and relevant preservice and in-service training, effective supportive supervision, planning, and monitoring, public financial management and logistics, still exist and highlight the need for a more strategic approach to human resource capacity development (Assante, 2014).

Women are the most important caregivers of children but often lack the agency to make decisions about what foods to purchase and when to use health care services. The demands on their time for childcare, household chores, and agricultural activities put an undue burden on them that only other families can help alleviate. Poor access to water is a crosscutting barrier to their stronger engagement. It creates childcare challenges by constraining both hygiene and health, increases the burden of household chores through the time needed for water collection, and constrains agricultural activities through seasonal shortages exacerbated by drought and local topography. Improving water access would reduce time burdens and enhance opportunities for women and girls for education, productive work, and other avenues for empowerment (Shabalina, 2018). The need to empower women is clear and the role of men in the nutrition and childcare dialogue, including their supportive and direct role, is becoming more recognized; however, mechanisms to achieve a balance of both effectively are yet to be defined. Little is known about women’s decision-making authority within the household to buy and distribute equitably nutrient-dense foods; this, too, warrants further investigation.

The extremely remote nature of many communities and continued lack of infrastructure lead to onerous physical, financial and socio-cultural barriers that prevent vast tracts of the population

from accessing services. Implementing programs and policies in remote communities is costly, time consuming and difficult. While the GoTL has had success in revitalizing the health system to extend the reach of primary health care services to community and household levels, access to other services and programs at adequate scale and depth to support sustained improvements in nutrition remains limited.

These gaps hold true for the water supply and sanitation sectors, as well. There is a shortage of qualified staff in urban operations, and the unavailability of engineers and skilled technicians hinders willingness to invest in expanding and improving urban infrastructure. Workforce numbers and capacity are particularly strained at the municipal level managing urban systems and providing support to rural operators. These shortages impede government's ability to develop proposals and get approvals from the municipal administration. This contributes significantly to low budgetary disbursements. Similarly, technical and organizational capacity at the sub-district level are also constraints leading to delays in providing support to GMFs for repairs and to ineffective monitoring and reporting of service levels. Nowhere in the sector is there an assessment of actual human resource needs to support urban growth, municipal operations, or community management.

Despite the high burden of malnutrition in Timor-Leste, there are no accredited preservice trained clinical nutritionists/dietitians. Mother Support Group members (volunteers) and PSFs (Family Health Promotion volunteers) receive some ad-hoc nutrition training, but this is mostly delivered by NGOs working with these groups and individuals. Consistent feedback received from a range of respondents during the field mission indicated the need to strengthen human resource capacity in nutrition, water supply maintenance, and sanitation promotion (from national to frontline workers), with several stating the need for more supportive supervision and others requesting training on nutrition-sensitive interventions and SBCC theory and methods.

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ANNEXES

Annex 1: Significant Findings from Analyses in the TLFNS, 2013, Report

| Relevant Determinants | n | Prevalence | p value | Regression | p value |
|---|------|------------|---------|------------|---------|
| Illness, Child Morbidity | | | | | |
| Illness in last two weeks (0-59mos) | | | | | |
| Any sickness in the last 2 weeks | | | | | |
| No | 4920 | 50.4 | 0.007 | | |
| Yes | 4404 | 53.0 | | OR 1.20 | <0.001 |
| Diarrhea in the last two weeks | | | | | |
| No | 7754 | 50.8 | <0.001 | | |
| Yes | 1558 | 55.6 | | | |
| Suspect Pneumonia in the last two weeks | | | | | |
| Not sick | 5824 | 50.8 | <0.001 | | |
| Fever only | 2620 | 52.2 | | OR 1.11 | 0.023 |
| Suspected Pneumonia | 879 | 55.6 | | OR 1.20 | 0.048 |
| Child Feeding Practices | | | | | |
| Currently breastfeeding (0-23 months) | | | | | |
| No | 1133 | 52.1 | <0.001 | | |
| Yes | 3590 | 33.4 | | | |
| Adhering to IYCF practices (0-23mos) | | | | | |
| Not adhere | 3343 | 41.8 | <0.001 | | |
| Adhere | 1307 | 27.8 | | | |
| Intake of fortified food (6-23 mos) | | | | | |
| No | 3219 | 46.1 | <0.001 | | |
| Yes | 411 | 37.7 | | | |
| Minimum Meal Frequency (6-23 mos) | | | | | |
| No | 666 | 53.8 | <0.001 | | |
| Yes | 2917 | 43.3 | | | |
| Responsive Feeding (6-23 mos) | | | | | |
| Being help/fed by mothers | 3033 | 45.1 | <0.001 | | |
| Eat by him/herself | 161 | 61.5 | | | |
| Consumption of flesh foods (24-59mos) | | | | | |
| No | 3184 | 67.7 | <0.001 | | |
| Yes | 1382 | 60.9 | | | |
| Consumption of milk (24-59mos) | | | | | |
| No | 4213 | 66.6 | <0.001 | | |
| Yes | 353 | 55.2 | | | |

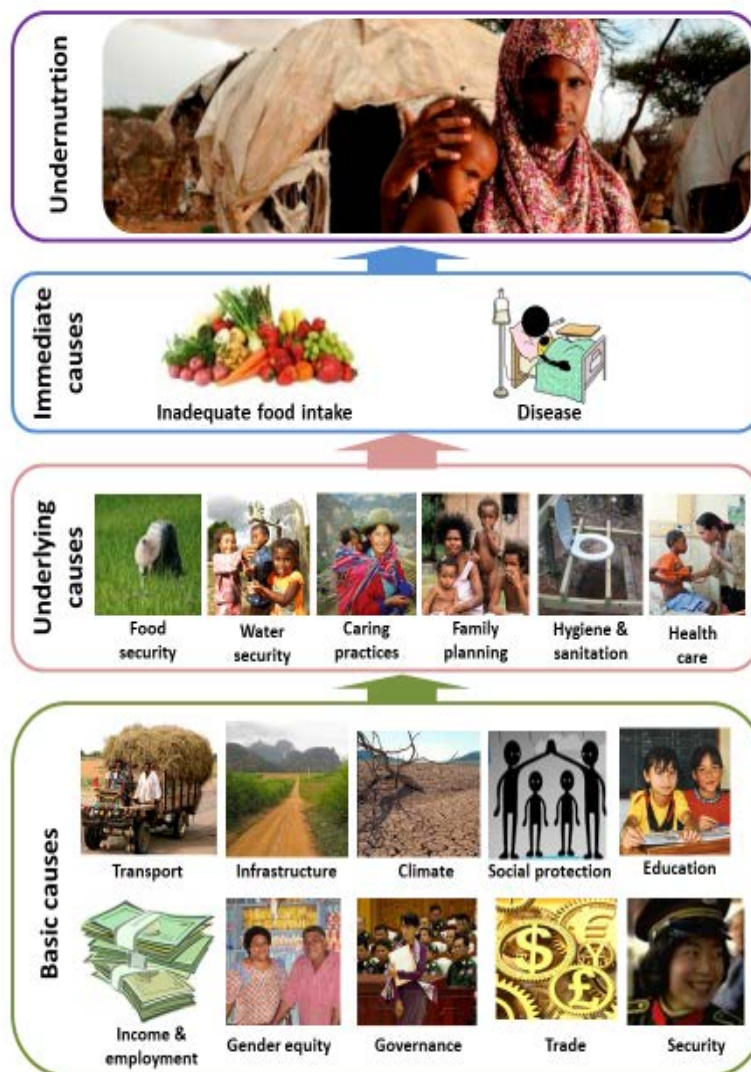
| | | | | | | |
|---|------|------|--------|---------|--|--------|
| Good dietary practices | | | | | | |
| Not Adequate | 6856 | 54.1 | <0.001 | | | |
| Adequate | 2358 | 44.4 | | OR 1.30 | | <0.001 |
| Coverage of nutrition and health care services | | | | | | |
| Immunization coverage/Received BCG | | | | | | |
| No | 100 | 75.0 | <0.001 | | | |
| Yes | 2272 | 54.8 | | | | |
| Mother had any ANC visits during pregnancy | | | | | | |
| No | 1198 | 56.3 | <0.001 | | | |
| Yes | 7819 | 50.6 | | | | |
| Sanitation | | | | | | |
| Type of latrine | | | | | | |
| Unimproved sanitation | 4994 | 54.9 | <0.001 | | | |
| Improved sanitation | 4294 | 47.6 | | | | |
| Demographic | | | | | | |
| Nutritional status of mothers (0-23 mos) | | | | | | |
| Thinness | 2150 | 53.1 | <0.001 | | | |
| Normal | 5217 | 49.9 | | | | |
| Overweight | 761 | 42 | | | | |
| Education level of primary caregivers | | | | | | |
| No school | 2891 | 58.1 | <0.001 | OR 1.37 | | 0.006 |
| Primary school | 2431 | 51.1 | | | | |
| Junior High school | 1609 | 50.0 | | | | |
| Senior High/University/Academy | 2389 | 45.2 | | | | |
| Literacy of the primary caregivers | | | | | | |
| Cannot read at all | 3384 | 57.2 | <0.001 | | | |
| Able to read partly | 1812 | 52.2 | | | | |
| Able to read | 4058 | 46.6 | | | | |
| Age of primary caregiver | | | | | | |
| <20 years | 277 | 37.5 | <0.001 | | | |
| 20-35 years | 6358 | 49.9 | | | | |
| >35 years | 2689 | 57.0 | | | | |
| Socio-economic factors | | | | | | |
| Household wealth quintile | | | | | | |
| First | 1987 | 58.5 | <0.001 | OR 1.59 | | <0.001 |
| Second | 1812 | 55.0 | | OR 1.43 | | <0.001 |

| | | | | |
|---|------|-----------------|---------|---------|
| Third | 1773 | 52.3 | OR 1.35 | <0.001 |
| Fourth | 1868 | 49.7 | OR 1.34 | <0.001 |
| Fifth | 1859 | 41.9 | | |
| Livelihood | | | | |
| Household main activities in agriculture | | | | |
| No | 2876 | 44.4 | <0.001 | |
| Yes | 6164 | 54.7 | OR 1.25 | <0.001 |
| Household main activities in salary work | | | | |
| No | 7030 | 53.4 | <0.001 | |
| Yes | 2010 | 44.3 | | |
| Cash Crops | | | | |
| No | 3670 | 50.5 | <0.001 | |
| Yes | 2791 | 56.7 | | |
| Connection to the electricity | | | | |
| No | 3175 | 56.9 | <0.001 | |
| Yes | 6124 | 48.8 | | |
| Household experienced shock 12 months prior to survey | | | | |
| No | 7074 | 50.8 | 0.007 | |
| Yes | 2185 | 53.9 | | |
| Age and Sex of Child | | | | |
| Age | | (HAZ <-2.00 SD) | | |
| 0-5 months | 1093 | 12.2 | | |
| 6-11 | 1251 | 25.9 | | |
| 12-23 | 2379 | 54.9 | | |
| 24-35 | 1957 | 62.2 | OR 3.27 | p<0.001 |
| 36-47 | 1599 | 65.2 | | |
| 48-59 | 1045 | 63.9 | | |
| Sex | | | | |
| Male | 4770 | 53.1 | OR 1.37 | p<0.001 |
| Female | 4554 | 47.2 | | |
| Residence/Locale | | | | |
| Urban | 2326 | 38.9 | | |
| Rural | 6998 | 54.5 | | |
| Mother's height | | | | |
| < 145 cm | | | OR 1.86 | p<0.001 |
| ≥145 cm | | | | |

Source: TLFNS, 2013 pp80-90

Annex 2: Conceptual Framework for Malnutrition in Timor-Leste

Conceptual framework for the causes of undernutrition



Source: Adapted by Menzies School of Health Research from UNICEF 1991 for MOH